Associations between Leprosy and the Subjective Wellbeing of People within India and Nepal

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Executive Summary

In 2018, a total of 208,619 new leprosy cases were detected globally. From these, 120,334 were from India, and 3,259 from Nepal. Together, these two countries contribute nearly 60% of the global caseload. Leprosy principally affects an individual's skin and peripheral nerves, resulting in neuropathy, deformity and disability. While low-cost antibiotics are readily available as a cure for leprosy, social stigma hinders early detection.

In India and Nepal, the stigma associated with contracting leprosy has its source within a vernacular belief that God is punishing affected people. As a result, individuals are abandoned due to the prevailing fear of opposing divine purposes. In response, early signs of leprosy are hidden. This concealment allows the disease to progress until its presence manifests to others due to tendon shortening within a person's fingers. This damage permanently curls the fingers of affected people, which is noticed upon greeting others. At this point, people are usually excommunicated from their families and places of employment and forced by their circumstances to seek treatment.

The standard treatment for leprosy includes the administration of multiple antibiotic drugs. Dispensing these antibiotics, including their dose and duration, are dependent upon the type of leprosy and age of the affected person. Associated treatments often include remedying ulcers, conducting surgery to repair nerve damage, and in many cases, amputations. These medical interventions are effective to some degree and continue to attract significant global research and funding; however, the moderating effect of stigma on an individual's subjective wellbeing (SWB) has life-long adverse implications and has received, by comparison, little research and funding.

In response, this investigation explores associations between leprosy and the SWB of people drawn from within India and Nepal. These investigations are conducted under the theoretical framework of subjective wellbeing homeostasis. To explore SWB cross-culturally, researchers often collect data using measurement scales developed and validated within Western contexts. This is problematic. A burgeoning literature now recognises that transporting Western scales into cross-cultural contexts creates vulnerabilities to strong cultural biases that contaminate data, rendering inferences invalid.

To combat such cross-cultural contamination of data, the first study examined the suitability of measures designed to quarantine data from bias. These strategies included a rigorous translation process, questions employing facial emoticons designed to identify acquiescent responding, a procedure to limit the influence of the researcher's proximity during data collection, and the use of a faces scale delivered using an Apple IPad, aimed to replace the usual numeric11-point, end-defined response scale.

Despite a reported successful use of a facial scale within India (Biswas-Diener & Diener, 2001), findings revealed that the facial representations did not function as expected. Rather than representing graduations of happiness, participants interpreted each face as a discrete emotion. This renders the questions designed to identify acquiescence and the facial response scale, as unreliable. In response to these findings, and under advice received from indigenous researchers, the original 11-point end-defined numeric scale was returned for the remaining data collection process, and all facial representations used to highlight acquiescent responding were removed from the questionnaire.

After gathering all data, including from a large sample of comparative Australian adults, the next study employed measurement invariance to confirm that data from India and Nepal validly represented each scale's factorial structure.

The study proceeded in three parts. The first established each scale's item content that produced the best fit between each hypothesised model and their observed Australian data. The second tested whether each Australian model accurately represented the Indian and Nepali data, separately. The third employed a series of multi-group confirmatory factor analyses to determine whether the models were invariant across Australian, Indian and Nepali contexts.

The results from Study 2 indicate only the depression scale of the Depression, Anxiety and Stress Scale employed within Nepal demonstrated measurement invariance with the Australian sample. This finding verified that Nepali people responded in the same way as Australian respondents to each scale item; thus, results were compared between Australia and Nepal. This comparison revealed that depressive symptoms from Nepali participants unaffected by leprosy are significantly higher than those drawn from the Australia sample.

The implications of this study's failure to demonstrate measurement invariance suggest that between-country comparisons using the scales included in this study cannot be validly made. Therefore, Study 3 was limited to examining within-country SWB comparisons between people with and without leprosy.

Study 3 had four main aims. The first aim examined differences between people with and without leprosy, in India and Nepal. It was found that people with leprosy returned lower levels on all SWB measures, along with higher levels of depression severity.

The second aim examined associations between leprosy and demographic variables. It was found that people affected by leprosy consistently reported lower SWB levels than people without leprosy, irrespective of their demographic. This is consistent with the reported negative impact of leprosy on someone's life within India and Nepal (Subedi & Engelbrektsson, 2018).

The third aim examined the relative contributions to a participant's SWB made by self-esteem, perceived control, optimism and the mildly positive mood, referred to as homeostatically protected mood (HPMood), as a function of SWB levels. SWB homeostasis predicts that when a SWB measurement is taken from people functioning without duress, the pervasive influence of HPMood results in a greater contribution to SWB from HPMood than other SWB variables. However, as levels of duress increase, a person's contact with HPMood decreases and salient protective variables such as self-esteem, are engaged to buffer the threat. Therefore, it was expected that for groups with lower levels of SWB, results would show decreasing contributions from HPMood and increasing contributions from variables such as self-esteem irrespective of whether a respondent had leprosy or not. Overall, these expected trends were not evidenced by the results.

In fact, results were indicative of poor performing models possibly caused by semantic differences between the three cultures. For example, the HPMood scale, developed within Australia, asks participants how happy, content and alert they feel. Conflating these three variables has been shown to produce a construct, HPMood representing the stable, mildly positive mood felt by people under normal conditions. Anecdotal evidence from India and Nepal suggests the use of the word happy may push the emotional valence of the HPMood scale towards a higher-energy positive affect than intended. For example, upon being asked to define "happy," people usually replied with a statement such as, “it’s the super-excited feeling you would get if you were to win a lot of money.” Additional research is required to explore this explanation further.

The fourth aim tested whether self-esteem still predicted SWB after controlling for HPMood within Nepal and India. Within the literature, any significant, unique variance added to SWB by variables such as optimism and perceived control is removed with the addition of HPMood. However, self-esteem is a robust construct supplying SWB with unique variance even after controlling for the pervasive influence from HPMood. Therefore, a hierarchical multiple regression explored whether these findings were able to be replicated from data collected from people affected by leprosy.

For people affected by leprosy, stigma results in people within India and Nepal becoming socially isolated, unable to engage in meaningful work and generally exhibiting low levels of self-esteem. These conditions are likely precursors for systemic failure in mechanisms evolved to maintain a person’s SWB; a condition referred to as homeostatic defeat. Homeostatic defeat is characterised by a loss of influence from HPMood, as homeostatic buffers such as self-esteem are increasingly engaged, but are eventually overwhelmed by severe, sustained, emotional threats. As a result, it was expected that for people affected by leprosy, the protective role played by self-esteem would be diminished. Therefore, the fourth aim explored whether the self-esteem of people affected by leprosy remains as resistant to the influence of HPMood as those without leprosy. This was found to be the case within Nepal, but not India. Within India, the use of HPMood as a covariate eradicated any significant contribution made by self-esteem for people with and without leprosy.

In summary, this thesis proposed to test the level to which leprosy is a significant threat to the SWB of people within India and Nepal. Results support leprosy as an irresistible homeostatic threat that was not effectively buffered by internal homeostatic mechanisms evolved to defend SWB, including the normally robust self-esteem variable. Further, despite every effort being made to limit the influence of cultural perspectives, measurement invariance and poor performing regression models determined such cross-cultural comparisons to be mainly invalid. This finding heralds a strong cautionary note to both the reading of existing cross-cultural research, and, any future research not incorporating extensive measures to secure immunity from the introduction of strong cultural bias. Finally, further research relevant to eliminating bias from Western scales used in India and Nepal, or perhaps better yet, indigenous scales designed and validated to measure SWB, may shed further light on reversing the influence of leprosy upon an individual's most valuable resource, their motivation for life.

Chapter 1: Subjective Wellbeing

1.1 Overview

Defining and measuring *subjective wellbeing* is contentious. A seminal shift in understanding the construct arrived when Andrews highlighted the difference between objective and subjective indicators of wellbeing (Andrews, 1974). He described objective measures as those that count the occurrence of verifiable phenomena, and subjective measures record an individual's perception of life quality (Andrews, 1974). By connecting *wellbeing* to *quality of life* indicators, Andrews began an evolution of wellbeing nomenclature.

Prior to Andrews, literature accentuating the objective perspectives of quality of life was the norm. However, he critiqued this focus as an adequate explanatory model (Andrews, 1974; Andrews & Withey, 1976). Instead, he suggested that objective indicators indirectly measure only one of several determinants of wellbeing. In addition, he underscored the necessity for research to broaden its definition and measuring praxis to include subjective evaluations (Andrews & Withey, 1976). This shifting emphasis proved influential both theoretically and pragmatically.

The theoretical and practical implications of subjective quality of life perspectives are contemporaneously expressed by Campbell, Converse, and Rodgers (1976). They comment that idiosyncratic individual differences result in divergent subjective evaluations of objectively driven social mediations, which could act to fuse quality of life theory with pragmatic social policy. Expressly, judicial use of governmental resources are legitimately directed by objective contributions to health; however, calculating their personal impact requires the employment of subjective measures (Vogel, 1997). These emphases led researchers in the early 1970s to suggest that subjective aspects of quality of life be the focus of future research (Campbell & Converse, 1972; Dalkey, 1972).

These recommendations inspired a wealth of scientific research exploring subjective quality of life. An analysis of quality of life literature by Land (2012) revealed, apart from one exception (McCall, 1975), the 34 most cited articles published in *Social Indicators Research* between 1974 and 2003 centred on subjective indicators of quality of life. As a further indicator of progress, Tomyn (2011) found that the Australian Centre on Quality of Life (Australian Centre on Quality of Life, 2016) lists more than 1000 instruments currently in use for measuring the subjective component of quality of life. These findings suggest that determining the subjective component of quality of life, more recently labelled *subjective wellbeing,* is established as a critical constituent of quality of life research.

The following discussion provides a historical perspective regarding the emergence of subjective wellbeing from its antecedent, quality of life. The section concludes with an account of the composition and measurement of subjective wellbeing. Throughout the course of this treatise, the contentious nature of many formative contributions is observed.

1.2 Quality of Life

1.2.1 Introduction.

Quality of life considerations are not modern phenomena. Relevant perspectives are found within ancient manuscripts dating back as far as Hebrew texts from the 15th century B.C.E (Bromiley, 1985, pp. 255-261) and the Koine Greek text, Papyrus Bodmer

II, dated at 200 C.E (John 10:10; Danker, 2000). One ancient author frequently referenced by modern quality of life research is Aristotle (Kesebir & Diener, 2008).

Aristotle's often-cited Nicomachean Ethic (350 BCE) contains a description of qualities associated with his *good life*. For Aristotle, these qualities include rationality and happiness (Aristotle, 1984). In this text, he describes the εὐδαίμονα (eudaimona) person as someone cognisant that virtuous activity is achieving his or her deepest desire for the good life. A pleasant affect, described by Aristotle as "μακαρίοις" (happy), is felt upon realizing that the focused activity is virtuous and securing the good life.

Aristotle's work remains an influential source for present-day perspectives on quality of life. However, reductionist perspectives sometimes misinterpret key aspects when connecting the Nicomachean Ethic to quality of life research, such as Aristotle's relationship between cognition and affect proposed by Kesebir and Diener (2008). Their statement "Aristotle, in his influential work Nicomachean Ethics, in which happiness (eudaemonia) was the central issue" (Kesebir & Diener, 2008, p. 117), incorrectly transliterates the Greek text εὐδαιμονα as "eudaimonia" and then, inadequately translates it as "happy." This translation effectually obscures Aristotle's variant meanings for εὐδαιμονα (eudaimona) and μακαρίους (happy) thereby, distorting the relationship between cognition and affect. Happiness, for Aristotle, is a product of the cognitive processes that typify the eudaimona person. Therefore, happiness and eudaimona have discrete meanings.

For Aristotle, this separation of intended meanings becomes clear in the following portion of the Nicomachean Ethic, reproduced below, along with a translation.

> "ἀμφισβητεῖται δὲ καὶ περὶ τὸν <u>εὐδαίμονα</u>, εἰ δεήσεται φίλων ἢ μή.
> οὐθὲν γάρ φασιδεῖν φίλων τοῖς <u>μακαρίοις</u> καὶ αὐτάρκεσιν" (Aristotle, 1983, 1169b1).

> "It is also debated whether the eudaimona needs friends. For it is said, that those who are happy and self-sufficient do not need friends" (Translation mine).

In this manuscript, Aristotle articulated both εὐδαίμονα (eudaimona) and μακαρίοις (makariois) within the same literary context, suggestive of discrete intended meanings. Whilst both terms are typically translated as happy, this is inadequate. With no direct parallel in English, translating eudaimona remains contentious. For example, Dybikowski (1981) clearly advocated against happy as a suitable rendering when he said,

> "The differences between the two notions, it is now commonly supposed, are too many and too deep to think that happiness and eudaimonia are very closely related; and consequently "happiness", the long-established conventional translation, will seriously mislead us in understanding the nature of Aristotelian eudaimonia" (Dybikowski, 1981, p. 185).

An interpretation for eudaimona more closely aligned with Aristotle's written text is that it describes an individual living the good life centred on the rational apprehension of value-driven action. These cognitions then produce a felt happiness.

Lastly, in contrast to the influence of Aristotle's eudaimonic individual, philosophers such as Democritus, Aristippus of Cyrene, and Epicurus were antecedents to another modern quality of life emphasis. Referred to as "The Hedonic View" (Ryan & Deci, 2001, p. 143), its focus is on pleasurable happiness (Taylor, 2000) and the absence of pain (Bunnin & Yu, 2004; Joshanloo, 2013). It comprises "the belief that pleasure is the greatest good and highest aspiration of humankind" (Bunnin & Yu, 2003, p. 882). The influence of hedonic perspectives dominates modern vernacular understandings around the good life and social science research (Kahneman, Diener, & Schwarz, 1999).

Coupled with the influence of the hedonic mantra on early wellbeing scholars such as Diener and their subsequent ascendancy in the psychological literature, the hedonic balance between positive and negative affect is now effectually viewed as the dominant substrates to the notion of subjective wellbeing (Deci & Ryan, 2008)

1.2.2 Defining Quality of Life.

Aristotle's writings on the good life highlight that many psychological discussions around quality of life have their roots in ancient texts. These texts discuss questions approximating those raised in some modern research contexts. For example, the relationship between cognition and affect within quality of life research remains divisive and will be explored in subsequent sections on subjective wellbeing. Other questions posed by ancient writers such as “How to conceptualise quality of life” and “What factors improve and maintain life's quality” are also discussed in psychological literature. Addressing these begins by operationalising the construct.

An attempt to create a common definition for quality of life emerged in the 1960s when the U.S. began measuring the societal impact of the space program (Campbell et al., 1976; Noll & Zapf, 1994) and continued within international collaborations during the early 1990s (WHO; Saxena & Orley, 1997; The WHOQOL Group, 1995). These later discussions were informed by the prelude to the WHO's constitution, which states that “Health is a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity” (World Health Organisation, 1948, p. 1). However, scholars argue against the adequacy of this premise for a definition (Cummins, 1998).

According to Cummins et al. (1998), the association of “disease” and “infirmity” with quality of life unnecessarily assigns stigma to individuals affected by mental illness. He argues that this association is antiquated and in need of change. In addition, despite the WHO's most recent definition of quality of life "as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (The WHOQOL Group, 1998, p. 551), alternative definitions continue to emerge (Hagerty et al., 2001). Notwithstanding attempts to unify definitions by the WHO and later, Cummins, to date, no universally accepted lexicon exists (Hagerty et al., 2001).

In response, researchers advocate continuing the pursuit towards a unifying quality of life “grand theory” that includes an agreed definition as well as a description of the construct's essential determinants (Felce & Perry, 1995). These determinants then constitute a group of evaluative measures for judicial management and accountability for those distributing finite resources (The WHOQOL Group, 1995; Vogel, 1997).

Diener (1997) and Hagerty et al. (2001) agree, adding that a common definition and agreed theory also facilitates population-wide normative data (Hagerty et al., 2001; The WHOQOL Group, 1998). In addition, according to Cummins, Lau, Davey, and McGillivray (2010), these data ought to include participation from special needs groups. In doing so, the evaluation and distribution of resources against a standardized benchmark include entire populations (Cummins et al., 2010; Evans, 1994; Hagerty et al., 2001).

A common definition for quality of life makes intuitive sense. However, according to Felce and Perry (1995), the level of specificity within fields such as psychology, economics, sociology, and politics, makes reaching a cooperative agreement complex. Despite this, one such collaborative attempt was made between members of the interdisciplinary International Society for Quality-of-Life Studies (ISQOLS; Cummins, 1998).

The catalyst for the ISQOLS' conversation was a prior collection of 107 variant published definitions for quality of life and the subsequent desire to converge upon a universal definition (Cummins, 1998, p. 3). In addition, Cummins (1996) had previously exposed 351 extant domains associated with quality of life, published in 1500 articles. According to Cummins et al. (1998), 291 of these domains were satisfactorily allocated to one of seven associated with his existing Comprehensive Quality of Life Scale (ComQol). Therefore, in this record of correspondence, Cummins proposed and provided justification for the following definition.

> Quality of life is both objective and subjective, each axis being the aggregate of seven domains: material well-being, health, productivity, intimacy, safety, community, and emotional well-being. Objective domains comprise culturally relevant measures of objective well-being. Subjective domains comprise domain satisfaction weighted by their importance to the individual. (Cummins, 1998, p. 3)

The edited conversation amongst the ISQOLS concludes with a positive appraisal of progress made, acknowledging the necessitous search for a quality of life grand theory. This optimism is made explicit in a subsequent discussion by Cummins (2000), where he highlighted the continuing progress made towards a grand theory on quality of life. He acknowledged the strengths and contributions of a multidisciplinary approach specifically pertaining to defining the nature and relationship between the objective and subjective components to quality of life. Cummins stated that a clearly understood distinction between these components is at the heart of an integrated and comprehensive understanding of the construct (Cummins, 2000, p. 54).

Despite this initial optimism, thirteen years later, Fayers and Machin (2013) report that quality of life remains an ill-defined term that continues to mean many different things to different people. Further, a comment made by the WHO's European director at the 14th European Health Forum, that the 1948 definition for health "has not only stood the test of time, but appears even more relevant today" (Jakab, 2011, p. 3), is evidence for its resistance to subsequent critiques highlighting the WHO's antiquated language.

Notwithstanding the pessimism expressed by Fayers and Machin (2013) and the resilience of the WHO's archaic definition, researchers seem to generally agree with the summation that quality of life is both objective and subjective and that each ought to be measured independently (Kamman, 1982; Keith, Yamamoto, Okita, & Schalock, 1995). These perspectives, influenced largely by Campbell et al. (1976) and Andrews and Withey (1976), as well as research by Cummins (1996), support the inclusion of essential subjective perspectives to understanding quality of life. For example, Cummins (2000) confirmed the *Easterlin paradox* (Clark & Senik, 2011; Easterlin, 1974, 1995) when he suggested, despite the contradictory earlier findings of Diener, Diener, and Diener (1995), that increasing an objective variable such as income levels above a certain threshold, does not continue to raise subjective perceptions regarding how well life is going.

As a result, many contemporary quality of life researchers agree that there exists a complex interaction between objective conditions and subjective assessments around how well life is going. In addition, the survey by Land et al. (2012) shows that subjective quality of life indicators are now increasingly influencing social policy in Western countries. However, their concern that developing countries are not adequately represented in subjective quality of life literature remains noteworthy.

Maintaining a focus on objective indicators in countries such as India and Nepal remain a priority. However, with the increasing importance of subjective indicators, there are now reasons to adopt these in developing contexts. These reasons include the existence of a robust theoretical base, the validity of metrics such as the Personal Wellbeing Index for measuring subjective perspectives, a growing awareness around cultural impacts on the salience of objective indicators (Keith, Heal, & Schalock, 1996) and the subsequent accountability this affords to service providers. Consequently, from manifold iterations of potential definitions and measures, the current study operationalizes subjective perceptions of an individual's quality of life as an individual's "perceived level of satisfaction with their life as a whole." This evaluation is established based on Campbell's (1976) summation of specific life domains, listed and measured by the *Personal Wellbeing Index* (PWI; International Wellbeing Group, 2013).

1.3 Subjective Wellbeing

1.3.1 Introduction.

The research community defines subjective perceptions of an individual's quality of life as *subjective wellbeing* (SWB; Campbell et al., 1976; Cummins, 2018). The simplest way of accessing SWB is by asking someone to evaluate their life as a whole (Andrews, 1974). This evaluation is obtained in response to one of three questioning methodologies. Firstly, researchers may ask a single, abstract question such as "How satisfied are you with your life as a whole?" (International Wellbeing Group, 2013, p. 6). The response is thought to be an approximation of an individual's level of SWB (Diener, 2000).

The second option for measuring SWB is the completion of a multi-item single construct questionnaire such as the Satisfaction with Life Scale (SWLS) developed by Diener, Emmons, Larsen, and Griffin (1985). This scale consists of five parallel items each measuring the single construct, global life satisfaction. A score is obtained by averaging the responses to each item.

A third approach is the utilization of a multi-item scale that appraises multiple life domains. This type of instrument directs questions of satisfaction at each domain theorized to contribute unique variance to an individual's level of SWB. The Personal Wellbeing Index (PWI; International Wellbeing Group, 2013) is this category of questionnaire and measures seven life domains. These domain scores are averaged to produce a final SWB metric.

Two questions are raised from this understanding. First, despite the measurement mechanism employed, there is ambiguity regarding what underlying factors drive a person's response (Busseri, 2018). A discussion addressing this will proceed by examining three influential perspectives. The first of these, personality, will be considered noting recent developments suggestive that this factor is now considered moot. After this, how researchers have conceptualized affective drivers and their proportional contribution to SWB are discussed. Finally, the role of cognition in personal assessments will be explored within the SWB literature.

The second question raised by the existence of various measurement instruments is, which is preferred? Therefore, this section includes reasons why the PWI is preferred for collecting SWB data in Western and non-Western contexts.

1.3.2 Personality as a Subjective Wellbeing Correlate.

The burgeoning literature on subjective wellbeing (SWB) is saturated with perspectives exploring why people report experiencing their lives in moderately positive ways. An early review exploring SWB correlates by Wilson (1967) determined a "happy person emerges as a young, healthy, well-educated, well-paid, extroverted, optimistic, worry-free, religious, married person with high self-esteem, high job morale, modest aspirations, of either sex and of a wide range of intelligence" (Wilson, 1967, p. 294). That same year, Cantril (1967) drew similar conclusions based on results from an extensive cross-cultural study. He noted that "the vast majority of people's hopes and fears revolve around the complex of personal well-being, and this is rather simply and genuinely defined: a decent standard of living; opportunities for children; technological advances; good health; a good job; decent housing; a happy home life; better educational facilities" (Cantril, 1967, p. 145). Almost two decades later, Diener (1984) commented that the exploration for SWB correlates had been heavily influenced by Wilson and Cantril's findings and as a result, largely focused on demographic and external factors.

Two catalysts shifted attention from demographic associations to internal SWB correlates such as personality. First, Andrews and Withey (1976) found that demographic factors regularly account for less than 10% of the variance in SWB. Second, Andrews (1974) and Campbell (1976) reported that SWB levels remained stable in the presence of changing circumstances allied with various life domains. This stability was confirmed by Cameron (1974) and Feinman (1978) who also found that people with a disability, and controls, were equally happy. Concurrently, Brickman, Coates, and Janoff-Bulman (1978) reported that lottery winners or quadriplegics were no less happy than their control groups, while Wortman and Silver (1982) confirmed the stability of SWB levels with longitudinal data on spinal cord-injury victims. Therefore, the ubiquitous constancy of SWB and the inadequacy of demographic factors to explain variance in the construct led researchers "to look elsewhere for more potent variables, such as personality" (Diener, 1984, p. 561).

The stability of personality provided investigators with an explanatory model that appeared to account for the global reporting of positive SWB levels despite temporary changes to circumstances (Diener, 1984; Diener & Lucas, 1999; Diener, Sandvik, Seidlitz, & Diener, 1993). This conclusion is drawn from adoption and twin studies, whereby Lykken and Tellegen (1996) found up to 52% of the variance in SWB was associated with genetic variation and only 3% related to external life circumstance. In support of a genetic correlate, Nes, Røysamb, Tambs, Harris, and Reichborn-Kjennerud (2006) reported that for both males and females, genetic factors explained 80% of the stability of SWB. The subsequent search for the source of genetic factors led researchers such as DeNeve and Cooper (1998) to examine a potential candidate, personality.

In response to their meta-analysis, DeNeve and Cooper (1998) were so confident in the explanatory reach of personality as the foremost determinant of SWB they were able to conclude that personality is "critical to experiences of SWB in Western contexts" (DeNeve & Cooper, 1998, p. 222). This analysis examined responses from 42,171 participants answering questionnaires pertaining to personality and SWB. As measures of personality, Eysenck's Personality Questionnaire (Eysenck & Eysenck, 1975) was the most commonly employed measure. Data relating to SWB, conceptualized in the majority of studies as life satisfaction and happiness, were most often collected using the Life Satisfaction Index (Neugarten, Ha, & Tobin, 1961). The conclusion of DeNeve and Cooper (1998), drawn from analyses of 148 studies, was based on their finding of an average weighted correlation between personality and SWB of .19.

By the early 2000's, personality was emerging as the prime mediatory candidate between life experiences and SWB (Cummins & Nistico, 2002). Further, researchers were proposing a range of influential personality traits, such as emotional stability that Vitterso (2001) reported as accounting for 34% of the variance in SWB. Other personality traits discovered with significant associations to SWB included self-esteem (Campbell et al., 1976; Reid & Ziegler, 1980), extraversion (Cummins & Nistico, 2002; Tolor, 1978), social aspects associated with extraversion including sociability and impulsivity (Emmons & Diener, 1986), and neuroticism (Cameron, 1975; Cummins & Nistico, 2002). Amongst these, neuroticism emerged as the foremost contender as the leading correlate (Headey & Wearing, 1992; Vitterso & Nilsen, 2002).

Despite these early findings, two studies by Davern, et al., (2007), when taken together, effectually disqualify personality as the significant correlate to SWB. Sampling 854 adult Australians aged 18-86 years (M = 52.00; SD = 15.37), the first study measured the contribution of *affect* to the SWB construct. According to Diener, Kanazawa, Suh, and Oishi (2015), affect is a general term for feelings that include both moods and emotions. A lengthy discussion around the meaning and application of affect within SWB studies is undertaken in an ensuing section. The SWB construct in Davern's first study was measured by the global single item "How satisfied are you with your life as a whole" (Davern, Cummins, & Stokes, 2007, p. 431). It was found that six affective indicators (energized, happy, content, satisfied, stressed, and pleased) accounted for 64% of the variance in SWB. Based on these findings, investigators concluded that responses elicited by the global single item have a significant pleasant affect component. Further, they claimed that the finding contrasted "literature claiming that SWB is primarily determined by personality and that it has a strong cognitive component" (Davern et al., 2007, p. 435).

Strengthening the case against personality as a major SWB correlate were the results from Davern's second study Davern et al. (2007). These researchers compared the relative strength of affect in three SWB models incorporating affect, personality (Costa & McCrae, 1992), and *multiple discrepancies theory* as the cognitive construct (Michalos, 1985). The study design tested for the predominance of personality as the foremost determinant of the affective component of SWB. On this occasion, SWB data were collected using the Personal Wellbeing Index (International Wellbeing Group, 2013). From the six affective indicators utilized in the first study, only content, happy, and excited were retained. Personality was measured as five latent variables (Extraversion, Neuroticism, Agreeableness, Openness and Conscientiousness). Structural equation modeling was then employed to compare an affective-cognitive driven model of SWB, with personality, and discrepancy driven models.

In response to the model fit statistics generated by this second study, investigators concluded that "the results provide support for an affective-cognitive model, which explained 90% of the variance in SWB. All models confirm that the relationship between SWB, Core Affect and Discrepancies is far stronger than the relationship between personality and SWB" (Davern et al., 2007, p. 429). *Core Affect*, originally defined as a "pre-conceptual primitive process, a neurophysiological state, accessible to consciousness as a simple non-reflective feeling" (Russell, 2009, p. 1264) is described in full in subsequent sections. In addition to the considerable amount of variance explained by the affective-cognitive model, investigators also found that personality is a weak predictor of SWB when affective and cognitive variables are present. These findings sparked a move away from the personality variable to examine cognition and affect as likely major correlates of SWB (Jovanovic, 2011). This shift is evidenced recently in a report by Diener et al. (2015) exploring the reasons underpinning the global observation that positive mood is ubiquitous in humans. Despite his lengthy discussion regarding the stability and genetic underpinning to mood, personality is never mentioned.

1.3.3 Affect as a Subjective Wellbeing Correlate.

1.3.3.1 Introduction.

The analyses of American data by Andrews and Withey (1976) found evidence for a three-factor structure to SWB, referred to as cognitive evaluation, and two affective constructs denoted as positive and negative affect (see Busseri & Sadava, 2011 for a review of five alternate structural conceptualizations of SWB). These findings were replicated by Mc Kennell (1978) and McKennell and Andrews (1980) using exploratory and confirmatory factor analyses. These researchers confirmed the distinction between cognition and affect by identifying a significant amount of remaining variance in global life satisfaction after excluding the influence of the affect balance scales by Bradburn (1969) and any correlated methods effects.

The discrimination between cognition and affect has subsequently found broad agreement amongst SWB researchers (Campbell et al., 1976; Davern et al., 2007; Veenhoven, 1994). However, ambiguities around the essence of the cognitive construct remain, due in no small part to ambiguous nomenclature concerning the affective component. This lack of precision in terminology is further highlighted within SWB affective literature concerning distinctions between mood and emotion (Beedie, Terry, & Lane, 2005; Ekman & Davidson, 1994). Therefore, against this confusing background, the following section seeks to clarify the affective construct associated with SWB.

1.3.3.2 The Structure and Measurement of Affect.

Early debates on the structure of affect centred on two conflicting perspectives. The first, defended by investigators such as Green and Nowlis (1957) required up to 12 unipolar dimensions. By contrast, Larsen and Diener (1992); Reisenzein (1994); and Russell (1980) reported the adequacy of two bipolar dimensions. A resolution commenced when Russell (1979) demonstrated that common method bias was influencing results towards the production of unipolar dimensions. He subsequently demonstrated that after the influence of bias is removed, a two-dimensional bipolar solution ensues. Finally, a review by Yik, Russell, and Feldmam (1999) found the ubiquitous reporting of two bipolar dimensions for affect. They are *pleasantness-unpleasantness,* referring to an individual's hedonic tone; and *activation-deactivation,* denoting a sense of arousal (Barrett & Russell, 1999). These dimensions are now widely accepted as describing the underlying structure of affect.

In 2003 Russell incorporated the bipolar structure of affect into an explanatory model of emotional experience. Reflecting on prior research by Woodworth and Schlosberg (1938) and Schlosberg (1952), Russell (1980) proposed and confirmed that affective states are “best represented as a circle in two-dimensional space” (p. 1162), referred to as the *circumplex model of affect*. The vertical axis of Russell's circumplex describes the intensity of emotion, representing activation at 0^{o} and deactivation at 180^{o}. The horizontal axis is anchored by pleasure at 90^{o} and displeasure at 270^{o}. However, Davern et al. (2007); Feldman (1995); Huelsman, Nemanick, and Munz (1998) report that the hedonic axis, pleasure-displeasure, accounts for more variance in self-reported mood than arousal. This suggests that the circular ordering of affect proposed by Russell is more properly depicted as an ellipse.

At the heart of Russell's model is *core affect*. His conceptualization of core affect is similar to Thayer's (1967) *activation,* Watson and Tellen's (1985) *affect*, Morris' (1989) *mood*, and is most like Cummins' (2016) *homeostatically protected mood,* examined in detail in Chapter 2 of this thesis. Core affect is described by Russell (2003) as an object-free neurophysiological state that blends the hedonic and arousal dimensions, experienced by individuals as feelings. Analogous to core body temperature, core affect is pre-conscious until either attention is directed towards it, or when extremes in its valence infiltrate awareness. Finally, core affect is psychologically irreducible, therefore, causal mechanisms are not psychological, but biological (Russell, 2003). This formulization of core affect and Russell's circumplex model have become the most widely employed conceptualizations associated with the structure of affect (Davern et al., 2007).

Despite consensus that pleasantness and activation are basic and universal dimensions of affect, and the integration of these within broader theory by authors such as Russell (2003) and Cummins (2016), a uniform approach to measuring affect remains elusive. Russell has not developed instruments for this purpose after his seminal work in 2003 and Watson, Clark, and Tellegen's (1988) widely employed Positive and Negative Affect Scale (PANAS) has been critiqued for measuring only high-activation states, thereby missing many affects from the pleasant and unpleasant affective axis (Barrett & Russell, 1999). Further, for some researchers, contentious associations between affect and cognition complicate how affect should to be measured. For example, multiple regression analysis by Cummins and Weinberg (2015) suggest the influence of affect so dominates cognition within the *subjective wellbeing* (SWB) construct, that when measuring SWB, researchers primarily tap affect against only trace levels of cognition.

For these authors, incorporating an additional instrument to tap core affect alongside a dedicated SWB measure is largely moot.

Notwithstanding the suggestion by Cummins and Weinberg (2015) that SWB is an affective construct, many instruments remain in use purporting to measure both the cognitive and affective contributions to produce an overall SWB score. For example, a recent survey of SWB instruments by Cummins and Weinberg (2015) identified 202 such measures. Of these, Diener's (1985) Satisfaction with Life Scale (SWLS) and the 5th edition of the adult version of the Personal Wellbeing Index (PWI-A, International Wellbeing Group, 2013), were deemed most useful for research purposes.

Globally, the use of the SWLS is prolific. As of February 2018, Google estimates Diener's original article on the Satisfaction with Life Scale (Diener et al., 1985) was citied 19,001 times. The SWLS asks respondents how much they agree or disagree with five statements ("In most ways my life is close to my ideal;" "The conditions of my life are excellent;" "I am satisfied with my life;" "So far I have gotten the important things I want in life;" and "If I could live my life over, I would change almost nothing"). Responses to these items are recorded on a 7-point scale anchored by *strongly disagree* and *strongly agree*.

Each of the five statements from the SWLS tap the same underlying construct, satisfaction with life-as-a-whole, otherwise referred to as global life satisfaction (GLS). By contrast, the distinguishing feature of the PWI-A as the first-level deconstruction of GLS, uniquely supports both an examination of each domains' influence on GLS and provides an overall SWB score.

To complete the PWI-A, respondents rate their satisfaction level with these seven life domains: *Standard of living*; *Health*; *Achieving in life*; *Personal relationships*; *Safety*; *Community connectedness*; and *Future security*. Responses are made using an

11-point unipolar scale anchored by 0 (“not satisfied at all”) and 10 (“completely satisfied”). A total SWB score is produced by averaging scores from the seven domains, projected onto a 0-100 scale.

Confirmations for the current domain structure of the PWI-A are reported by the International Wellbeing Group (2013) supporting the instrument’s utility in examining the influence of each domain on GLS, as well as providing an overall SWB score. Finally, a Confirmatory Factor Analyses (CFA) of the PWI-A’s seven domains of satisfaction, modelled as a unidimensional construct, are reported by Tomyn, Fuller Tyszkiewicz, and Cummins (2013) using Byrne’s (2010) following criteria: Comparative Fit Index (CFI $\geq$ 0.95 for good fit), Root Mean Square Error of Approximation (RMSEA; RMSEA < 0.05 for good fit, $\leq$ 0.08 for adequate fit), and Standardized Root Mean Square Residual (SRMR; SRMR < 0.05 for good fit). Results were CFI = 0.96, RMSEA = 0.08, and SRMR = 0.03 and interpreted by the authors as an adequate model fit to data gathered from 1,965 participants ranging in ages from 18-92 years (Cummins et al., 2009). Therefore, the unique characteristics of the PWI-A along with the ratification of its domain structure, make it the preferred measure of SWB throughout this thesis.

1.3.4 Cognition as a Subjective Wellbeing Correlate.

1.3.4.1 Introduction.

In the form of cognition and affect, thoughts and feelings dominate intrapsychic life (Robinson, Watkins, & Harmon-Jones, 2000). Researchers also agree that cognition and affect are distinct constructs, interacting to produce perceptions such as quality of life (Diener, 2006; Ochsner & Gross, 2005). Taken at face value, a study by Kong, Hu, Wang, Song, and Liu (2015) lends support to these perspectives. They used noninvasive, resting-state functional magnetic resonance imaging to measure brain activity whilst participants were responding to the Satisfaction with Life Scale (SWLS; Diener et al., 1985) and the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). They report that the SWLS stimulated a cognitive response, while the PANAS stimulated affect. A confirmatory factor analyses supported a two-factor model with moderate positive correlations between cognition and affect leading them to conclude "the two components of subjective well-being are interrelated but distinct" (Kong et al., 2015, p. 139).

These findings are consistent with the conclusions of Diener and Lucas (1999), that SWB is produced by the interface of cognition and affect. In order to appraise this conclusion in more depth, it is necessary to define cognition.

1.3.4.2 Defining Cognition.

Within general psychology, cognition is broadly defined as the conscious or unconscious activity of acquiring, organizing, and using information to guide behaviour (Oatley & Johnson-laird, 1987; Schachter & Singer, 1962; Shettleworth, 2010). Based on this definition, Scherer (1984) explains that cognition benefits individuals by increasing available behaviours beyond simple reflexive responding. The mechanisms for these benefits are neural devices that decouple impetuses from subsequent responding (Ochsner & Gross, 2005). As a result of this decoupling, individuals can engage in thought-processing that support complex behaviours, which in evolutionary terms, afford maximum survival advantage (Kazanas & Altarriba, 2015). However, understanding cognition within SWB research requires greater specificity regarding how people evaluate the quality of their lives.

To investigate how perceptions of wellbeing are organized in the minds of different groups, Andrews and Withey (1976) collected and analyzed data from 5,422 American adults who answered questions about their quality of life. One such question was “How do you feel about your life as a whole?” (Andrews & Withey, 1976, p. 66). This global question is referred to within their study as “Life 1”. It is asked at the commencement of each interview and again mid-way during the consultation. The second occurrence is termed "Life 2." Participants use a response scale called the Delighted-Terrible scale (D-T scale), specifically designed to contain seven categorical options varying from "delighted" to "terrible." A third measure, referred to as “Life 3,” comprises the mean score calculated from Life 1 and Life 2 and is the metric utilized for further analyses. Therefore, Life 3 is referred to by these authors as a global measure representing “a summary evaluation about life-as-a-whole” (Andrews & Withey, 1976, p. 64). Validation for this single-item metric emerged during their data collection and analyses.

Utilizing the Life 1 question to collect these data, it became apparent to Andrews and Withey (1976) that individuals continuously hold evaluations regarding their quality of life and these evaluations are made cognizant by pertinent global questions. They provide four observations supporting the premise for extant summary evaluations:

1. The fact of people maintaining their desire to live in the face of strong adversity implies a fundamentally positive life-force that likely includes a "summary evaluation that their life-as-a-whole is worth continuing" (Andrews & Withey, 1976, p. 64).

2. They noted that people respond to global questions concerning life-as-a-whole "promptly and with apparent ease" (Andrews & Withey, 1976, p. 64), suggestive of

previous thought about life-as-a-whole that is readily made cognizant by a single question.

3. When participants were required to select a categorical response to a global life satisfaction question from the Delighted-Terrible Scale, Andrews and Withey (1976) report less than 1% selected "Never thought about it."

4. A prior study by Dalkey (1972) asked "What portion of the adult population maintain some form of running evaluation, explicit or implicit, of themselves or their life? ... The majority of respondents agreed that some evaluation is kept by most people" (p. 97).

To explore factors predicting extant global assessments of life quality, Andrews and Withey (1976) used data collected during November 1972 from two samples (N = 1,118, Form 1; and Form 2, N = 1,072) of adult Americans. Employing an orthogonal factor analysis on a matrix of correlated global measures (p. 85), they extracted three factors labeling the second and third factors as *positive* and *negative affect* respectively. Regarding the first factor, they defined it as *cognitive evaluation*. A summary listing the items employed and their loadings onto these three factors are summarized in Table 1. In response to these analyses, they concluded that measures assessing general evaluations of life-as-a-whole were "mainly composed of Cognitive evaluation variance" (p. 90). Similarly, results produced by satisfaction and happiness measures were also "heavily laden with Cognitive evaluation variance" (p. 91).

Table 1: Factor Analysis of 12 Global Measures

		Factor Loadings			
Code	Measures*	I Cognitive evaluation	II Negative affect	III Positive affect	Variance explained %
G1	Life 1	.85	.17	.14	78
G2	Life 2	.86	.15	.18	79
G3	Life 3	.92	.18	.17	91
G8	Thermometer	.66	.09	.07	45
G29	7-point Satisfaction	.75	.25	.13	64
G31	3-point Happiness	60	.22	.32	52
G32	7-point Happiness	.80	.18	.21	72
G33	Worries	.19	.60	.01	39
G35	Affect positive	.27	-.12	.90	91
G36	Affect negative	.11	.89	.18	84
G37	Affect balance	.18	.51	.80	94
G66	Changes desired	.47	.49	-.07	47
	Factor contributions To total variance (%)	39	16	15	70
	To explained variance (%)	56	23	21	100

*Measures are described according to their codes by Andrews and Withey (1976, pp. 66-70).

Identifying relationships between cognitive evaluations and affective sources of variance within global assessments of quality of life provide no clarity regarding the substance of the cognitive factor identified by Andrews and Withey (1976). The authors acknowledge this and explain that exploring its essence was beyond the scope of their investigations and provide a justification for their definition of Factor 1 stating, "Because of our belief that assessments of life-as-a-whole involve both cognitive and affective elements, we called our first factor Cognitive Evaluation. While the name provides a needed label, it may imply a greater conceptual clarity than we believe actually exists" (Andrews & Withey, 1976, p. 88). This quote suggests that their definition was the result of a preexisting premise that global questions asking how individuals feel about their life-as-a-whole, necessarily engage cognition to formulate a response. For these authors, the cognitive component involves thought processing associated with summary evaluations about life-as-a-whole. These summary evaluations may reside below an individual's awareness, but are made cognizant by global questions such as "How do you feel about your life as a whole?" (Andrews & Withey, 1976, p. 66).

In addition to global evaluations, thought processing for Andrews and Withey (1976) also produce judgments about specific aspects of life that concern individuals. Therefore, it follows that these domain/criteria-level considerations are obtained by less abstracted questions than global types and are directed at individual aspects of life such as "How do you feel about your marriage?" (Andrews & Withey, 1976, p. 32). They found that if feelings about life concerns are measured using the D-T scale, "one feeling just seems to add-on to another" (p. 148) suggesting that this simple additive methodology for combining domain/criteria-level variables "fit the data as well as more complex ones" (p. 148). However, despite these additional perspectives, no direct measure for cognitive sources of variance were developed by these authors, and nor was it by the time McKennell and Andrews (1980) investigated the operations of cognition and affect in perceptions of wellbeing.

A definition for the cognitive component to SWB was formulated by McKennell and Andrews (1980) after an extensive review of satisfaction measures used by Abrams (1975), Andrews and Withey (1976), and Campbell et al. (1976). Upon completing the review, McKennell and Andrews (1980) describe cognition as the factor accounting for the covariance amongst life-as-a-whole assessments "after affect, as measured by Bradburn's (1969) Affect Balance Scale, is partialled out and after allowance is made for the presence of correlated measurement errors" (McKennell & Andrews, 1980, p. 257). This definition comprises additional levels of specificity from those reviewed earlier and builds on prior statements by Mc Kennell (1978) describing positive and negative affect as the remnants after being "freed as far as possible from the relativity inherent in cognitive judgments of satisfaction" (p. 391). However, the reach of this description as an explanatory model for cognition is limited as it portrays it as "a residual factor, defined in terms of its structural relations with other variables rather than through its own indicators" (McKennell & Andrews, 1980, p. 289). Despite these authors' providing evidence of construct validity through their confirmatory factor analyses, cognition's essence and a measure to tap the construct, remain ambiguous.

In fairness, difficulties identifying the essence of cognition were not lost on McKennell and Andrews (1980). Reflecting on these challenges they describe cognition as "an unobserved variable in the sense that we do not have even indirect or proxy measures available. [Therefore] it is theory together with the observed pattern of relationships among the other variables in the system which give the cognitive factor its meaning" (p. 259). It was their opinion that the absence of an explicit cognitive measure stemmed from a lack of clarity around the nature of the construct. This lack of lucidity had not been overcome in earlier attempts by Cantril (1967) who attempted to improve clarity by conceptualizing satisfaction with life as cognitive comparisons between an individual's present and aspirational situations. Despite these efforts by Cantril (1967) and McKennell and Andrews (1980), theory had not dislodged the empiricism associated with investigations surrounding quality of life evaluations. This situation was remedied by Michalos (1985) who suggested an explanatory model for the thought-processing engaged by individuals when responding to questions of satisfaction. He named this theory *multiple discrepancies theory* (MDT).

For Michalos, the catalyst for the construction of MDT was a quest for research examining *satisfaction* and *happiness* reported between 1969 and 1982. This pursuit identified 3,785 reports on these rapidly emerging foci. However, it was the absence of a unifying theory amongst these reports that drove further explorations and his subsequent publication in 1983 (Michalos, 1983). Within this publication, he asserts the applicability of gap-theoretic hypotheses as an explanatory model for the cognitive contribution to global and domain satisfaction levels. Two years later, these propositions emerged within a seminal paper, fully formed, as MDT (Michalos, 1985).

The proposition of MDT led Michalos (2004) and Davern et al. (2007) to propose that the cognitive component of SWB includes the dissonance between desired and actual perceptions of life domains. Further examination warrants a recalling of MDT's major tenants as outlined by Michalos (1985). These are as follows:

1. Reported net satisfaction as a function of perceived discrepancies between what one has and wants, relevant others have, the best one has had in the past, expected to have 3-years ago, expects to have after 5-years, deserves and needs.

2. All perceived discrepancies, except that between what one has and wants, are functions of objectively measurable discrepancies, which also have direct effects on satisfaction actions.

3. The perceived discrepancy between what one has and wants is a mediating variable between all other perceived discrepancies and reported net satisfaction.

4. The pursuit and maintenance of net satisfaction motivates human action in direct proportion to the perceived expected levels of net satisfaction.

5. All discrepancies, satisfactions and actions are directly and indirectly affected by age, sex, education, ethnicity, income, self-esteem and social support.

6. Objectively measurable discrepancies are functions of human actions and conditions.

The first hypothesis is most often cited when MDT is referenced, and the only one pursued in this thesis. It contains a number of gap-theories that are given a full explanation, along with their historical antecedents, in Michalos (1985). These gap-theories are not repeated here; suffice to say, that MDT asserts that perceived discrepancies are inversely related to SWB.

In the light of Michalos (1985) defining and operationalising the cognitive component of SWB in-line with MDT, Diener's (1985) influential *Satisfaction With Life Scale* (SWLS) appears to regress SWB theory by introducing confusing taxonomy. Whereas Andrews and Withey (1976) identified three factors associated with GLS and named them cognitive evaluations, negative, and positive affect, Diener et al. (1985) state, "Life satisfaction refers to a cognitive judgmental process" (p. 71).

Thus, Diener et al. (1985) have converted *Life Satisfaction* from a correlate of GLS to the process used to create GLS. Diener provides no supporting premise for this conclusion apart from echoing the opinion that satisfaction assessments are cognitive judgments distinct from "feeling states" (Mc Kennell, 1978, p. 391). Throwing further doubt on the validity of this change, recent studies have demonstrated the opposite, that affect accounts for up 64% of the variance in SWB (Davern et al., 2007).

The influence of Diener's taxonomy remains pervasive, evidenced in a recent study investigating the neural substrates associated with SWB by Kong et al. (2015). In the methods section, Kong states "The cognitive component of subjective well-being was assessed using the Satisfaction with Life Scale" (p. 137). Kong is mistaken. Life satisfaction correlates includes both affect and cognition, with both dimensions included in responses to the SWLS.

Consistent with the above analysis, the perspective adopted throughout this thesis is that the SWLS is a valid measure of satisfaction with life-as-a-whole. The SWLS does not, however, define the cognitive component of SWB. By contrast, Multiple Discrepancies Theory (MDT) may provide the theoretical grounds for a valid and reliable description of cognitive evaluations as defined by Andrews and Withey (1976).

However, operationalising cognition as MDT raises the issue of whether this is the only way of conceptualizing the cognitive component of SWB. For example, McKennell and Andrews (1980) point out that, at that time, no direct measures for cognition analogous to Bradburn's affect scales had been developed. They state:

> "Affect required two factors. There was no problem in incorporating this two-dimensional concept in our models. For convenience we have treated global cognition as a single factor. But we would not be surprised if several factors proved necessary to cover the concept, nor would we anticipate any difficulty in principle in extending our models to cover multiple dimensions of cognition."
> (p. 293)

In an attempt to expand the number of cognitive ingredients within SWB, Kjell, Daukantaite, Hefferon, and Sikstrom (2016) propose *Harmony* as an additional cognitive dimension. They demonstrated a two-factor structure, one from data collected using the SWLS and a second factor from the Harmony in Life Scale (HILS). This finding is offered as evidence for a second, independent, cognitive dimension to SWB. The five items of the HILS are:

1. My lifestyle allows me to be in harmony.
2. Most aspects of my life are in balance.
3. I am in harmony.
4. I accept the various conditions of my life.
5. I fit in well with my surroundings.

However, these authors fail to discuss how their harmony construct essentially differs from affect. This issue is something the authors acknowledge as a limitation to their enquiry, which leaves their premise that the HILS is a measure of cognition, uncertain.

In addition, they have included the SWLS as a second measure of cognition, something argued earlier, to be false.

No further studies exploring additional cognitive ingredients to SWB, in-line with the suggestion made by McKennell and Andrews (1980), have been located. Therefore, in-line with subjective wellbeing homoeostasis (Cummins, 2016), detailed in Chapter 2, this thesis extends the exploration of dimensions of cognition beyond MDT to *self-esteem*. Justifications for its inclusion as a cognitive dimension of SWB are also provided in Chapter 2 and investigated within Australian, Indian, and Nepali, pathological and non-pathological contexts in chapter 6.

1.4 Summary

The consensus regarding cognition and affect underlying the structure of SWB does not extend to the proportional contributions of each. While researchers agree on cognition's involvement when participants respond to questions of satisfaction with life-as-a-whole and specific life domains, a stubborn ambiguity around operationalising cognition hampers proportional investigations. The lack of definition for the cognitive component of SWB is ubiquitous with few exceptions. One such exception is Davern, Cummins, & Stokes, 2007 defining cognition in-line with multiple discrepancies theory (MDT, Michalos, 1985). Subsequently, this study was able to demonstrate that affect accounted for 64% of the variance in SWB, and cognition, 26%.

Multiple discrepancies theory provides theoretical grounds for a valid and reliable description of cognitive evaluations as defined by Andrews and Withey (1976). However, McKennell's (1980) finding of a two-factor structure for affect and their subsequent suggestion that the cognitive component of SWB might consist of multiple dimensions supports investigating other plausible contenders. Self-esteem may prove to be one such candidate.

Self-esteem has been theoretically integrated into an integrative model of SWB referred to as *subjective wellbeing homeostasis* (Cummins, 2016). The past 20 years has seen the emergence and development of this model. Currently, subjective wellbeing homeostasis is a unique explanatory model that escapes the empiricism driving conclusions regarding SWB and its correlates. By contrast, it provides theoretical grounds for the addition of self-esteem as a cognitive correlate to SWB and a framework for analysing its unique contribution to an individual's SWB. Therefore, subjective wellbeing homeostasis is now described in detail.

Chapter 2: Subjective Wellbeing Homeostasis

2.1 Introduction

According to subjective wellbeing homeostasis theory (SWB homeostasis), self-esteem, optimism and perceived control are critical contributors to the healthy maintenance of SWB. Consequently, this theory provides researchers with a context for investigating the impact of individual-level threats to SWB, such as leprosy. Therefore, to explore associations between leprosy and SWB, this chapter begins by briefly describing the mechanisms of homeostasis and its relevance to SWB.

Homeostasis was first coined by Cannon (1932) to describe the stability of normal body states. This internal constancy is imperative for healthy functioning and achieved by homeostatic control systems (Singh, 2017). When usual physiological states deviate from their genetic set-point, associated systems employ compensatory mechanisms to maintain equilibrium. This active process is referred to as *dynamic constancy* whereby a physiological variable, such as the concentration of sodium ions in the blood, may temporarily fluctuate, nonetheless, the automatic engagement of homeostatic mechanisms maintains values within a set range of functional values (Cannon, 1932; Widmaier, Raff, & Strang, 2016).

The homeostatic processes portrayed by Cannon (1932) were extended by Fletcher (1938) to describe analogous psychological functions. He suggested both the human mind and body employ mechanisms to maintain optimal functioning. Emerging for the first time within the psychological literature was a united mind-body, understood as an organic whole, around the topic of homeostasis. Subsequent developments to psychological homeostasis reside in Helson's (1964) *adaptation level theory* and Headey and Wearing’s (1989) *dynamic equilibrium model* as explanations for the maintenance of SWB (described within Section 2.3).

Psychological homeostasis is attendant with modern perspectives associated with clinical and theoretic psychology. For clinical contexts, DSM-V (American Psychiatric Association, 2013) states that emotions are:

> Generally maintained in a homeostatic balance without a disruption in normal functioning. It requires clinical training to recognise when the combination of predisposing, precipitating, perpetuating, and protective factors have resulted in a psychopathological condition in which physical signs and symptoms exceed normal ranges (p. 19).

Within theoretical psychology, homeostatic features emerge from two contending SWB models. The first, held by Diener (2015) and the second, by Cummins (2014).

Diener and Cummins compete for ascendency regarding the underlying structure and maintenance of an individual's SWB. Regarding the structure of SWB, Diener localises SWB within a group of pleasant and temporal emotions that include joy, euphoria, and satisfaction (Diener & Lucas, 1999). Diener also asserts that cognitive evaluations and affective reactions equally influence subjective assessments of life domains (Diener, 2006). Regarding these cognitions, along with Michalos (1985, 2004), Diener argues the cognitive component of SWB equates to the felt dissonance between desired and actual perceptions of life domains.

By contrast, Cummins (2017) disagrees with Diener regarding equal contributions to SWB from affect and cognition. For example, multiple regression analysis by Cummins and Weinberg (2015) suggest the influence of affect on SWB so dominates cognition, that when measuring SWB, researchers primarily tap affect against only trace levels of cognition. Further, Davern, Cummins, and Stokes’ (2007) argue SWB is perfused by three affective components. These components are contentment, happiness (mood valance) and a level of alertness (mood arousal) that together explain 66% of the variance in SWB when assessed with linear methods (Blore, Stokes, Mellor, Firth, & Cummins, 2011),

However, it is descriptions regarding the maintenance of SWB that accentuate the homeostatic features of each researcher's SWB model. For example, a recent addition to Diener's SWB model is an evolutionary explanation for the genetic origin of mildly positive moods, commonly felt by individuals in the absence of any emotional catalysts (Diener et al., 2015). Diener (2015) refers to this phenomenon as *positive mood offset* and suggests it explains the observation that "individuals have "happiness set-points" to which they return after momentary perturbations to their baseline level of happiness" (Diener et al., 2015, p. 236). In addition, he argues that happiness set-points are a psychological adaptation that drives evolutionary success in humans.

The late addition of positive mood offset to Diener's SWB model resembles characteristics from earlier propositions such as Russell's (2003) *Core Affect* (discussed in detail within Section 1.3.3.2). Finally, Diener's positive mood offset appears to mirror Davern, Cummins, and Stokes' (2007) previous conceptualisations of *homeostatically protected mood* (HPMood) and SWB homeostasis. Therefore, HPMood and its salience to psychological homeostasis is now discussed.

2.2 Homeostatically Protected Mood

Central to SWB homeostasis and the major component of SWB is the stable background influence of HPMood (Blore et al., 2011; Cummins, 2017; Davern et al., 2007). Emerging from Russell's (2003) initial conceptualising of *Core Affect,* the phrase, HPMood, was created by Cummins (2010) to describe a stable, low-intensity, object free, neuro-physiologically generated positive mood state that is the catalyst for an individual's general motivation for life. In 2009, Russell revised his definition of Core Affect, describing the variable as a conflation of mood and emotion, liable to change under external influences and, attached to objects. This definition was no longer consistent with the way mood was understood within SWB homeostasis theory, so Cummins (2010) developed the term HPMood to refer to the stable, underlying, object-free mood that dominates SWB.

Concerning the origin of HPMood, Capic, Li, and Cummins (2018) argue that individuals have a genetically determined and unchanging level of HPMood that is biologically hard-wired and represents an individual's set-point. The term set-point was initially used in connection with SWB by McGue, Bacon, and Lykken (1993) and was followed by Cummins (1995), who, for the first time, attached set-points to an SWB homeostatic management system.

By connecting set-points to SWB homeostasis, researchers were provided with an alternate explanation for the observed stability of SWB (Cummins, 2003, 2016, 2017). While Lykken and Tellegen (1996) initially associated this stability with genetics, Headey and Wearing (1989) named the phenomenon an individual's *equilibrium level* and determined the genetic source as personality. Further, Headey and Wearing (1989) allowed for a degree of permanent change to set-points within their theoretical perspectives.

However, proponents of SWB homeostasis now regard the role of personality moot and disagree with Headey and Wearing's description of slow permanent changes to equilibrium levels in response to chronic changes in such things as wealth, social connections or age (Headey & Wearing, 1992). According to SWB homeostasis theory, set-points are not analogous to an individual's equilibrium. Rather, set-points are genetically fixed at a constant level analogous to other biological systems evolved to control physiological states such as blood pH levels.

Consequently, under normal operating conditions, an individual's set-point is inert to environmental provocations via the protection of a homeostatic management system. This system effectively dampens transient emotional responses by employing homeostatic mechanisms (discussed shortly) that return SWB levels toward an individual's set-point. Longer-term changes in SWB can also occur; however, they do not represent a change in set-point but an obstinate defeat of homeostasis due to a controlling stressor such as depression (Cummins, 2010).

While set-point theory emerged as an explanatory model explaining SWB stability, until 2014, no direct evidence for their existence had emerged. Difficulties associated with providing evidence were principally due to the non-equivalence between measured SWB and a respondent's set-point (Capic et al., 2018). So, when individuals respond to a question such as "how satisfied are you with your life-as-a-whole?" according to SWB homoeostatic theory, their answers are influenced by interactions between two variant affective components of SWB. These constituents are a genetically set level of HPMood, and a small affective contribution comprised of transient, felt emotions, generated from notable environmental stimuli (Cummins, 2017).

Thus, to provide conclusive evidence for the existence of set-points, a method for separating the conflation of HPMood and emotion from measured SWB was required. A methodology for untangling emotion from HPMood was achieved by Cummins et al. (2014), who provided the first direct substantiation for the existence of set-points and their stabilising role on SWB.

Evidence for the existence of set-points came from analyses associated with a 10-year longitudinal study conducted by Cummins et al. (2014). The study took data collected each year from 7,356 respondents participating in the Household, Income and Labour Dynamics in Australia Survey (Watson & Wooden, 2012). Each respondent answered the global life satisfaction question, “All things considered, how satisfied are you with your life?” Answers were rated on a 0–10 response scale (0 = “No satisfaction at all” to 10 = “Completely satisfied”) and subsequently projected onto a 0 to100-point scale. At the end of the 10 years, each respondent’s ten raw scores were used to generate a within-person mean and employed to allocate each participant to a category. Each category represented a range of 5-points. As an example, the category ranging between 96-100 points contained 309 people, representing 4.2 % of total respondents.

Following assigning participants to categories, a mean and normative range for each category was calculated. Subsequently, outliers were eliminated based on two a-priori assumptions. First, homeostatic processes only operate over a narrow range of the entire 0 to100-point response scale. Within this range, an individual’s normal homeostatic functioning maintains SWB levels around their set-point. Second, values outside this range represent respondents experiencing homeostatic defeat (described in Section 5.3.3.6) whereby a transient emotional state has overwhelmed the stable background influence of the dominant component of SWB, HPMood.

After the first iteration, a new mean and normative range for each category is created and outliers subsequently removed. The data-stripping process is repeated until all outliers are removed from each category, leaving an approximation of the normal distribution of SWB set-points between 71 and 90 points on the standardised scale with an average range of 18–20 points for each person, over time (see their Section 5.3.6.6 for this calculation).

Using a similar data-stripping process to validate findings from Cummins et al. (2014), Capic et al. (2018) employed pooled data from 1,151 respondents who had completed at least five surveys from 25 study waves referred to as the Australian Unity Wellbeing Index (The Australian Centre on Quality of Life, 2017). For the first time, Capic et al. (2018) extended her investigation to include HPMood.

Results from Capic et al. (2018) found that the distribution of set-points for SWB was normal and the average range of values distributed around each set-point was between 75 and 90 points. The average set-point range for each person was calculated at approximately 16.5 points, representing the normal SWB range for individuals. Similar results emerged for the HPMood variable. Understanding this later finding within the context of the study's data-stripping process confirms a central tenet of SWB homeostasis. Equivalency between the SWB and HPMood results, after removing the overlaid emotional contribution to SWB and retaining only mood, provide evidence for each person having a genetically determined and unchanging level of HPMood, representing their set-point.

In summary, a methodology enabling the isolation of HPMood from emotion paved the way for a demonstration of the existence of set-points for SWB by Cummins et al. (2014). These findings were confirmed by Capic et al. (2018) and extended to include evidence for the existence of set-points for HPMood. In response, it is believed that this set-point is genetically pre-determined (Capic et al., 2018; Diener et al., 2015).

Therefore, as HPMood is described as "the basic psychological molecule that homeostasis seeks to protect" (Capic et al., 2018, p. 1), a detailed explanation of the psychological homeostatic defensive system is now undertaken.

2.3 Psychological Homeostasis

Homeostasis, as portrayed by Cannon (1932), evolved to maintain normal body states, such as a person's core body temperature, around a genetic set-point. This set-point reflects the optimal functional state for organisms under normal conditions. When a physiological variable, such as core body temperature, is threatened and begins to drift above or below its set-point, reflexive homeostatic measures are deployed to return the variable towards its normal operating level.

Similarly, subjective wellbeing (SWB) is another homeostatically-operated variable, when threatened, psychological homeostatic devices engage to return an individual's SWB level toward their genetically determined set-point (Cummins, 2018).

The effectiveness of the SWB homeostatic management system to defend an individual's set-point is a function of the capacity of available resources to act against challenges (Cummins, 2010). Within SWB homeostasis, these defensive resources are termed *buffers* and categorised as either external or internal.

Three external buffers recruited to facilitate homeostasis are listed by Cummins (2018) and include money, personal relationships and achieving in life. These external buffers defend SWB and assist in homeostatic recovery. In addition to external resources, internal resources are denoted as habituation and adaptation, self-esteem, optimism and perceived control, with the later three referred to as cognitive buffers (Cummins & Lau, 2004; Cummins & Nistico, 2002). The external buffers are now briefly reviewed, followed by a detailed explanation of the internal buffers.

2.3.1 External Buffers.

2.3.1.1 Introduction.

Identifying money, personal relationships and a sense of achieving as external buffers emerged from research associated with measured SWB. The simplest measure of SWB is a single global life satisfaction (GLS) question (International Wellbeing Group, 2013). This question was created by Andrews and Withey (1976), and asks "How do you feel about your life as a whole?" (p. 66). This single-item measure is a simple approximation of SWB, though not as reliable as multi-item scales such as the Personal Wellbeing Index (PWI, International Wellbeing Group, 2013, see Section 5.3.1 for a full discussion).

The PWI contains seven items of satisfaction relating to different life domains. These domains are: standard of living, health, achieving in life, personal relationships, safety, community connectedness, and future security. Over the last 16 years, the PWI has been employed within an Australian context to measure SWB. Subsequent analyses of each domains contribution to SWB identifies standard of living, personal relationships and achieving as more predictable contributions of unique variance to GLS than the other four domains (Cummins, 2018).

The inferential response by Cummins (2018) to these variant domain contributions to SWB is that "not all life domains are equal in their capacity to support SWB homeostasis" (p. 19). Thus, the colloquialism referred to as the *golden triangle of happiness* was invented to describe the primacy of standard of living, expressed by Cummins (2018) as "money" (p. 19), personal relationships and a sense of achieving in life, defined as "the process of active engagement, providing purpose in life" (p. 20), as dominant external homeostatic mechanisms that support SWB and assist in homeostatic recovery. Each is now discussed in relation to SWB homeostasis.

2.3.1.2 Money.

Early research by Campbell et al. (1976) suggested that money is weakly correlated with an individual's SWB. Subsequent research published by Headey and Wearing (1992), and later by Diener, Suh, Lucas, and Smith (1999), supported this view. However, a subsequent literature review by Cummins (2000) found "that personal income is a very important element in the maintenance of SWB, most particularly for people who are poor" (p. 151).

For example, a recent study conducted by the Australian Unity Wellbeing Index (AUWI) aggregated data collected from 2002-2017 and described the relationship between SWB and demographic measures such as income. The study reports that people with gross household incomes < $30,000 had significantly lower levels of SWB compared to those with incomes ranging from $30,000 to $100,000. In addition, for those with annual incomes < $30,000, their SWB levels were, on average, below the Australian adult normal range of 74.2 to 76.8 percentage points. By comparison, the SWB of people with incomes from $30,000 to $100,000 fell within the normal adult range (The Australian Centre on Quality of Life, 2017).

In addition, researchers such as Easterlin, McVey, Switek, Sawangfa, and Zweig (2010) reported that the relationship between money and SWB follows an asymptotic curve. For example, over time, increases to income above a certain threshold do not continue to raise subjective perceptions regarding how well life is going (Easterlin et al., 2010). The threshold for gross household income within an Australian context is approximately $91,000 - $120,000, with increased income beyond this point not consistent with significant increases in SWB and with higher incomes showing no increases in SWB (Cummins et al., 2009).

The explanatory reach of SWB homeostasis not only rationalises the observed asymptotic curve, but also explains Cummins' (2000) finding of the disproportional impact of money on the SWB of people who are poor. The explanation centers on an individual's genetically determined set-point for SWB and its normal operating range.

For example, when SWB drops below its set-point range, homeostatic mechanisms, such as money can be employed to return SWB towards its normal range.

Thus, for poorer people with low levels of SWB, increasing finances is associated with an increase in SWB. However, for these people, when their SWB returns to its normal operating range of values, further increases conclude as the genetic set-point cannot be permanently modified, just as a healthy individual's core body temperature cannot be permanently increased.

Finally, Cummins (2000) contends that money exerts a dual action within the homeostatic system. The first action is defensive. Adequate financial resources are utilised to defend against negatively valenced emotions such as depressive symptomology. These negative emotions threaten to overwhelm the homeostatic management system, which evolved to maintain SWB at mildly positive levels. Therefore, in response to threats such as depression, the utility of money allows individuals to employ professional assistance at the onset of symptoms, thus, buffering the threat and returning SWB towards its set-point. Second, adequate financial resources support the production of positively valenced emotions by facilitating involvement in activities that are intrinsically rewarding to individuals and thus, supportive of mildly positive levels of SWB (Cummins, 2000).

2.3.1.3 Personal Relationships.

Within the context of SWB homeostasis, personal relationships constitute a second external homeostatic resource. Personal relationships are operationalised as the mutual contribution of intimacies and support (Cummins, 2018). Based upon this definition, a distinction is drawn between the incidence of a personal relationship as an objective factor and satisfaction with a close and intimate personal relationship as a subjective phenomenon. Therefore, a personal relationship acts as a buffer to SWB when it offers a partner the benefits of intimacy such as the sharing of personal problems, thus potentially alleviating the burden of any threat to SWB (Diener, Oishi, & Tay, 2018). Likewise, the consistency of care and availability of a partner may serve to reinforce the person's cognitive buffers of self-esteem, optimism and control (discussed shortly), thus strengthening internal homeostatic resources in the face of challenging agents.

A large corpus of literature attests to the efficacy of personal relationships as a moderator against stressors (for a review see, Sarason, Sarason, & Pierce, 1990). For example, Sarason et al. (1990) claim that amongst older people, personal relationships foster increases to an individuals' perceived sense of support and acceptance that subsequently moderates against the influences of anxiety and depression.

Evidence of associations between SWB and mutual contribution of intimacies and support is provided by the 34th Australian Unity Wellbeing Index (2017). This report details positive linear associations between personal relationships and SWB for those aged between 26-65 years. For example, this report reveals, on average, married people within Australia have the highest levels of SWB, followed by individuals in de facto relationships. By contrast, people who are not married or in de facto relationships, separated, divorced or never married, have SWB levels below the Australian normative range of 74.2 to 76.8 percentage points.

Supporting findings from the 34th Australian Unity Wellbeing Index (2017), a recent longitudinal study of data collected by the British Household Panel Survey (Grover & Helliwell, 2019) reports married people having higher SWB levels than unmarried. In addition, Grover and Helliwell (2019) controlled for pre-marital SWB levels and found those who marry are more satisfied with their lives. These data support the inference that personal relationships benefit SWB.

2.3.1.4 Achieving in life.

The third external homeostatic resource defending an individual's set-point against homeostatic failure, is a sense of achieving, defined by Cummins (2016) as "the process of active engagement that provides purpose in life" (p. 70). This definition and relationship to SWB is supported by McKnight and Kashdan (2009), who describe purpose in life as a catalyst for goal-setting whereby achieving personal goals subsequently moderates motivations for life, described as both the product and goal of SWB homeostasis (see Section 2.3 for a full discusion, Cummins & Lau, 2004).

Further, Argyle (2001) noticed that when this external homeostatic resource is denied through circumstances such as unemployment, individuals return lower levels SWB compared to those who are gainfully employed. Similarly, Lucas, Clark, Georgellis, and Diener (2004) report a reduction in SWB levels associated with declines in perceived achievement through the loss of significant family roles and relationships.

While the primacy of money, personal relationships and a sense of achieving in life act as dominant external homeostatic resources, SWB homeostasis also describes internal buffers that reflexively protect and maintain SWB within its set-point range of values. These are now discussed in detail.

2.4 Internal Mechanisms of Homeostatic Control

A strong determinant of mood happiness is the influence of internal mechanisms of homeostatic control to retain jurisdiction of SWB when confronted by a threat (Cummins, 2017). These internal mechanisms not only assist in retaining control of SWB, but they also act to restore the dominance of HPMood after an affective experience moves an individual's SWB away from their set-point (Cummins & Wooden, 2014). These internal mechanisms of homeostatic control include habituation and adaptation, and three cognitive buffers conceptualized as self-esteem, perceived control and optimism.

2.4.1 Habituation and Adaptation.

Nomenclature around habituation and adaptation are easily confused. Both terms refer to the process of an organism becoming desensitized to new stimuli, although they have differential influence in relation to the operation of SWB homeostasis.

Habituation is defined by Thompson (2009) as a ubiquitous neurophysiological phenomenon whereby exposure to a repeated frequent stimulus decreases subsequent responsiveness within organisms. For example, a new proximal sound may draw an individual's attention; however, over time, the individual becomes accustomed to this audible stimulus. Subsequently, attention and response to the noise diminishes. This diminishing response is habituation.

Habituation is adaptive, involving primitive learning mechanisms evolved to conserve resources in the presence of predictable stimuli (Humphrey, 1933). Therefore, as an internal reflexive mechanism of homeostatic control, habituation mitigates against the presence of minor predictable positive or negative challenges to SWB (Cummins, 2018). Consequently, an individual's optimal functional state, under normal conditions, remains mostly unaltered as minor agitations to SWB are corrected by the habituation process. SWB is thus effectively maintained around its set-point.

Adaptation, like habituation, involves an organism becoming desensitized to stimuli. However, the nature of the stimulus differs between these constructs. While habituation is a response to a repeated frequent stimulus, adaptation refers to the process whereby an organism adapts to a continuous, unchanging stimulus (Helson, 1964; Luo, 2019). Within SWB homeostasis, adaptation is a fundamental psychological buffer.

Over time, adaptation allows people to tolerate a reduced negative or positive reaction to changed circumstance within their life (Andrews & Withey, 1976). For example, when Brickman et al. (1978) compared happiness levels between people who won the lottery and people who became paraplegic following a trauma 18 months after the event, despite an initially large discrepancy, happiness levels for each group had returned to their baseline levels. One explanation for these findings is the adaptation process described by Helson's (1964) *adaptation level theory*.

Adaptation level theory posits that when an individual's assessment of their current level of stimulation is higher (as was the case for Brickman's (1978) lottery winners) or lower (Brickman's (1978) paraplegic participants) than usual, an unconscious process is enacted to dampen the valence of the emotional response. This is referred to by Helson (1964) as a shift in *adaptation level* whereby the novel situation is now re-categorized as normal. At this point, the individual has become accustomed to the permanent stimulus.

Despite little attention given within the corpus of SWB literature to confirming Helson's (1964) theory, and the insufficiency of non-significant correlational findings to ever identify the causal mechanisms of adaptation, SWB homeostasis has annexed adaptation level theory. This is due to proponents of SWB homeostasis theory finding within adaptation level theory an explanatory model for the observed stability of SWB levels in the face of permanent positive and or negative changes in an individual's life circumstance. They state, "it is clear that adaptation to altered circumstances of living does occur through one means or another, and that such processes are involved in maintaining the set-point-range of SWB" (Cummins & Lau, 2004, p. 288).

2.4.2 Self-Esteem, Optimism and Perceived Control.

In addition to habituation and adaptation, internal mechanisms of homeostatic control include the cognitive buffers: self-esteem, optimism and perceived control (Cummins, 2018; Taylor et al., 2012). This section will firstly define each, then report evidence for their association with SWB and describe the most common measures for gathering self-esteem, optimism and perceived control data. The conclusion of the section describes their role as a buffer within SWB homeostasis theory.

2.4.2.1 Self-esteem.

Literature is replete with studies concentrated on self-esteem. For example, in 2019, a search of the PsychInfo database yields 50,781 results for self-esteem compared with 7,891 for SWB. Within many of these studies, self-esteem is described in line with Rosenberg's (1979) definition as an attitude of self-worth held by an individual towards an object. In this case, the object is one's self. According to Rosenberg, an individual's attitude towards their self gives rise to either positive or negative feelings, and it is generally held that maintaining positive feelings towards one's self is fundamental and ubiquitous to human beings (Kaplan, 1975; Rosenberg, 1979).

Self-esteem has been theoretically connected to SWB. For example, Diener et al. (2015) locate SWB within his theory of *positive mood offset* (a term analogous to the mood component of Cummins' *HPMood* and Russell's *core affect*) by conflating positive mood offset with Leary's sociometer theory of self-esteem (Leary, Tambor, Terdal, & Downs, 1995). This conflation explains why, universally, people feel and maintain mildly positive moods in the absence of strong emotional events by connecting an individual's mood with their personal relationships and self-esteem.

For example, according to Diener et al. (2015), when close relationships elicit feelings of being valued by another, both an individual's self-esteem and positive mood are sustained. By contrast, exclusion from relationships can lower someone's sense of worth and, if left unaddressed, will eventually negatively impact mood. In addition, Diener et al. (2015) also includes within his explanatory model, adaptive responses to lowering levels of self-esteem. Behavioural adaptations are activated that increase the likelihood of future connections with other people, thus, when these behaviours produce the desired result, restored personal connection to others, self-esteem is increased, which moderates the return of an individual's normal level of positive mood.

In addition to theory, empirical associations between self-esteem and SWB are well documented (Hajek & König, 2019). While Diener et al. (2015) may assert that, "self-esteem can be considered a form of subjective well-being" (p. 236), these empirical findings suggest while self-esteem and SWB share similar properties, empirical findings support both their association and their essential differences. For example, Campbell (1981) showed self-satisfaction was the strongest predictor of SWB (.55) compared to other variables such as salary (.48), family (.45) and friends (.39). In addition, Argyle and Lu (1990) reported that self-satisfaction more strongly predicts life satisfaction than personality variables such as extraversion. Similarly, Diener and Diener (1995) identified self-esteem as the strongest predictor of SWB in their between-country study, reporting significant correlations in 29 of 31 countries, the highest being America at .60. Assessing the effect size of these findings from the report is opaque. However, these authors, recognizing the need for this information state, "our results point to the need for examining whether effect sizes systematically vary across cultures" (Diener & Diener, 1995, p. 661).

In reviewing the cross-cultural findings from Diener and Diener (1995), Cummins and Nistico (2002) noted that the strength of associations between SWB and self-esteem were stronger in individualistic compared to collectivist cultures (see Na et al., 2010 for a cautionary note regarding generalising cultural group distinctives to individuals within the group). According to Diener and Diener (1995), the reason for this is that within individualistic contexts, such as Australia, people are socialized to attend to their own inner attributes. Varnum, Grossmann, Kitayama, and Nisbett (2010) agree noting cultural contexts validating independence, "tend to emphasize self-direction, autonomy, and self-expression" (2010, p. 9). Thus, it is likely that people within individualist cultures primarily utilise their unique attitudes, emotions, and cognitions when making SWB judgments, resulting in stronger correlations between self-esteem and SWB (Lai, 2015). By contrast, collectivists are socialized to understand themselves as fulfilling duties within the community (Tam, Lau, & Jiang, 2012) and attend to harmony with other community members (Grossmann & Na, 2014; Varnum et al., 2010). Thus, feelings about one's self are less salient to the satisfaction-with-life construct than the organized social order, evidenced by lower correlations between self-esteem and SWB.

Finally, Diener and Diener (1995) also suggest that the differential importance of self-esteem in collectivist and individualistic nations is due to the socialization of affect. This is premised on their findings that students in the United States believe positive affect is normative, whereas students in Korea and China included negative affect. Therefore, these authors hypothesise that "life satisfaction may be based more on positive feelings in individualistic nations, [than] in collectivist nations [where] life satisfaction might be influenced by a more prevalent negative focus and therefore be more dependent on how many problems and social conflicts the person faces" (p. 662).

Whatever the cause, Diener's (1995) observation of different associations between self-esteem and SWB as a function of whether people are participating in individualistic or collectivist cultures is also supported by (Lai, 2015) and has major implications for the current thesis. At the very least, these observations demand a cautious approach to gathering data from collectivist cultures such as Nepal and India. Researchers ought to include methodological safeguards limiting the introduction of bias from strong cultural forces and deploy analytic strategies such as multi-group confirmatory factor analysis to evaluate the effectiveness of these strategies. These methods would constitute a minimum before any valid inferences could be drawn from gathered cross-cultural data using Western scales.

The most widely employed instrument for measuring self-esteem is the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). It is favoured for its brevity, manifold translations and reported invariance across cultures. The questionnaire askes people, regarding their current feelings, to indicate their level of agreement (measured on a 4-point scale "strongly agree, agree, disagree, strongly disagree), with the following 10 statements:

1. On the whole, I am satisfied with myself.
2. At times I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel I am a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude towards myself.

A self-esteem score is obtained by summing the five positively worded items and five negatively worded items (reverse scored). High scores indicate robust levels of self-esteem. The measure has sound psychometric properties with test-retest correlations ranging between .82 to .88 and a Cronbach's alpha reported at .86 (Mellor et al., 2008).

However, Song, Cai, Brown, and Grimm (2011) and Chao, Vidacovich, and Green (2016) report differential item functioning for the negatively worded items between Western and cross-cultural contexts. These authors argue that the differential item functioning is suggestive of the increased cognition required in responding to negatively worded questions on an agree-disagree scale and impact the construct validity by consistently producing a bi-factorial structure (Quilty, Oakman, & Risko, 2006; Salerno, Ingoglia, & Lo Coco, 2017). As a result, they recommend researchers only employ the five positively worded items in their scales, "as the advantages of including both positively and negatively worded items seem to be offset by these methodological issues" (p. 114).

Despite the problems identified with retaining positive and negatively worded items, with the exception of single-item measures of global self-esteem (Brailovskaia & Margraf, 2018), a search in 2019 of Medline Complete, MeSH, PsycINFO, socINDEX and Google Scholar failed to locate studies employing only a positively worded version of the RSES. By contrast, to reduce the possible introduction of bias from the negatively worded items, the Australian Unity Wellbeing Index survey regularly employs the five positively worded items RSES as a measure of self-esteem. The current thesis also adheres to this practice.

2.4.2.2 Optimism.

Optimism is defined by Scheier and Carver (1985) as the expectancy held by individuals that future life outcomes are likely to be favourable. Further, these authors argue that an optimistic attitude regulates behaviours such as an initial willingness to engage with fearful activity and continued engagement. By contrast, those with lower levels of optimism are less likely to engage, and quicker to disengage, with fear inducing activity. As a result, it is hypothesised that higher levels of optimism translate to successfully engaging in more positively valenced outcomes, increasing an individual's overall SWB (Diener et al., 1999).

A positive association between optimism and SWB (r = .61) is reported by Dember and Brooks (1989), who measured optimism within 106 students by items such as "I generally look at the brighter side of life." In addition, similar empirical links between optimism and SWB have been reported by Lucas, Diener, and Suh (1996), reporting a correlation of .60 and Compton (2000), at .52.

To measure dispositional optimism and pessimism, a re-evaluation of the original 12-item Life Orientation Test (LOT, Scheier & Carver, 1985) by Scheier, Carver, and Bridges (1994) resulted in the production of the shortened version, referred to as the Revised Life Orientation Test (LOT-R), correlating .95 with the original LOT. The preeminence of the LOT-R, as a measure of optimism within SWB literature is well attested, returning 14,900 citations through Google Scholar in 2019. The scale contains ten-items consisting of three positively worded items and three negatively worded items, plus four filler items that are not scored.

Despite the prominence of this 10-item scale, a reasonable argument is made within the literature to justify shortening the scale further. For example, analysis of the LOT-R by Maher and Cummins (2001) suggested the filler items, designed to highlight response sets, add unnecessary length to questionnaires and response sets are easily identified via other methods during data cleaning, which researchers remove before analyses. Further, Scheier and Carver (1985) designed the LOT-R as a measure of optimism, therefore the negatively worded statements assessing pessimism are likely redundant.

Empirical justification for the redundancy of items assessing pessimism are supported by the CFA analyses of the LOT-R by Herzberg, Glaesmer, and Hoyer (2006). This study, examining data collected from 46,133 people, confirms that the two-factor solution for the LOT-R (CFI = .99; RMSEA = .04) is a superior fit to these data when compared to a single factor model (CFI = .62; RMSEA = .21). Further, studies confirming the reliability of the optimism dimension, including Reilley, Geers, Lindsay, Deronde, and Dember (2005), reporting Cronbach’s alpha’s of .83 and .82 in studies consisting of 204 and 273 respondents respectively, and, Chang, Maydeu-Olivares, and D'Zurilla (1997) who also report a Cronbach’s alpha of .91 for the optimism dimension of the LOT-R. Finally, correlations supporting the discriminant and convergent validity of the LOT-R’s optimism dimension are also reported within these studies by Reilley et al. (2005) and Chang et al. (1997).

As a result, researchers such as Vautier, Raufaste, and Cariou (2003) are justified when they state, “there is no empirical necessity for hypothesizing that the dispositional optimism construct must be split into optimism plus pessimism” (p. 390). Therefore, following suggestions by Maher and Cummins (2001) and Vautier et al. (2003), only the three positively worded statements from the LOT-R were included throughout the current thesis. These statements are:

1. In uncertain times, I usually expect the best.
2. I'm always optimistic about my future.

3. Overall, I expect more good things to happen to me than bad.

2.4.2.3 Perceived Control.

Perceived control is defined within the current thesis as the extent to which individuals believe they are in control of their lives. By contrast, based on research by Peterson (1999), perceived control has also been defined as how people behave to augment good outcomes for their lives (Blore, 2008). The distinction is pertinent.

Perceived control, operationalised according to how people behave to maintain control of their lives, has informed the selection of scale items measuring *control* on most Australian Unity Wellbeing Index surveys conducted before and after the 23rd edition. For these surveys, various control strategies are derived from Heeps (2000) and based upon theory originating from Rothbaum, Weisz, and Snyder (1982).

The Australian Unity Wellbeing Index questions pertaining to control strategies begin with the statement "When something bad happens to me," and are followed by statements such as "I ask others for help or advice" and "I remind myself something good may come of it." Respondents represent their level of agreement on an 11-point scale ranging from 0 (“strongly disagree”) to 10 (“strongly agree”). These items require participants to consider the strategies they use to regain control when ‘something bad happens,’ with the first response tapping a behavioural tendency that enlists external resources to maintain control, and the second, describing a preferred internal cognitive response utilised to restore control. The statement "When something bad happens to me," and the two options offered to respondents answering the Australian Unity Wellbeing Index, taps their preferred way of coping and not the degree to which they feel they are coping.

When the definition of perceived control is operationalised to measure the strategy employed to regain control, the extent to which an individual feels they are currently in control of their life, is not tapped. In relation to SWB, Diener et al. (2015) notes the primacy of these feelings as the catalyst for subsequent behaviours that an individual engages to maintain control and their subsequent set-point for SWB. Similarly, within SWB homeostasis theory, there is a theoretical relationship between feelings of control, subsequent behaviours engaged to maintain these (as reflected by the questions posed within the Australian Unity Wellbeing Index listed within the prior paragraph) and the buffering of threats to SWB.

There exist discrete scales to measure each. For example, the one used by the Australian Unity Wellbeing Index to assess preferred behavioural responses to loss of control, and another, a revised version of Pearlin and Schooler's scale (1978), to measure perceived control, as defined within the current thesis. Pearlin and Schooler's (1978) seven original items are:

1. I have little control over the things that happen to me.
2. There is really no way I can solve some of the problems I have.
3. There is little I can do to change many of the important things in my life.
4. I often feel helpless in dealing with the problems of life.
5. Sometimes I feel that I'm being pushed around in life.
6. What happens to me in the future mostly depends on me.
7. I can do just about anything I really set my mind to do.

A revised version of Perlin and Schooler's original scale (1978), employed within the 23rd Australian Unity Wellbeing Index, reduced the number of scale items from seven to five by removing the positively-worded items. The rationale for reducing items includes producing a scale with consistency regarding its valence, and, avoiding likely bias introduced by differential item functioning from including both positive and negatively worded items. Items retained by the 23rd Australian Unity Wellbeing Index are:

1. I have little control over the things that happen to me.
2. There is really no way I can solve some of the problems I have.
3. There is little I can do to change many of the important things in my life.
4. I often feel helpless in dealing with the problems of life.
5. Sometimes I feel that I'm being pushed around in life.

2.5 Internal Buffers and SWB Homeostasis

Within SWB Homeostasis, the role of self-esteem, optimism and perceived control is to maintain SWB levels through defending the emotional self against negative life challenges (Cummins & Nistico, 2002) and to restore the governance of HPMood after an affective threat moves SWB from its set-point (Cummins & Wooden, 2014).

These perspectives evolved from earlier remarks by researchers such as Taylor and Brown (1988, 1994) who found, on average, general populations have stable, mildly positive levels of self-esteem, control and optimism. Further, Taylor and Brown (1988) challenged prior assumptions that viewed these positive cognitive biases as processing flaws by suggesting they are, by contrast, highly adaptive mechanisms for maintaining day-to-day motivations. For example, as an adaptive mechanism, Coopersmith (1967) argues that people with positive levels of self-esteem approach responsibilities and others expecting to be successful and appreciated. He suggests it does not require a leap in logic to expect that people exhibiting such attributes are more likely to also have positive levels of general life motivation and SWB, which has subsequently been empirically confirmed (Campbell, 1981; Cummins & Nistico, 2002; Taylor et al., 2012).

Reflecting on the observations from Coopersmith (1967) and Taylor and Brown (1988), Cummins and Nistico (2002) agree stating “such positively biased cognitions constitute an adaptive mechanism which creates and maintains mean population life satisfaction in the range of 70–80%SM through partial fulfilment of these abstract needs” (p. 45). This explanatory statement, for the first time, connects observations from the Australian Centre on Quality of Life (2002), that “on a population basis, the [Personal Wellbeing] scores that we derive from this PWI, are quite remarkably stable” (p. 2), to the theoretical model of Taylor and Brown (1988), and thus, provides an embryonic explanation for the observed stability.

Regarding the ability of cognitive buffers to restore SWB levels towards their set-point, this scenario begins with the impact of a negative life experience. If the threat is of sufficient intensity or duration, adaptation can fail to assimilate these events (Cummins & Wooden, 2014). For example, upon experiencing a negative event such as a long-term relationship breaking up, self-esteem can buffer the negative experience by reminding the individual they are still loved by others and a valued person. If, however the adversity is chronic and ongoing, for example several other significant people communicate rejection, self-esteem may become damaged, and no longer be able to fulfil its buffering role (for an interesting perspective on how various cultures differ in their adaptation to negative life events, see Grossmann & Kross, 2010). In order to fully explore these homeostatic mechanisms, including the various behavioural responses to threats to an individual’s SWB, the next section of the current chapter engages in a fuller discussion regarding the nature of homeostatic challenge, including those posed by disability and leprosy, and the system’s response within SWB homeostasis theory.

2.6 Homeostatic Challenge

As previously discussed in Section 2.2, at the core of SWB homeostasis is the background influence of Homeostatically Protected Mood (HPMood, Cummins, Capic, Hutchinson, Fuller-Tyszkiewicz, & Olsson, 2018). HPMood is a person's stable, positive, mild background affect that is genetically fixed at a constant level in the same way as other biological systems control physiological states such as core body temperature. The genetic contribution is referred to as HPMood's set-point and is important to human functioning by generating a person's general motivation for life (Cummins, 2017). These set-points for HPMood are reported as being normally distributed within Australia's general population between 75 and 90 percentage points, on a 0-100 percentage point scale where 0=no positive feelings at all and 100=very high positive feelings (Capic et al., 2018).

The basis for Capic's (2018) finding regarding the distribution of set-points for HPMood is the analysis of data gathered by self-report measures, including the HPMood scale and the Personal Wellbeing Index. However, when people rate their satisfaction levels on these scales, the elicited response replicates a single stream of consciousness consisting of two major components. These components are HPMood, and an overlay of emotion made up of momentary affective-cognitive interactions between someone's thoughts and salient environmental factors. Therefore, at the time of measurement, the conflation of HPMood and current emotion influence a person's response. This leads to an assertion by Cummins et al. (2018) that SWB, HPMood and a person's set-point are discrete. Specifically, SWB consists primarily of HPMood, but not entirely, and HPMood consists of both mood and emotion.

Thus, under normal operating conditions with low levels of emotional input from the environment, HPMood dominates the affective content of a person's SWB.

However, when a person's current emotional state becomes highly valenced, the salience of HPMood gives way to the dominant emotion (Cummins, 2017). This is by design. In evolutionary terms, hominins are selected for survival when threats eliciting emotions result in focused attention to its source and the production of a set of subsequent favourable responses that reduce the threat-level (Frijda, 1986).

SWB Homeostasis theory includes the external and internal mechanisms that are systematically engaged to produce a range of favourable responses to negative emotion-inducing environmental stimuli. These favourable responses include behaviours such as removing one's self from the proximity of a threat, utilising money to access treatment for the triggers of negative emotional valence such as illness or disability, or engaging internal cognitive buffers such as optimism, self-esteem and perceived control to minimise the impact of personal failure on our positive view of self.

These internal buffers effectively negate threat by engaging strategies such as *social comparison,* whereby attempts to reduce strong negative emotions associated with our difficult life-circumstances are achieved by seeing ourselves as "less badly-off" than others. In addition to social comparisons, *goal disengagement* is another internal strategy that reduces the strength of negative emotions brought on by blocked personal goals. In response, individuals reduce effort and or commitment to a task, premised on revised cognitions regarding the intrinsic value of the original goal (Stiegelis et al., 2003; Wrosch, Scheier, Carver, & Schulz, 2003). For example, failing academic performance may produce the revised perspective that the earlier goal, my academic qualification, is not necessary for vocational success. Thus, heightened negative emotion around academic failure is buffered by disengaging from my original goal. While these and other homeostatic buffering mechanisms associated with SWB homeostasis are robust, as demonstrated by Australian SWB scores, averaged across 16 years, revealing a narrow range of 74.2 to 76.8 percentage points and a grand mean of 75.5 (The Australian Centre on Quality of Life, 2017), the system is not impervious to threat.

When the homeostatic system encounters negative experiences of sufficiently strong nature and or duration, *homeostatic breakdown* can occur (Cummins, 2010). This term describes the regulatory failure of the system under chronic and persistent conditions. Those exposed to the greatest risk of homeostatic breakdown are people already functioning at the edge of their set-point for SWB. For these individuals, homeostasis is already working the hardest to restore equilibrium and prevent SWB from deteriorating beyond its set-point (Cummins, 2010). When the system is overworked, indicated by measured scores beyond the lower bounds of their set-point (SWB < 50%SM), Cummins (2010) reports increased correlations between these SWB levels and psychopathology such as depression. For these individuals whose SWB is < 50%SM, "the basic psychological molecule that homeostasis seeks to protect" (Capic et al., 2018, p. 1), HPMood, is now likely to be experientially opaque, replaced by an enduring negatively valenced emotion.

2.6.1 SWB Threats from Intellectual Disability and Leprosy.

Previous sections identified the inability of the SWB homeostatic system's capacity to cope with highly valenced negative emotions that are extreme in their duration or intensity. The source of the strong emotion is often produced from adverse life circumstances such as people affected by an intellectual disability, or, as is the case for many within India and Nepal, leprosy. Each potential source of threat is now briefly discussed in relation to SWB homeostasis.

The American Psychiatric Association (2013) describes people affected by an intellectual disability (ID) as having a "disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains" (p. 33) with, "an overall general population prevalence of approximately 1%" (p. 38). Therefore, considering the functioning of SWB homeostatic buffers with the definition of ID from the American Psychiatric Association (2013), it is likely that challenges associated with a person's ID, such as difficulty with social connecting, would compromise the functioning of SWB homeostatic buffers, lowering resilience to threats, thereby increasing the risk of homeostatic defeat.

According to Cummins, Lau, Davey, and McGillivray (2010) and Grey, Totsika, and Hastings (2018), the added burden from ID predicts that people are, on average, less resilient than those without ID. These author's describe resilience as the capacity for the homeostatic system to resist threats and or return the system to stasis after encountering a SWB threat. This does not mean their SWB stasis is any lower than people without an ID, in fact, with adequate levels of social support, their SWB levels approximate the general population (Cummins et al., 2010). However, unlike the general population, people with an ID are forced to manage a constant challenge, which reduces their capacity to adapt to additional challenging life circumstances.

It seems reasonable to suspect that people with ID may encounter difficulty regarding obtaining or receiving the quality of social support that is key to maintaining their SWB. People with ID have adaptive functioning deficits in the social domain (American Psychiatric Association, 2013). According to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013), the social domain involves "awareness of others' thoughts, feelings, and experiences; empathy; interpersonal communication skills; friendship abilities; and social judgment" (p. 37). Therefore, it is reasonable to expect that functional deficits within this domain may hinder the ability for ID people to maintain interpersonal connections, regarded as an important homeostatic buffer and operationalised as the mutual contribution of intimacies and support (Cummins, 2018). Accordingly, without functional levels of empathy and interpersonal communication skills, it seems the probability of sustaining mutual intimacy and support, is unlikely. In response to lowered empathy and interpersonal skills, an individual may withdraw from someone with an ID and thus, remove an important homeostatic buffer, which would create fertile ground for lowered SWB levels and, if sustained, homeostatic defeat.

Investigating these predictions is hampered by a dearth of research. This is of concern to Cummins et al. (2010) who argue that ensuring those with an ID have normal levels of SWB is essential. According to Cummins et al. (2010), confirming that SWB levels for people with an ID are normal begins with measurement. To accomplish this, a version of the Personal Wellbeing Index was created for use amongst people with ID (PWI-ID, Cummins & Lau, 2005). In this parallel version of the adult PWI (PWI-A), the same theory undergirds the scale along with the same seven life domains. However, modifications designed to reduce the introduction of measurement bias are included that enhance the validity and reliability of collected data. These modifications include the following:

- **Item wording:** The PWI-A's term "satisfaction" is replaced within the PWI-ID by "happiness." Therefore, the original question "How satisfied are you with your health," now reads "How happy do you feel about how healthy you are?"

- **Response choice:** A reduced-choice format is included consisting of a series of outline faces (scored as 0=sad to 5 =very happy) to enhance comprehension. These are represented below in Figure 1.

Figure 1: A reduced-choice facial format to enhance comprehension

- **Pre-testing:** This protocol proceeds with an initial test for acquiescent responding. If people respond acquiescently, participation is terminated. Testing for acquiescent responding and competency in scale usage is important because people with an ID can often respond in ways they feel are desired by the researcher (see Cummins and Lau (2005) for further pre-testing information).

The PWI-ID was then employed by Cummins et al. (2010) within Australia to gather SWB data from people with an ID. These data were then compared to those from the general population, consisting of mean population scores from 18 surveys yielding a normative range of 73.4 – 76.4 percentage points (Cummins et al., 2008). According to Cummins, extrapolating SWB inferences for ID people from general population data is likely to be valid. However, he adds, “this group, of course, has special needs, and so complete congruence between the two populations is most unlikely” (Cummins et al., 2010, p. 42). In this study, Cummins et al. (2010) found the SWB of Australian’s with an ID was, on average, 77.08 percentage points, placing it slightly above the upper limit of the normative range for Australian adults. This result supports Cummins’ premise that extrapolating SWB inferences for ID people from general population data is likely to be generally valid, as shown by the similarities between the SWB means collected from the two Australian groups. However, due to the added burden of ID and the predicted lowered resilience placed upon the homeostatic system and without additional provision to the buffering system such as supportive relationships, SWB homeostasis predicts the absence of an important buffer such as personal relationships would result in lower mean scores. Research from Grey et al. (2018) has confirmed this prediction.

In support of associations between the lowered SWB levels and disconnecting from interpersonal relationships, Grey et al. (2018) report a t-test result ($t(1415) = -4.94$, $p < .001$) indicating that ID people living with their families have significantly higher levels of SWB than those living in out-of-home settings (M = 11.44, SD = 2.50; M = 10.79, SD = 3.38 respectively). An effect size of 0.23 (95% CI 0.14 – 0.31), estimated as a standardised mean difference (using the pooled standard deviation, $SD_{pooled} = 2.85$), denotes the significant mean-difference was small. In addition, their estimated odds ratio found the odds that ID people living outside their family home have significantly lower levels of SWB than those living with their families are 1.5 times higher. In addition, these differences were supported by their multiple linear regression analyses that found, controlling for other variables such as financial resources, living with their family was significantly associated with better SWB.

In summary, people with an ID report SWB levels that approximate the general population of Australia provided homeostatic buffers such as interpersonal relationships and financial resources are maintained. However, these individuals are likely operating at the limit of their internal homeostatic resources evolved to buffer threats from strong emotional catalysts. This is likely due to people with ID's living with psychological, and often physical encumbrances imposed by their disability. This additional source of stress, which non-disabled people do not have, diminishes their resilience to increasing levels of challenge.

2.6.2 Leprosy.

2.6.2.1 Introduction.

In 2018, a total of 208,619 new leprosy cases were detected globally. From these, 120,334 were from India, and 3,259 from Nepal (World Health Organisation, 2019). Together, these two countries contribute nearly 60% of the global caseload. In 2013, leprosy was a leading cause of infectious disease worldwide (Gunaratnam, Britton, & Hofmey, 2013). In 1985, the global number of people affected by leprosy was approximately 12 million with a prevalence rate of 12 per 10,000. In 1991, the World Health Assembly quantified an ambitious goal to "eliminate leprosy as a public health problem by the year 2000" (WHA; World Health Assembly, 1991, p. 1). At this assembly, WHA defined the elimination of leprosy as "the reduction of prevalence to a level below one case per 10, 000 population." (World Health Assembly, 1991, p. 2). In 2014, the global prevalence rate for leprosy was 0.32 per 10,000 (World Health Organisation, 2014), decreasing to 0.20 per 10,000 by the end of 2018 (World Health Organisation, 2019).

According to Hagge (2009) and Britton (2004) the cause of leprosy is a chronic granulomatous infection of skin and peripheral nerves with *Mycobacterium leprae* transmitted person-to-person via nasal droplets. A variant reaction by the cellular immune response to the mycobacterium produces deficiency of sensory and motor nerve function. For people who remain untreated, prognosis includes progressive and permanent damage to peripheral nerve trunks and small dermal nerves in skin, eyes, and limbs (Gunaratnam et al., 2013).

Leprosy principally affects an individual's skin and peripheral nerves, resulting in neuropathy, deformity, blindness and disability. The combination of symptoms common to leprosy sufferers can have particularly devastating consequences. For example, people who suffer blindness along with the inability to feel their feet and hands can unknowingly expose themselves to danger that results in significant structural damage, often resulting in necessary amputation.

The initial cause of blindness is the atrophy of the oculomotor nerve resulting in the inability to blink. Thus, invasion of bacteria and penetration from foreign materials are unhindered. As damage accumulates, blindness ensues. Researchers found that 2·8% of people affected by leprosy were blind at their diagnosis and a further 11% had visual pathology (Britton & Lockwood, 2004). While low-cost antibiotics are readily available as a cure for leprosy and its physiological ramifications, social stigma hinders early detection, allowing the disease to progress (Engelbrektsson & Subedi, 2018). Stigma is also a principal characteristic of the social impact of leprosy (Kazeem & Adegun, 2011) .

In India and Nepal, the stigma, and fear of potential stigma associated with contracting leprosy, has its source within a vernacular belief that God is punishing affected people (Adhikari, Kaehler, Chapman, Raut, & Roche, 2014). As a result, leprosy sufferers are abandoned by the general community and their families due to the prevailing fear of opposing divine purposes. In response, early signs of leprosy are concealed, which in turn, adversely affects health-seeking behaviour (Rafferty, 2005). This concealment allows the disease to progress until its presence manifests to others, initially, due to tendon shortening within a person's fingers. This damage permanently curls the fingers of affected people, which is noticed upon the traditional greeting of others. At this point, people are usually excommunicated from their families and places of employment and forced by their circumstances to seek treatment. There are, thus, critical social and psychological implications associated with the onset and experience of leprosy.

Treatment of leprosy includes a multi-drug therapeutic response with the first-line drugs clofazimine, rifampicin, and dapsone (Britton & Lockwood, 2004). Dispensing these antibiotics, including their dose and duration, are dependent upon the type of leprosy and age of the affected person. Associated treatments often include remedying ulcers, performing surgery to repair nerve damage, and in many cases, amputations. These medical interventions are effective to some degree and continue to attract significant global research and funding; however, the moderating effect of stigma on an individual's SWB has life-long adverse implications and have received, by comparison, little research and funding.

2.6.2.2 Leprosy and Subjective Wellbeing Homeostasis.

The stigma and physical disability associated with contracting leprosy within India and Nepal provide significant threats to an individual's SWB. As previously discussed, SWB is a homeostatically-operated variable that when threatened, engages psychological homeostatic devices to return an individual's SWB level toward their genetically determined set-point (Cummins, 2018).

The effectiveness of the SWB homeostatic management system to defend an individual's set-point for SWB is a function of the capacity of available resources to act against challenges (Cummins, 2010). Within SWB homeostasis, these defensive resources include external and internal buffers. Three external buffers are money, personal relationships and achieving in life. The internal resources include self-esteem, optimism and perceived control (Cummins & Lau, 2004; Cummins & Nistico, 2002). Both the external and internal buffers are significantly challenged by leprosy. Physical disability associated with untreated leprosy makes employment impracticable, thus, removing access to money and a major mechanism supporting achieving in life (Cummins, 2016). Further, due to stigma, leprosy affected people are excluded from social relationships, including their own families. Lastly, the vernacular understanding that leprosy is the result of divine punishment, coupled with social exclusion and unemployment, means a person's self-esteem, perceived control and hope for a future (optimism), are significantly impaired.

When the homeostatic system encounters negative experiences of sufficiently strong nature and or duration, such as experiences associated with leprosy, *homeostatic breakdown* ensues (Cummins, 2010). This term describes the regulatory failure of the system's internal and external buffers under chronic and persistent conditions. When the system is compromised in this way, Cummins (2010) reports increased correlations between low SWB levels and psychopathologies such as depression and anxiety. For these individuals, "the basic psychological particle that homeostasis seeks to protect," HPMood, and its product, motivation for life (Capic et al., 2018, p. 1), are now likely to be experientially opaque, replaced by an enduring negatively valenced emotion.

Implied within some SWB literature, is a prediction based upon SWB homeostasis theory, that people affected by leprosy are likely experiencing homeostatic defeat. For example, an Indian study by Ranjit Kumar and Verghese (1980) found signs of homeostatic defeat, the prevalence of psychiatric morbidity including depression, paranoia and anxiety in leprosy affected people, was significantly higher than the general population (99/1000 and 63/1000 respectively). In fact, the most common psychopathology associated with leprosy is depression (Singh, 2012; Yaduvanshi, Abraham, Jain, & Tomar, 2016). Further, support for the moderating impact of stigma on homeostatic defeat was found within a report by Adhikari et al. (2014) who note that concealment, disclosure and self-esteem were the major domains affected by leprosy. Specifically, this study reports that 66% of leprosy affected patients would conceal their disease after its diagnosis, and, 59% of these had determined never to inform family members. Lastly, of the 135 patients, 58% were experiencing low levels of self-esteem. These findings are consistent with findings from other Nepali and Indian studies (Barrett, 2005; Heijnders, 2004).

Regarding associations between leprosy and depression, a study of 300 leprosy patients aged between 18 and 60 years within the Agra and Kanpur districts within India found 33% of the male and 46% of the female patients presented with comorbid depression and 20.66% of the male leprosy patients and 16.00% of the female leprosy patients were suffering from depression and anxiety (Yaduvanshi et al., 2016). These results not only reveal associations between leprosy and depression, but that female leprosy patients present with higher rates of depression than male leprosy patients. This latter finding was expected due to the widespread vulnerability of women within India and Nepal, due in part, to a pervasive worldview that values men above women. Such a view likely places additional maintenance pressure onto the SWB of women in these contexts thus, lowering resilience and making additional threats imposed on the system by leprosy, irresistible (Diyali, 2017).

Further, a qualitative analysis of patients by Yaduvanshi et al. (2016) support their opaque contact with HPMood, and failure of homeostatic buffers to return people towards their set-point for SWB. These researchers concluded that, "There is a loss of hope [*optimism*] and the patients feel that they are not going to recover [*perceived control*], and it is better to die rather than to live due to leprosy. Ideas of helplessness [*perceived control*], worthlessness [*self-esteem*] and guilt also are present in patients with leprosy (Yaduvanshi et al., 2016, p. 322 , *emphases mine*). Further, associations between lowered levels of self-esteem, a robust internal homeostatic buffer (Cummins & Lau, 2004), and increases in social isolation were identified in a number of focus groups questioned during treatment at the Green Pastures Hospital and Rehabilitation Centre, Pokhara, Nepal (Rafferty, 2005).

2.7 Summary

Leprosy within India and Nepal presents a significant threat to a person's SWB. Due to its potency and duration, if left untreated, internal and external homeostatic resources are likely stretched beyond their capacity to maintain a person's SWB within their normal operating set-point range. With the subsequent onset of homeostatic defeat, feelings associated with various psychopathologies such as depression and anxiety can replace the affective impact from HPMood. Consequently, moderated by disability and stigma, many people affected by leprosy experience a loss of motivation for life.

Chapter 3: Cross-cultural Measurement

3.1 Introduction

To obtain data on the homeostatic buffers, depression, and leprosy in India and Nepal, extant self-report instruments have been used. All were developed in Western contexts. However, such cross-cultural application increases vulnerability to a number of measurement issues that threaten data validity (Cummins, 2018; Keith et al., 1996; Tov & Diener, 2007).

Various definitions of *culture* are summarised and discussed by Keith (2019). Described as a set of unique meanings and informational systems that are shared by a group and transmitted across generations, it is likely that individuals share the beliefs and behaviours of their cultural group (Cummins, 2018). In addition, these shared beliefs and behaviours often vary between different cultures, including how people respond to SWB questions asked by researchers. These variations between cultures almost certainly make the validity of direct cross-cultural comparisons ambiguous, thus increasing the need to identify and compensate for the impact of culture on SWB data.

Sources of measurement threat include *social desirability* (Crowne & Marlowe, 1964), *acquiescence* (John D. Winkler, Kanouse, & Ware, 1982), and *proxy responding* (Sneeuw, Sprangers, & Aaronson, 2002). Other generic sources of measurement error may include the type of response format, scale type, the content of items on questionnaires and the context surrounding the gathering of data such as the presence of the researcher (Fiske, 1982). These systematic sources of bias yield a form of measurement error referred to as Common Method Bias (CMB, Podsakoff, MacKenzie, Jeong-Yeon, & Podsakoff, 2003). As described by Fiske (1982), the danger of such systematic error variance is that it may offer grounds for an illegitimate explanation of the relationships between data and explanatory constructs.

Therefore, quarantining data from method variance is especially important for cross-cultural psychology. In addition to unintended distortions from group-specific attributes (Gregorich, 2006), data collection from countries such as India and Nepal pose additional risks introduced during the translation process and high rates of non-literate respondents with unknown numeracy capabilities.

The translation of instruments into languages such as Hindi and Nepali can precipitate unintended changes to the meaning of questions and the constructs they seek to measure (Angoff, 1993). Additionally, the untested assumption that non-literate individuals can answer questions using a numeric scale, further increases the vulnerability of data.

In 1987, Cote reported the extent of this problem for social science. He examined 70 individual reports for the presence of common method variance associated with the measures employed and found evidence for method variance in all but three. In fact, he reported that the measures contained, on average, 41.7% construct variance, 26.3% method variance, and 32.0% random error variance. Further, the discipline with the highest contribution of measurement variance was Education (30.5%) followed closely by Psychology at 28.9%. In a similar vein, Williams, Ronald Buckley, and Cote (1989) used Confirmatory Factor Analysis to reanalyse data previously processed by other authors as though free of method variance. They found that 25% of the variance was due to method.

These studies point to measurement error as a significant ‘blind-spot’ for research on psychological constructs. The extent of the problem led Wilkie (1973) to suggest the existence of a pervasive and ill-founded confidence in many measures of validity.

Considerations of bias will now be examined with special relevance to India and Nepal with reference to impacts from literacy, numeracy, translation and the type of response scale used. During the course of this chapter, examples cited from published reports will reveal pandemic levels of inadequate collection and analytic methods used by SWB investigators in cross-cultural contexts. Therefore, the final section explains and highlights advantages to establishing measurement invariance before drawing SWB inferences.

3.2 Identifying the Source of Bias in Cross-cultural Contexts

3.2.1 Literacy.

In Nepal, 57% of adults are reported as literate and 62.8% in India (Unicef, 2015). However, defining literacy takes many forms. The definition adopted for this thesis is provided by the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) as “A person is literate who can, with understanding, both read and write a short statement on his or her everyday life” (UNESCO, 2006, p. 157).

A background paper for Fransman’s (2005) report summarizes the historical perspectives associated with defining literacy. She categorises these approaches under four broad headings as (a) an established set of skills, (b) applied, practiced, and situated, (c) a process of learning, and (d) “text.” Each of these will be briefly explained.

Firstly, literacy, abstracted as an established set of skills, includes the ability to read, write, and demonstrate a degree of numerical proficiency. Defining literacy in this way is equivalent to Robert’s (1995) *quantitative* category that approximates a vernacular understanding of literacy. Fransman’s second conceptualisation describes literacy as applied, practiced, and situated. This portrayal connects quantifiable skills to a person's broader context by emphasising the extent to which their literary skills equip individuals for social, economic, and civil engagement.

The third approach, often referred to as *process learning* (Roberts, 1995), extends literacy beyond a set of acquired skills. This is a constructivist approach that emphasises how literary abilities develop in the first place and continue to evolve through interactions between people and environments (Yousif, 2003). As an illustration of this perspective, Freire (1995) describes reading, writing, and numeracy as mechanisms that facilitate two-way interactions between formal learning contexts that individuals are placed into and the broader world (Knowles, 1980; Kolb, 1984). An earlier quote from Freire (1993) encapsulates this viewpoint by describing the dialogic integration of school-based learning and life knowledge. In one of his final books reflecting on his application of democratic schooling amongst 2 million Brazilian students he writes, "reading the word - reading the world are mutually necessary as they complement each other" (Freire, 1993, p. 101).

The fourth perspective, defining literacy as text, extends personal competencies to include critical examinations regarding the social impact of literary texts and their suitability to the learning outcomes of students (Bhola, 1994). Therefore, Gee (1996) maintains that whilst many classical texts communicate and teach a range of social-political perspectives, the subject matter, genre, or complexity of the language used, is often inappropriately matched to student populations. Understanding literacy in these terms allows educational analysts such as Gee to conclude that some classical literary pieces teach hidden curriculum that are inappropriate to several student contexts.

In summary, operationalising literacy for gathering data from respondents within India and Nepal, including those affected by leprosy, broadly follows, "A person is literate who can, with understanding, both read and write a short statement on his or her everyday life" (UNESCO, 2006, p. 157). However, as people with leprosy often have significant structural damage to their fingers and hands, writing is often not possible. Accordingly, literacy is tested by asking participants to read a question from the questionnaire (see Section 5.3.2.1) and they were not required to write a response.

3.2.1.1 Association between illiteracy and psychometrics.

Researchers have previously translated and employed three psychometric scales used in the current thesis within Nepal (DASS-21, RSES, and SWLS; Gautam, Saito, & Kai, 2008; Mahat & Scoloveno, 2001; Subba, 2006; Tonsing, 2014). However, the authors did not describe any method for investigating, nor adjusting for, the impact of illiteracy on these data. This oversight leaves data vulnerable to bias. Cross-cultural use of translated psychometrics introduces the potential for a violation of measurement invariance inadvertently diminishing construct validity and confidence in any subsequent inferences made within these publications. Therefore, the addition of the pre-test protocols outlined in Study 1 are a precautionary response to the inherent difficulties associated with producing equivalent translations of psychometrics used in countries such as India and Nepal. It is expected that the pre-tests administered by researchers collecting these data will increase the likelihood of producing metric equivalence between translated measures by eliminating acquiescence and the impact of illiteracy (Harzing, 2006).

Besides the inherent difficulties associated with maintaining reliability and validity when researchers translate a self-report questionnaire, insufficient methodological responses to illiterate participants during data collection may also introduce bias. In the SWB literature reviewed from India and Nepal, pre-tests or responsive protocols were not employed.

To date, the studies reviewed simply reported the percentage of participants unable to read and, in response, researchers then read aloud the questions for illiterate respondents. Then, either the researcher themselves or an assisting colleague interpreted and recorded participant responses. For example, Subba (2006) used Diener's SWLS and the WHOQOL-100 questionnaires to measure the SWB of 200 Nepali women. She states that 25.5% of respondents were illiterate. Within this report, there is no mention of protocols used alongside these self-report measures completed by participants unable to read the questions. Her statement, "Rapport was established and respondents were asked to respond freely" suggests that participants were read the questions, however, this introduces potential problems regarding the content validity of the measures if researchers explain questionnaire items (Carmines & Zeller, 1991). In this case, it becomes increasingly likely that the additional comments made by the researchers could modify the meaning of questions and alter the assessment of the latent variable under investigation. In addition, it is conceivable that in contexts where researchers developed a strong rapport with illiterate participants, proxy responding, and or, acquiescence likely occurred (Cummins et al., 2010).

Whilst the difference between a respondent's self-assessment and the proxy-respondent's perspective, known as the *inter-rater gap*, is conceptually possible to reduce, difficulties remain with proxy responding, even when the researcher is well-known to the respondent (Cummins, Lau, Davey, & McGillivray, 2010; Pickard & Knight, 2005). The cognitions associated with answering self-report tools are significantly multifarious, even before layering the complexities associated with respondents not being able to read or write. Therefore, the temptation to "interpret" a response on behalf of a participant may expediently complete a given question. However, in cross-cultural contexts, it is impossible to disentangle whether (a) the response adequately recorded the opinions of the person taking the questionnaire or (b) the response reflected the tendency to agree or disagree with a question regardless of its content. This is because measuring SWB requires the respondent to reflect upon how they feel about aspects of their own life. This essential component is absent if the researcher records how they think the other is feeling (Cummins, 2002; Hensel, 2001). Therefore, the inconvenience associated difficulties with an illiterate participant should not to lead to researchers either providing an extended explanation of the construct under review, nor providing an approximated response on behalf of participants. Otherwise, it is probable the data are contaminated with bias.

In another study, Gautam (2007) used the SWLS in Nepal noting, "Verbal consent was obtained because of the high rate of illiteracy and inability of subjects to sign their name" (Gautam et al., 2007, p. 3). There is no mention of any objective pre-test procedure for assessing participant comprehension and discerning acquiescent responding. In addition, a recent study by Adhikari (2014) investigating perceived stigma in leprosy affected patients at the Green Pastures Hospital in Western Nepal, included 135 participants, and 54.8% of them were illiterate. This study defined literacy as "those who could not read and write" (Adhikari et al., 2014, p. 3) and the authors collected data using questionnaires and semi-structured interviews lacking protocols for protecting data from the influences of the researchers' interactions with respondents.

These examples are typical of the broader landscape associated with the praxis of collecting SWB data with self-report measures amongst non-literate people within India and Nepal. Under these conditions, the possibility of diluting content validity, engaging in a mild form of proxy responding, or the likelihood of acquiescent responding, is an abiding threat to the reliability and validity of data.

In light of the issues associated with the use of translated psychometrics and their cross-cultural use, the potential influence of cultural response bias, and the additional pressure on validity posed by non-literate respondents, it is highly improbable that two individuals from different cultures would respond similarly to any item on a self-report questionnaire (Angoff, 1993). However, the problem deepens when participants have unknown numeric capabilities.

3.2.2 Numeracy.

In addition to appropriate precautions against impacts from variant literacy levels, quarantining data from bias necessitates establishing respondent capacity to report SWB answers on a numeric scale. Accordingly, an initial step in data collecting is to establish if respondents are numerically competent. Therefore, numeracy requires operationalising.

However, an agreed global definition for numeracy is elusive. A report by Coben (2003), funded by the UK government's Department for Education and Skills, contains a comprehensive exposition of the complexities associated with defining numeracy. Suffice to say, his quote, "numeracy is a deeply contested and notoriously slippery concept, the subject of lively debate by commentators concerned with the education of adults" (Coben, 2003, p. 9), reflects the definitional complications.

The complexities associated with Coben's (2003) comment stand in contrast to a definition from Girling (1977), who defines numeracy as the sensible use of a 4-function calculator. The brevity of this definition camouflages the modern intricacies associated with describing numeracy. In response to these intricacies, this thesis' operationalising of numeracy does not attempt to contribute to the on-going global search for an agreed meaning. Rather, a context-specific definition for numeracy defines it as the ability for participants to express a personal response to specific questions using a numeric scale.

This definition for numeracy produces a measurable construct functionally connected to collecting data within India and Nepal using an 11-point end-defined scale.

Therefore, numeracy is operationalized as the ability for participants to numerically express a personal response to SWB questions using a 0-10 end-defined scale (0 = "No satisfaction at all," 10 = "Completely satisfied"). Finally, numeric competency as assessed within this thesis is detailed within Section 4.3.2.3.

3.2.3 Translation.

An inaccurate translation also poses potential risk to bias. Accordingly, the translation of the thesis' questionnaire uses the widely employed Brislin model to achieve semantic equivalence between the English version and its Hindi and Nepali translations (Brislin, 1970). The translation process proceeds as follows. First, researchers construct an English version of the SWB questionnaire. After this, two bilingual colleagues from The Leprosy Mission India and Nepal translated the questionnaire from English to Hindi and Nepali. This first translation is referred to in the literature as a *forward translation* (Brislin, 1970, 1986). After receiving the forward translation, two bilingual Australian colleagues back translated the questionnaire from the target language to English (*backward translation*). To ensure the equivalency of the translated documents, the back translation was done by blinding the Australian bilingual translators to the original document. Both versions (the original and the back-translated documents) were then compared for accuracy. Any questionable items are identified and again blindly back translated into the original language by another bilingual translator. This process is repeated multiple times until the meaning of the translated document is mutually agreed to be equivalent and unambiguous. The original forward and back translation of this thesis' questionnaire proved adequate and is detailed within Section 4.3.2.1.

3.2.4 Multiple scales, with variant choice-point ranges and response styles.

The practice of using multiple scales with variant choice-point ranges within a single study has been shown to be another likely source of bias. Whilst McHorney's (1993) principal components analysis of the SF-36 scales gave support for a multidimensional approach to testing health related QOL, his next report highlights problems associated with the use of multiple scales employing differing choice-point ranges within single studies (McHorney, War, Lu, & Sherbourne, 1994). Within this study, he demonstrates dissimilar response patterns between groups using scales with variant labelling and distances between choice-points on eight scales amongst the elderly, poorly educated, and those in poverty.

The finding of dissimilar response patterns for people affected by poverty found by McHorney et al. (1994) is relevant to collecting data from individuals affected by leprosy using Likert scales in India and Nepal. Leprosy is a mycobacterial disease associated with poverty and malnutrition. These environmental mediators result in the immunosuppression of genetically susceptible individuals to active disease (Britton & Lockwood, 2004). Therefore, it is highly probable that the current project's data will include responses from people impacted by poverty, specifically, participants who are malnourished and illiterate. Therefore, in light of McHorney's 1994 study, the assumption that the psychological values of each choice point on a 5 or 7-point scale are identical for this group cannot be supported, and is, according to Cummins, "almost certainly false" (Cummins, 2002, p. 2).

3.2.4.1 Response styles.

In addition to variant ascribed values on Likert scales by people affected by poverty, cultural dissimilarities in *response style* may also confound equivalence.

Response style is the tendency for people to systematically distort the direction of their responding, independent of an item's specific content (Lanyon & Goodstein, 1997). Hui (1989) suggested two explanatory perspectives relating to systematic response distortions. The first is a cultural perspective where cultural norms impact responding. Researchers refer to this phenomenon as *cultural response bias* (CRB; Chen, Lee, & Stevenson, 1995; Lai, Cummins, & Lau, 2013; Lau et al., 2008). For example, it is reported that Asian cultures value modesty and typically tend to select options toward the middle of a scale, avoiding extremes (Zax & Takahashi, 1967).

In 1984, an argument for the cultural influence on response style appeared in a study of 1,647 business managers from nine countries. The study reported that graduates from the Association of Southeast Asian Nations (ASEAN) chose the midpoint of the *semantic differential scale,* a 54-item questionnaire translated into each respondent's own language using a 7-point Likert scale, more often than their British or American peers (Stening & Everett, 1984). Subsequent replication by Chen (1995) and Lee (2002) showed the tendency for Asian participants to prefer mid-point selections when recording personal feelings onto a Likert scale, compared to their Western counterparts. In addition, Lau (2005) demonstrated that Asian participants produced normative ranges of domain scores, derived from the Personal Wellbeing Index (PWI), for individuals and groups that were on average 10 percentage points lower than Western samples. These findings support the argument for the existence of a cultural response bias, particularly within Asian nations.

The second source for response bias suggested by Hui (1989) was not the impact of cultural norms, but psychological mechanisms employed by individuals within any culture when responding to questions using Likert scales. In order to explain these psychological mechanisms, Hui distinguished between an individual's *subjective* *categories* of judgment and the *response categories* provided by researchers in the form of a Likert scale.

Hui theorizes that individuals use their subjective categories for organizing and interpreting incoming information. Examples of these subjective categories include "I love it," "I hate it," and "This is good." By contrast, response categories are those categories supplied to participants by researchers. In the case of a 3-point scale, those conducting the research supply three possible response categories. The subsequent task for respondents is to map their subjective categories onto the response categories. Participants accomplish this task with varying degrees of ease depending on their ability to contract or stretch their subjective categories to fit (Hui & Triandis, 1989).

What determines the success or failure for individuals to manipulate their subjective categories may depend on such things as academic ability, affording some individuals an advantage over others for the task. Some evidence for this possible explanation was found by Watkins (1995) who reported significant Country X Gender differences in response styles to items on a questionnaire, known as the SDQ-1, designed to assess three areas of academic and non-academic self-esteem. Hui suggests that if a certain individual cannot manipulate their subjective categories to match the response categories, and if the individual has a greater number of intense subjective categories clustered in a certain direction, they may map several subjective categories onto extreme response categories "resulting in frequent checking at the endpoints of the rating scale." (Hui & Triandis, 1989, p. 298).

Importantly, if the scenario suggested by Hui is accurate, a 10-point scale would provide a finer graduation between selections and a greater number of potential response categories. The finer graduation between selections on a 10-point scale effectually simplifies the response task for participants by reducing the cognitive load required to manipulate subjective categories to fit a reduced number of choice options when responding on a smaller 5-point scale.

3.2.4.2 Advantages of a 10-point response scale.

Hui (1989) reported that use of a 10-point response scale, when compared to a 5-point Likert scale, reduced the extreme checking tendencies of Hispanic respondents compared to non-Hispanic participants. The study explored responses from employees about their work supervisors. Though the study did not explore satisfaction with life as a whole, it did investigate subjective response categories in relation to variant response scales. Therefore, the findings are pertinent to the current project's preferred use of a 0 – 10-point scale. Whilst the analysis of variance revealed main effects of both culture and scale format on extreme responding, the interaction effect was significant ($F = 7.71$) between these two indicator variables ($p < .01$). Interpreting these findings, Hui noted that the cultural difference in extreme responding observed between Hispanic and non-Hispanic participants was dependent on whether respondents used the 5-point scale or the 10-point scale. In this case, the greater frequency of extreme answers given by Hispanic participants compared to non-Hispanic participants occurred with the use of the 5-point Likert scales and not the 10-point scale. Therefore, Hui concludes that differences in extreme responding were not due to cultural norms alone (Hui & Triandis, 1989, p. 296). According to Hui, individual differences in how judgments are mapped onto 5 and 10-point rating scales provided a better explanation for the greater likelihood for extreme responding from the Hispanic group.

Hui (1989) appears convinced that the extreme ratings from the Hispanic group is a function of choice-point range. "Hispanics made more extreme ratings than non-Hispanics. This discrepancy occurred only when a 5-point scale was used." (Hui &

Triandis, 1989, p. 303). Though Hui reported end-point selection as a percentage of the total use of either endpoint, this is misleading. The difference between Hispanic and non-Hispanic endpoint selection as a function of choice-point range only holds for the zero selection of each scale. It is correct that when Hui compared the upper ends of each scale, he found no significant differences in choice-point checking between Hispanics and non-Hispanics as a function of scale range on the 10-point scale. However, there were no differences between Hispanics and non-Hispanics checking the zero as a function of scale range. From Hui's (1989) findings, it appears that cultural differences evaporate only when the upper checkpoint on the 5-point and 10-point scales are compared.

3.2.4.3 A preferred 11-point scale.

These findings from Hui (1989) demonstrate the advantages to data quality as a result of using a larger choice-point range and support the transformation of the variant Likert scales associated with the psychometric measures into an 11-point end defined scale for use within India and Nepal (Bendig, 1953; Benson, 1971; Boot, 1981; Cummins & Gullone, 2000).

The advantages of using an 11-point end-defined scale over Likert scales in SWB research are discussed in a study by Cummins and Gullone (2000). These researchers argue that Likert scales commonly used to measure outcomes are not sensitive enough to reflect personal levels of discriminant capacity. Therefore, as argued by the authors, it is counter intuitive to restrict the range of choices presented to respondents who are capable of discriminating more choices than is commonly presented.

Cummins and Gullone, unlike Hui, present no cognitive explanation for the observations associated with discriminant capacity of respondents, however, the point remains prominent. Interestingly, Cummins and Gullone also point to the skewed nature of SWB data. Interpreting the relevance of this observation to scale size, Cummins suggests that there is effectually a reduction of likely choice-points available for selection and, as a result, this diminished range further reduces item sensitivity. Therefore, expanding the number of choice points beyond the commonly used 5 or 7-points increases scale sensitivity.

Finally, Cummins and Gullone argue against the use of categorical naming associated with Likert scales in favor of end-defined numeric scales. Whilst Andrews and Withey (1976) endorsed Likert's suggestion to name each choice category, Cummins and Gullone disagree. The premise for their alternate preference for an end-defined numeric scale over Likert's categorical naming is the likelihood of unequal psychometric distances existing between categories. They state in emphatic terms that "The clear implication is that these categorical names exhibit the same internal scaling as the printed scale and numbers suggest. This, however, is wrong, sometimes very wrong, and the data demonstrating this have been available for a considerable period of time" (Cummins & Gullone, 2000, p. 80).

3.3 Measurement Invariance

Once known sources of bias are identified and methods to quarantine these are enacted, researchers can defend observations regarding between-group differences by demonstrating Measurement Invariance (MI) using analytic strategies such as Confirmatory Factor Analysis (CFA, described in detail in Section 5.3.4.1). MI provides proof that methodological influences were not the origin of group distinctions. By taking time during the investigative process to conduct these analyses, investigators confirm that respondents in each group ascribed identical meanings to the focal constructs. This evaluation also verifies that the comparison of sample estimates reflects differences between the various groups sampled.

Demonstrating common understandings concerning latent constructs and their measurement items on questionnaires are central to evaluating similarities and differences between groups. These priorities are especially relevant when studying groups that do not share the original language of the measurement instrument (Jovanovic & Brdar, 2018). Unfortunately, despite a small number of indigenous exceptions (Bense, Das, Rao, & John, 2013; Raju, Rao, & Mutatkar, 2014; Stevelink, Terwee, Banstola, & van Brakel, 2013; Stevelink & van Brakel, 2013; Van Brakel et al., 2006), SWB questionnaires used within India and Nepal originate from Western contexts with negligible procedures that test measurement invariance (Gregorich, 2006; Little, 1997). Therefore, the compulsory assumption for investigating between-group mean differences between Australian, Indian and Nepali SWB metrics is that the measurement and structure of each examined construct demonstrate equivalence (Bejar, 1980; Drasgow & Kanfer, 1985).

Unfortunately, the literature review revealed that a substantial amount of cross-cultural SWB reporting failed to address this central concern. A cursory reading of the methods section of SWB studies reveals that most include a description of the instruments used to collect data and fewer outlined their translation procedure. Further, they all report how these data were analysed and include a results section and the obligatory discussion of results. However, rarely do they contain methods to establish evidence for measurement invariance before researchers move from the results to draw inferences.

Three examples serve to highlight the above observation by way of introducing the need for establishing measurement invariance. Firstly, a recent systematic review of alternative forms of Participation Scales reported that "Our findings showed that the cultural equivalence of the included participation instruments has generally not been tested adequately" (Stevelink & van Brakel, 2013, p. 1264). Participation Scales are widely used in cross-cultural Quality of Life (QOL) studies, especially within India and Nepal, amongst people affected by disability and leprosy. The Participation Scale is the most popular of all options, of which there are five commonly employed alternatives (P-scale; Stevelink & van Brakel, 2013). The six Participation Scales are (a) the Impact on Participation and Autonomy (IPA), (b) the London Handicap Scale (LHS), (c) the Perceived Impact Problem Profile (PIPP), (d) the Craig Handicap Assessment, (e) the Reporting Technique (CHART), and (f) the Participation Scale (P-scale; Stevelink & van Brakel, 2013).

Researchers simultaneously developed the P-scale in six languages within India, Nepal, and Brazil. This instrument is available in a self-report or interview format and measures 18 items over nine domains of participation. These domains include learning and applying knowledge, communication, domestic life, interpersonal interactions and relationships, mobility, community, social and civic life and self-care. Therefore, questions such as "Do you contribute to the household economically in a similar way to your peers?" are scored by two response formats. Firstly, participants select either "Yes," "Sometimes," "No," or "Irrelevant." The "Yes" and "Irrelevant" responses are pre-scored with a "0." If respondents indicate either "Sometimes" or "No," they are further asked "If Sometimes or No, how big a problem is it to you?" People then select either "No problem," "Small," Medium," or "Large." Each of these possible responses are pre-scored as 1, 2, 3, and 5 respectively. Researchers then sum these later scores to give a final participation score, which are compared to a table of "Grades of participation restriction," where 0-12 equals "No significant restriction," 13-22 is equivalent to "Mild restriction," 23-32 is "Moderate restriction," 33-52 equals "Severe restriction," and 53-90, "Extreme restriction."

Investigators have subsequently translated and administered the P-Scale in a further 18 languages, most of which were non-Western. Stevelink's (2013) systematic review found only one of these prior studies validated the measure (van der Zee et al., 2010). In this case, researchers did not test for measurement invariance across groups. Instead, they focused on successfully demonstrating reproducibility via Test-retest reliability over a 2-week period in a university hospital in the Netherlands.

By way of a second example, Diener's (1995) omission of between-group measurement invariance testing diminishes the force of conclusions. In this case, Diener investigated cross-cultural comparisons of correlates of Life Satisfaction and Self-esteem. He surveyed 13,118 people from 31 nations who completed a questionnaire rating their satisfaction with 12 life domains on a scale from 1 ("*terrible*") to 7 ("*delightful*"). In addition to these domains, Diener included a single "Satisfaction with life-as-a-whole" item using the same 1 – 7 response scale. According to the report, researchers translated the instrument from English into the native language of 19 countries then administered it to single gatherings of large groups in each context.

Despite reporting relationships between self-esteem and life satisfaction, the paper provides an example of the sort of methodological praxes that regularly appear in cross-cultural studies on SWB. Diener, like many others, provided no details regarding the translation method and did not mention the use of any procedures designed to protect these data from the introduction of bias. This later point is particularly relevant given those large groups of people completing the survey in proximity with each other. Under these conditions, data contamination is likely. Finally, Diener's study does not establish psychometric equivalence of the measurement instruments used amongst these culturally diverse groups. These absent but essential analytical components render conclusions concerning group differences equivocal (Lonner, Keith, & Matsumoto, 2019).

One final example from an article published in Applied Research in Quality of Life by Kapuria (2014) suffices to make the case for the advantages afforded by a stringent methodological approach in cross-cultural contexts. In this instance, the author, investigating wellbeing in Delhi, describes Quality of Life (QOL) as a complex construct, and her sample as a "heterogeneous mix of … diverse social, cultural, ethnic, and linguistic backgrounds" participating in the study (Kapuria, 2014, p. 126). Unfortunately, her research design, intended to respond to the complexities associated with QOL and the diverse sample, prospectively manufactured greater levels of confusion.

In assessing the QOL of 330 households consisting of 1,267 individual people in Delhi, Kapuria (2014) used an unidentified survey constructed to measure a "plurality of well-being dimensions" (Kapuria, 2014, p. 125). Specifically, 70 QOL variables were measured by the questionnaire. The report does not include the content or how the survey was constructed or whether it was translated into different languages. Neither does the report contain details regarding the methodology employed in its administration. Despite the linguistically diverse population that also would have certainly included non-literate people, and the "difficult and complex" latent construct, it appears that researchers gave no consideration to protecting these data from the potential introduction of method bias.

3.4 Discussion

There is a growing number of subjective wellbeing (SWB) researchers realising data gathered cross-culturally are almost certainly contaminated by group-specific attributes (Cummins, 2018; Gregorich, 2006). Despite this growing awareness, the current chapter's literature review, assessing the data-gathering practices within India and Nepal, unearthed no utilised method for protecting data from bias during collection. Further, no raw data cleaning practices checking for aberrant values were located. Finally, apart from Singh, Ruch, and Junnarkar (2015) employing a confirmatory factor analysis (CFA) to validate the psychometric properties of a Hindi translated version of the Personal Wellbeing Index (PWI), no other inclusion of valid analytic strategies assessing the infiltration of bias were identified. Although, regarding Singh, Ruch, and Junnarkar (2015), these authors did not establish measurement invariance using techniques such as multi-group CFA. As a result, comparative cultural inferences such as their claim that Australian and Indian data support similar domain contributions to SWB, are not valid.

It seems the growing concern over the influence of strong cultural forces on data is warranted. The current chapter highlights the vulnerability of data to bias when it is collected in places like India and Nepal using Western self-report instruments such as the PWI and Rosenberg Self Esteem Scale. Potential sources of cross-cultural bias discussed include social desirability, acquiescence, a scale's response format, the content and translation of scale items, and the presence of non-indigenous researchers during participant responding. Moreover, concern was also raised within the chapter that collecting data within countries such as India and Nepal likely expose them to additional bias from low rates of literacy and numeracy. The latter catalysed the apprehension that respondents with no numeric capabilities may not be able to represent their subjective feelings onto an 11-point response scale.

In response to these manifold sources of cross-cultural bias, and, to prepare for collecting data within India and Nepal, assembling methods designed to build resistance to bias is a necessary first step. To this end, an earlier chapter's discussion around SWB homeostasis and threats caused by intellectual disability becomes highly relevant. In particular, a version of the PWI used for people with an intellectual disability (PWI-ID) was unearthed that contains important protocols protecting data from bias, that may also be effective cross-culturally (Cummins & Lau, 2005). Within this parallel version of the PWI, Cummins and Lau (2005) integrated modifications designed to reduce the introduction of measurement bias and therefore, enhance the validity and reliability of collected data.

These alterations include swapping the word "satisfaction" for a more easily understood proxy, "happy." In addition, the number of response choices are reduced from the 11-point scale to include a 5, 3 or 2 choice option, and includes a version consisting of five outlined face pictures from sad to very happy (each, with a corresponding numeric value). Finally, a pre-testing protocol is described to assess scale competencies and acquiescent tendencies (see Section 2.5.1 or Cummins and Lau (2005) for a detailed description and justifications).

These protective measures are expected to limit bias from Indian and Nepali respondents and will, therefore, inform and influence the production of a composite SWB questionnaire that includes the word "happy," instead of "satisfaction," tests for scale competencies and acquiescent responding, and, an additional facial-scale for Indian and Nepali participants with no numeric competencies. Finally, strategies will be constructed that, where possible, remove the proximity of the researcher from the respondent to avoid introducing biases from contributing factors such as social desirability.

In addition to constructing a study with careful design features to resist introducing cross-cultural sources of bias into data, analytic strategies to identify bias within these data will also be employed. Employing analytic approaches to identify bias after data are collected are vital because many scales to be used within India and Nepal contain multiple items. Therefore, their observed mean scores constitute the primary comparative, cross-cultural statistic. Accordingly, Cummins (2018) explains that the validity of comparisons are premised on the assumption that people from each culture are responding to scale items identically.

Therefore, in view of the many possible entry-points for contamination of data collected cross-culturally, measurement invariance testing is invoked. The details regarding this analytic method are meticulously explained in Section 6.3.4, suffice to say, that a multi-group CFA constitutes a statistical method allowing researchers to determine whether, "and to what extent, the latent construct measured by each factor is validly represented by the observed factor mean scores" (Cummins, 2018, p. 38). If a multi-group CFA determines the latent construct validly represents the observed factorial mean scores, and, respondents across groups are responding to items identically, data are described as demonstrating measurement invariance (Byrne, 2010). Only under these conditions, are between-country comparisons validly made.

In summary, this chapter found little evidence for the systematic use of either preventative strategies designed to resist the introduction of cross-cultural bias into data nor analytic strategies to establish measurement invariance between data from Australia, India and Nepal. In response, the next chapter creates a composite questionnaire for use within India and Nepal that adopts features from the PWI-ID to resist bias, along with methods to avoid undue contact with researchers during participant responding. After the development of these strategies, a pilot study is conducted to test the effectiveness of these planned inclusions. Following this, all gathered data are subjected to a multi-group CFA to establish if data are invariant before drawing between-country inferences.

Chapter 4: Study 1

4.1 Introduction and Aims

In response to the likely inclusion of bias to data collected cross-culturally, the previous chapter identified the need to establish both strategies designed to minimise bias and establish measurement invariance (MI) before researchers can validly draw cross-cultural comparisons. Bias is introduced to data when variations in responses are produced by such things as a poorly translated scale whereby people misunderstand the intended question, or from cultural response tendencies that systematically influence how people rate their feelings. The result is a data set containing bias and the actual feelings of participants (Lai et al., 2013). Literature is replete with studies ignoring the almost certain inclusion of bias and cross-cultural inferences whereby researchers did not first establish the invariance of their scales (Jovanovic & Brdar, 2018). Without establishing MI, these findings are questionable. Therefore, in anticipation of bias occurring between Australian, Indian and Nepali participants, the current study designs and tests strategies to limit its introduction before Chapter 5 establishes each scales measurement invariance.

The strategies designed to reduce bias include the following:

1. A rigorous translation process outlined in Section 5.3.2.1.

2. Questions within the composite questionnaire employing facial emoticons designed to identify acquiescent responding, defined by Hinz, Michalski, Schwarz, and Herzberg (2007) as the tendency is to provide "yes" or "true" answers to questions, regardless of the content of the question being asked.

3. A detailed procedure to limit the influence of the researcher's proximity during data collection.

4. A series of questions designed to test the participant's comprehension of the response scale.

5. The use of a facial scale aimed to replace a numeric 0-10 end-defined response scale. This later precaution was developed in response to the low adult literacy and numeracy rates reported by Unicef (2015), which raised doubts regarding the ability of participants to project their SWB perspectives onto a numeric scale, and the reported success of a facial scale previously used within India (Biswas-Diener & Diener, 2001).

These five tactics designed to reduce the impact of bias on data collected from within India and Nepal are now examined.

4.2 Participants

4.2.1 India.

Ethics approval was obtained from Deakin University Human Research Ethics Committee, the Consulate General of India, the Indian Leprosy Mission Trust, the Shadarah Community Hospital in Delhi, and The Leprosy Mission Hospital Muzaffarpur. After approval and on arrival at the Shadarah Community Hospital in Delhi, two groups, consisting each of 10 bi-lingual individuals volunteered to join a pilot study. Researchers conducted the pilot study to invite feedback on the strategies designed to limit the introduction of cross-cultural bias, the accuracy of the translation and comprehension of the numeric and facial response scales. Participants were the social science and medical researchers, physiotherapists, a psychologist, members of the hospital's nursing and surgical staff, and community development officers employed at the Hospital. Researchers gave participants a plain language statement outlining their obligations, a procedure for answering the questionnaire that included their right to withdraw at any time, and a list containing support mechanisms should anyone become distressed. The first group of 10 then completed the survey containing the numeric scale, while the second took the survey utilising the facial response scale.

4.3 Method

4.3.1 Measures.

4.3.1.1 Global Life Satisfaction.

Global Life Satisfaction (GLS) characterizes an abstract rating of life satisfaction (International Wellbeing Group, 2013). GLS is measured by the single question, “how satisfied are you with your life-as-a-whole?” A response to this question is made on an 11-point end-defined unipolar scale anchored by 0 (“no satisfaction at all”) to 10 (“completely satisfied”). The GLS score is an approximation of SWB and results are recoded onto a standard 0 –100-point distribution as suggested by the PWI-A manual (International Wellbeing Group, 2013).

Research has demonstrated this GLS single-item measure is reliable (Larsen, Diener & Emmons, 1985), moderately stable and sensitive to variant life circumstances (Diener & Arora, 2009). In addition, the measure is stable in Western and non-Western contexts and sensitive to changes in respondent life circumstances (Lai et al., 2013).

However, despite the GLS question having good face-validity, asking the question twice in an interview produces variable responses with correlations of .70. In addition, over a 7-day period, test-retest reliability falls to .60 (Cummins & Weinberg, 2015). Therefore, whilst the GLS questions produces an approximation of SWB it is not as reliable as multi-item measures such as the Personal Wellbeing Index (International Wellbeing Group, 2013).

4.3.1.2 The Personal Wellbeing Index.

The International Wellbeing Group (2013) describe Personal Wellbeing Index (PWI) as a measure of the subjective experiences of wellbeing in accordance with homeostasis theory. The measure contains seven items of satisfaction that relate to different areas of quality of life domains. These domains are: standard of living, health, achieving in life, personal relationships, safety, community connectedness, and future security. Participants who respond to all seven domains have their scores averaged and converted to a percentage point scale from zero to 100. The PWI is available from The Australian Centre on Quality of Life's website http://www.acqol.com.au/ in formats designed to measure personal wellbeing levels of adults (PWI-A), school children (PWI-SC) and intellectually disabled (PWI-ID) populations. The PWI-A is utilised for collecting data for the current study.

Whilst an additional PWI-A domain, satisfaction with spirituality/religion meets criteria for inclusion (Tomyn & Cummins, 2011; Wills, 2009), the current PWI-A manual suggests spirituality as optional arguing this domain is not relevant for the majority of Australians (International Wellbeing Group, 2013). Therefore, the PWI-A employed by the current study to gather data from residents within Australia did not include an item tapping the spirituality domain. By contrast, the salience of spirituality within India and Nepal warranted its inclusion.

Finally, the PWI-A has sound psychometric properties. For example, PWI-A mean scores averaged across 32 Australian surveys conducted over the last 16 years, from March 2002 to April 2017, reveal a narrow range of 74.2 to 76.8 percentage points and a grand mean of 75.5 (The Australian Centre on Quality of Life, 2017). To compute this normative range, researchers first calculate a grand mean (M) and standard deviation (SD), using the mean scores as data, from each of the 32 previous surveys. From this grand mean, 2SD's are subtracted to establish the lower bound. The upper bound is calculated by adding 2SD's to the grand mean.

Further psychometric properties include a Cronbach's alpha for data collected by the PWI-A from Australian samples between .71 and .85, along with moderate inter-domain correlations at 0.30 to 0.55, and item-total correlations of at least 0.50 (Cummins, Woerner, Tomyn, Gibson, & Knapp, 2006). Lastly, the PWI-A's test-retest reliability over a one to two-week period has demonstrated an intra-class correlation coefficient of .84 (Cummins & Lau, 2005).

4.3.1.3 Depression, Anxiety and Stress Scale (DASS-21D).

The shortened version of the Depression, Anxiety and Stress Scale (DASS-21, Lovibond & Lovibond, 1993) assesses symptoms of depression, anxiety, and stress over the past week. Participants rate their level of agreement with the 21 items on the same 11-point end defined scale utilized throughout this study. The 21 items are divided into three groups tapping symptomology related to depression, anxiety and stress.

The seven depression items are:

1. I couldn't seem to experience any positive feels at all.
2. I found it difficult to work up the initiative to do things.
3. I felt I had nothing to look forward to.
4. I felt down-hearted and blue.
5. I was unable to become enthusiastic about anything.
6. I felt I was not worth much as a person.

7. I felt that life was meaningless.

The seven anxiety items are:

1. I was aware of dryness of my mouth.
2. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion).
3. I experienced trembling (e.g. in the hands).
4. I was worried about situations in which I might panic and make a fool of myself.
5. I felt I was close to panic.
6. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat).
7. I felt scared without any good reason.

The seven stress items are:

1. I found it hard to wind down.
2. I tended to over-react to situations.
3. I felt that I was using a lot of nervous energy.
4. I found myself getting agitated.
5. I found it difficult to relax.
6. I was intolerant of anything that kept me from getting on with what I was doing.
7. I felt that I was rather touchy.

The DASS-21 demonstrates good internal consistencies with Cronbach's alpha coefficients of .91, .84, and .90 for the DASS-21 respectively (Lovibond & Lovibond, 1995). Furthermore, factor analysis and structural equation modelling have replicated the three scales that consistently account for up to 60% of the variance in a three-factor solution (Bittar, 2009). For the purposes of the current study, only the depression subscale is employed, referred to hereafter as the DASS-7D.

4.3.1.4 Rosenberg Self-esteem Scale.

The most widely employed instrument for measuring self-esteem is Rosenberg's Self-Esteem Scale (RSES, Rosenberg, 1965). It is favoured because of its brevity, manifold translations, invariance across cultures (Schmitt & Allik, 2005), and its transparent one-dimensional factor (Corwyn, 2000). The questionnaire asks people, regarding their current feelings, to indicate their level of agreement (measured on a 4-point scale, "strongly agree;" "agree;" "disagree;" and "strongly disagree") with the following 10 statements:

1. On the whole, I am satisfied with myself.
2. At times I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel I am a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude towards myself.

A self-esteem score is obtained by summing the five positively worded items and five negatively worded items (reverse scored). High scores indicate robust levels of self-esteem. The measure has sound psychometric properties with test-retest correlations ranging between .82 to .88 and a Cronbach's alpha reported at .86 (Mellor et al., 2008).

However, as discussed in Section 4.6 of this thesis, Song et al. (2011) and Chao et al. (2016) report differential item functioning for the negatively worded items between Western and cross-cultural contexts. This differential functioning is suggestive of the increased cognition required in responding to negatively worded questions on an agree-disagree scale. In addition, method effects associated with the negatively worded items of the RSES impact the construct validity by consistently producing a bi-factorial structure. As a result, researchers such as Quilty et al. (2006) recommend employing only the five positively worded questions, “as the advantages of including both positively and negatively worded items seem to be offset by these methodological issues” (p. 114). Therefore, the current thesis retains the following items for use within Australia, India and Nepal:

1. On the whole, I am satisfied with myself.
2. I feel that I have a number of good qualities.
3. I am able to do things as well as most other people.
4. I feel I am a person of worth, at least on an equal plane with others.
5. I take a positive attitude towards myself.

Finally, to match the scale formats of the other instruments delivered via the composite questionnaire to all participants, respondents are asked to assess their current feelings by rating their level of agreement with the five items on the same 11-point end defined scale.

4.3.1.5 Revised Life Orientation Test.

The Life Orientation Test (LOT) was first developed by Scheier and Carver (1985) to measure individual differences in perceived good versus bad outcomes in life. The measure consists of eight items assessing optimistic versus pessimistic outcomes and four filler items listed below.

1. In uncertain times, I usually expect the best.
2. It's easy for me to relax.

3. If something can go wrong for me, it will.
4. I always look on the bright side of things.
5. I'm always optimistic about my future.
6. I enjoy my friends a lot.
7. It's important for me to keep busy.
8. I hardly ever expect things to go my way.
9. Things never work out the way I want them to.
10. I don't get upset too easily.
11. I'm a believer in the idea that "every cloud has a silver lining."
12. I rarely count on good things happening to me.

Positive expectations are assessed by the positively worded statements and negative outcomes by the four negatively worded statements. Participants respond on a 5-point scale ranging from 0 (strongly disagree) to 4 (strongly agree). Researchers reverse-score negatively worded items, and the total yields an overall optimism score. However, critiques such as those by Mook, Chr, and Ploeg (1992) reported the instrument consistently returning a two-factor structure whereby the positively worded questions were loading onto the first factor and negatively worded questions loading onto the second. The conclusion of Mook et al. (1992) that the LOT measures two independent constructs, optimism and pessimism was based on the emergence of two factors with a weak correlation of .31. In response, Scheier et al. (1994) revised the LOT (LOT-R), removing questions 4, 9 and 11 and adding "Overall, I expect more good things to happen to me than bad" for reasons outlined in Section 2.5.2.1 of the current thesis.

Further analysis of the LOT-R by Maher and Cummins (2001) suggested the filler items, designed to highlight response sets, add unnecessary length to questionnaires and response sets are easily identified during data cleaning, which researchers remove before analyses. Further, Scheier and Carver (1985) designed the LOT-R as a measure of optimism, the negatively worded statements assessing pessimism are redundant. Therefore, following Maher and Cummins (2001), only the three positively worded statements are retained to measure optimism throughout the current thesis. These statements are:

1. In uncertain times, I usually expect the best.
2. I'm always optimistic about my future.
3. Overall, I expect more good things to happen to me than bad.

4.3.1.6 Perceived Control Scale.

Perceived control is the extent to which individuals feel they are in control of their lives. This construct was measured within the 23rd Australian Unity Wellbeing survey using a revised version of the 7-item mastery scale, originally constructed by Pearlin and Schooler (1978). These seven original items (statements) are as follows:

1. I have little control over the things that happen to me.
2. There is really no way I can solve some of the problems I have.
3. There is little I can do to change many of the important things in my life.
4. I often feel helpless in dealing with the problems of life.
5. Sometimes I feel that I'm being pushed around in life.
6. What happens to me in the future mostly depends on me.
7. I can do just about anything I really set my mind to do.

The revised version of Perlin and Schooler's scale (1978), employed within the 23rd Australian Unity Wellbeing survey, contains five of the original seven statements (See Section 2.4.3 outlining a justification for reducing scale items), listed as follows:

1. I have little control over the things that happen to me.
2. There is really no way I can solve some of the problems I have.
3. There is little I can do to change many of the important things in my life.
4. I often feel helpless in dealing with the problems of life.
5. Sometimes I feel that I'm being pushed around in life.

Participants are asked, “How much do these statements apply to you in general.” They rate their level of agreement on an 11-point scale ranging from 0 (“Not at all”) to 10 (“Extremely”).

Most Australian Unity Wellbeing Index surveys conducted before and after the 23rd edition, similarly, purport to measure perceived control. However, all editions measuring control, except the 23rd edition, measure two constructs centred on an individual’s preferred locus of control (for a full explanation regarding how perceived control is defined within SWB homeostasis theory, see Section 2.4.3). First, an external locus of control, attributes control over life events to environmental factors (*primary control*). The second, an internal locus of control, attributes control to internal states in order to minimise psychological impacts (*secondary contro*l, Cummins & Lau, 2004).

Statements within the Australian Unity Wellbeing Index pertaining to primary and secondary control strategies are derived from Heeps (2000) and based upon theory originating from Rothbaum et al. (1982). Questions of control begin with the statement "When something bad happens to me," followed by items such as "I ask others for help or advice" (primary control) and "I remind myself something good may come of it" (secondary control). Participants denote their level of agreement on an 11-point scale ranging from 0 (“strongly disagree”) to 10 (“strongly agree”).

However, when perceived control is operationalised as either primary or secondary control, the extent to which an individual feels they are in control of their life, is not tapped. Rather, the preferred strategies by which people develop a sense of control is measured.

Thus, to measure perceived control, the 23rd Australian Unity Wellbeing survey employed the revised version of Perlin and Schooler's scale (1978).

In addition, for reasons outlined in Section 2.4.1, the scale used by the 23rd edition of the Australian Unity Wellbeing Index, is simplified by rewording negative statements to read as positive affirmations. These are:

1. I am in control of my life.
2. I can change the important things in my life.
3. I feel I have control over the things that happen to me.
4. I feel I can solve the problems I have.
5. Nothing is stopping me doing the things I want to do.

To reflect these substantive changes, the original PPCS' name is changed hereafter to the Perceived Control Scale (PCS) and used within India and Nepal.

4.3.1.7 Homeostatically Protected Mood Scale.

Researchers theorise that the affective component of subjective wellbeing (SWB) is best described by a tri-cluster of terms that together form a construct referred to as homeostatically protected mood (HPMood, Cummins & Wooden, 2014). These terms are "happy," "content" and "alert" that together, explain 66% of the variance in SWB when assessed with linear methods (Blore et al., 2011), and 42.3% when assessed using a cosine wave analysis (Hartley-Clark, 2014).

To measure happy, content and alert, individuals are asked the following three questions and responses are made on an 11-point end defined scale ranging from 0 = "Not at all" and 10 = "Extremely."

1. "How happy do you generally feel?"
2. "How content do you generally feel?"
3. "How alert do you generally feel?"

The first two questions tap mood valance and the third, mood arousal. Researchers then average the three scores to calculate an individual's level of HPMood. A detailed discussion of HPMood, including measuring the construct is contained within Section 2.3.1 of the current thesis.

4.3.2 Procedure.

4.3.2.1 The questionnaire and its translation.

The questionnaire used in India and Nepal has several parts. The first contains two questions screening for acquiescence, followed by three questions testing scale comprehension and competency (see 4.3.2.3 below). Following this are three global questions measuring self-esteem, optimism and perceived control. These are: "How worthwhile do you feel?" How optimistic do you feel?" and "How much control do you feel you have over your life as a whole?"

The remaining questions are common to the questionnaire utilised within Australia, India and Nepal. These questions are as follows (see Appendix B for complete versions): Three items, which together examine HPMood ("How happy do you feel?" "How alert do you feel?" and "How content do you feel?"), a GLS question, the PWI-A, DASS-21, RSES, the Revised Life Orientation Test (RLOT; Scheier & Carver, 1985), the Personal Perceived Control Scale (PPCS; Lachman & Weaver, 1998) and a number of demographic questions such as gender, age, employment and married status.

The composite questionnaire was translated into Hindi and Nepali using Brislin's (1970, 1986) model. This translation process involves two bilingual people independently translating the questionnaire. The first person translates the English version into Hindi/Nepali; then, the second translator translates the Hindi/Nepali version back into English. After this procedure, referred to as *Back-Translation* (Brislin, 1970), researchers compare the original with returned English or Hindi/Nepali translations. In this case, both returned English translations were identical to the English original. However, in the translation from English to Hindi, the translator added male and female linguistically equivalent forms of some individual questions (see attached Hindi questionnaire in Appendix B). The translators and researchers agreed to preserve both gender forms for the final Hindi version, as this aided comprehension for Indian readers and therefore, retained these modifications.

4.3.2.2 Questionnaire response scale for numerically non-literate responders.

An 11-point end-defined response scale is preferred based on previous research by Cummins and Gullone (2000). These authors found increasing the number of choice-points beyond either five or seven did not reduce scale reliability and enhanced scale sensitivity. These findings support their contention that Likert-type scales are not sufficiently sensitive to SWB constructs such as satisfaction with life-as-a-whole. The conclusion by Cummins and Gullone (2000) is the employment of an 11-point end-defined scale from zero to 10 for gathering SWB data is preferential. Therefore, this range is utilized throughout this thesis as it is commonly understood in Australian, Indian, and Nepali contexts and therefore easily adopted as a rating system shown to decrease categorical naming, increase sensitivity, and is a catalyst for higher response discrimination (Cummins & Gullone, 2000).

However, in anticipation of numerically non-literate participants within India and Nepal, a facial ordering App was constructed at Deakin University. Due to the remote areas used to collect data, this App was designed for use on an Apple iPad independent of an internet connection and was uploaded onto the researchers IPad prior to departure. Anyone wanting to view the App can do so at:

https://www.deakin.edu.au/apps/psychology/EMHU/HAPPY%20PROJECT/happy.html

This App was designed for use on an Apple iPad. The App was devised to replace the 11-point end-defined unipolar scale anchored by 0 ("no satisfaction at all") to 10 ("completely satisfied"). For participants unfamiliar with a numeric scale, responses to SWB questions are made using 11 facial pictures, known as emoticons, anchored from "no happiness at all" to "completely happy."

The App's facial emoticons were chosen due to their universal use by mobile phones and cyber communications to pictorially describe facial expressions representing an individual's feelings. Despite challenging economic life-settings within India and Nepal, there are 1,156,867,852 mobile users within India, representing 88% of the total population (Mishra, 2018) and Nepal's mobile use currently outstrips its population at 105.15% (Nepal Telecommunications Authority, 2018). Therefore, it is expected that people within these countries either regularly use emoticons to communicate mood or are at least familiar with their form and purpose.

Further, unlike the numeric scale, the facial response scale uses pictorial representations of happiness rather than the word "satisfaction." While these two constructs are not equivalent, they yield similar data and are recommended and employed by the school children's version of the PWI (PWI-SC, Cummins & Lau, 2005). Therefore, the researcher substitutes the word satisfaction with happy for the GLS question and each PWI-A question. Finally, it was expected that the agree-disagree response scale associated with the DASS-21 and RSES rendered the facial response scale moot. Therefore, these data would not be collected from numerically non-literate participants within India and Nepal.

4.3.2.3 Testing participant competencies.

To ascertain whether respondents could perform tasks associated with the questionnaire, researchers in India and Nepal employed the following pre-test protocols.

Acquiescent responding

First, to test for acquiescent responding, the researcher showed two emoticons (see Figure 2) printed in colour on page one of the questionnaires. The respondent was asked, "Do both of these faces look happy?" Participants then selected their response by marking "Yes" or "No" on the questionnaire with a pen provided by researchers.

क्या यह दोनों चेहरे खुश दिखते हैं?

(Do both these faces look happy?)

हाँ (Yes)

नहीं (No)

Figure 2: Facial test for acquiescence

If participants answered this question incorrectly ("No"), researchers terminated the testing, and they were removed from the study as it was likely they were responding in a manner independent of the question's content.

If the participant selected the correct response ("Yes"), researchers then revealed the unhappy face (Figure 3). The researcher then asked the respondent to indicate with the pen their response to the question, "Is this a happy face?"

क्या यह चेहरा एक खुश चेहरा है?

(Is this face a happy face?)

हाँ (Yes)

नहीं (No)

Figure 3: Facial test for acquiescence

If participants responded incorrectly ("Yes"), the researcher concluded testing, and they were removed from the study as the participant was prone to acquiescent responding. For participants answering these two questions correctly, researchers proceeded to test for numeric and scale competencies.

Numeric and scale competencies

For the remaining participants, to discover if they could use appropriately an 11-point end-defined scale from zero to 10 and had the cognitive capacity to characterise responses to SWB questions using the numeric scale, a two-stage test was employed. First, to test numeric competency, researchers asked participants to count from zero to 10. Second, for those who completed this task successfully, researchers gave three further questions and asked which number they would select on the numeric scale to determine scale comprehension. These questions were as follows:

1. If you felt completely satisfied, which number would you choose? (The expected response was 10).

2. If you felt no satisfaction at all, which number would you choose? [The expected response was zero].

3. If you felt just a little bit satisfied, which number would you choose? [The expected response was 6-8].

For participants demonstrating numeric proficiency and scale competency, researchers provided the composite survey for completion. This survey also included three comprehension questions to complete using the numeric scale concerning the agree/disagree statements associated with the DASS-21, RSES, RLOT and PPCS. These were:

1. "If you completely agreed with the statement, which number would you choose?"
2. "If you did not agree at all with the statement, which number would you choose?"

3. "If you agreed just a little, which number would you choose?"

Correct responses to the three comprehension questions were (10, zero and 6-8 respectively). If during data cleaning, participant responses fell outside these expected values, researchers removed the participant before further analyses of data.

Facial App and scale comprehension

As an alternative to the numeric scale for respondents unable to count from zero to 10, researchers revealed a random ordering of 11 facial expressions, referred to as emoticons, on an iPad (see Figure 4). The random ordering was programmed into the App's creation and is generated uniquely for each new participant. The emoticons were identical in all aspects except for manipulated eyes and smile to form 11 different expressions representative of equal graduation of happiness. The faces represented emotions from 0 ("No happiness at all") to 10 ("Completely happy"). Once the researcher disclosed the randomly arranged faces to the respondent, they asked the participant to order the faces, beginning by placing the least happy face on the far left and ending on the far right of the screen with the happiest face.

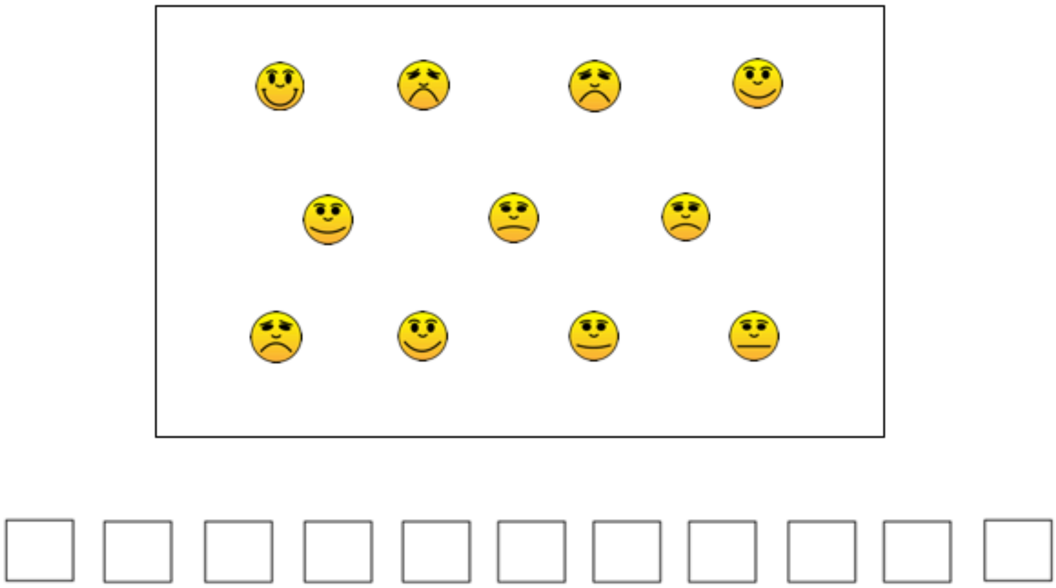


Figure 4: Emoticon ordering task for Apple iPad

To move the faces around the iPad screen, participants were shown how to select a face and, while providing constant pressure on the iPad's screen, drag the face into one of 11 blank boxes arranged in a horizontal row below. Respondents were asked to re-order the emoticons until confident they had arranged them in order from no happiness at all, to completely happy. This ordering task determined the participant's ability to conceptualise a scale ranging from least to most. If respondents completed the task successfully, they moved to the next phase of the pre-test. Researchers removed from the study respondents unable to successfully complete this exercise.

For remaining participants using the facial scale, researchers gave a demonstration of the response procedure. The explanation included pointing to the face on the extreme left and explaining that if the desired response to a question were "no happiness at all," they would select this face. The researcher then pointed to the face on the extreme right and explained that if a participant's response was "completely happy'" this is the face they would select. Finally, the researcher pointed to the middle face within the scale and explained this face represents someone who is neither happy nor unhappy.

Following this introduction, the researcher presented participants with three questions designed to ascertain if they had the cognitive capacity to characterise responses to SWB questions using the facial scale. These questions were as follows:

1. If you felt completely happy, which face would you choose? (The expected response was the face located to the far right).

2. If you felt no happiness at all, which face would you choose? (The expected response was the face located on the far left of the scale).

3. If you felt just a little bit happy, which face would you choose? (The expected response was any face located to the right of the middle face, excluding the face on the extreme right).

Successful participants were given the composite questionnaire to complete along with the facial scale. When each emoticon was selected, an associated number, equivalent to its position between 0 and 10, displayed automatically below the line for the researcher to record.

4.4 Results from the Pilot Study

On arrival at the Shadarah Community Hospital in Delhi, the two groups of bi-lingual individuals completed the survey, one group of 10 utilizing the numeric scale while the other, the facial response scale.

After completion, researchers organised a meeting with respondents to glean feedback. Both groups confirmed the accuracy of the translation and endorsed it unreservedly. Further, they suggested that literate participants could answer all the questions independent of any assistance. However, both groups raised considerable doubts regarding the effectiveness of the questionnaire's use of facial expressions to test for acquiescent responding. They explained that for Indian participants, each smiling face better represented an unconnected emotion and not degrees of happiness. In this case, the group agreed the first acquiescent question contained one face representing someone feeling happy (see the left face in figure 5 below), but the face to the right represents someone feeling "gracious."

क्या यह दोनों चेहरे खुश दिखते हैं?
(Do both these faces look happy?)

☐ हाँ (Yes)

☐ नहीं (No)

Figure 5: Facial test for acquiescence

Further, both groups agreed that understanding the faces as representing discrete emotions meant the subsequent facial scale on the iPad App would not provide gradations of happiness equivalent to the end defined scale. Also, both groups suggested that all respondents, including numerically non-literate participants, would have no difficulty representing their responses on the 11-point, end-defined scale, explaining that doctors and staff use this scale as a measure of pain intensity when treating all patients at the hospital.

Finally, pilot study participants reported the three questions designed to assess scale comprehension were challenging to understand. They explained that after the instruction, "If zero equals "no satisfaction at all" and 10 equals "completely satisfied," the questionnaire asks respondents to circle the number (or select the face for those using the facial scale) you would choose if you felt "completely satisfied," "no satisfaction at all" and "just a little bit satisfied" (see figure 6 below).

अगले 3 प्रश्नों के लिए: यदि शून्य के बराबर होता है तो संतुष्ट नहीं है और दस के बराबर होता है तो पूरी तरह से संतुष्ट है।
(For the next 3 questions: If **zero** equals no satisfaction at all and **10** equals completely satisfied…)

१: अगर आप पूरी तरह से संतुष्ट है तो वांछित संख्या पर गोला बनाएं।
(Please circle the number you would choose if you felt completely satisfied.)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

२: अगर आप पूरी तरह से असंतुष्ट है तो वांछित संख्या पर गोला बनाएं।
(Please circle the number you would choose if you felt no satisfaction at all.)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

३: अगर आप थोड़ा बहुत संतुष्ट है तो कौन सी सांख्य पर गोला बनाएंगे?
(If you felt just a little bit satisfied what number would you circle?)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

Figure 6: Hindi scale competency questions

The group expressed difficulty understanding the nature of each question commenting that "I am not feeling completely satisfied at the moment, so I cannot answer these questions." This feedback was unanimous. Researchers documented the conversation and offered no explanatory comments to the assembled group.

In response to feedback from the bi-lingual consultancy group, researchers initiated a subsequent meeting with a group of 10 new participants, gathered from the hospital staff to trial a modified version of the composite questionnaire.

The modified version:

1. Contained no facial test for acquiescence.
2. Re-phrased the three scale competency questions to the third person. These were:

   "If zero equals "no satisfaction at all" and 10 equals "completely satisfied" and…

   - someone you knew felt completely satisfied, what number would they circle?"
   - someone you knew felt no satisfaction at all, what number would they circle?"
   - someone you knew felt just a little bit satisfied, what number would they circle?"

3. Retained the original 11-point end-defined scale to record responses.

On completion of the modified questionnaire, the entire 20 participants re-took the composite questionnaire. Feedback was unanimous. Every respondent understood the changes made to questions and answered accurately on the original 11-point end defined scale. Therefore, researchers retained these amendments, and data collection began in Delhi and a short time later at Muzaffarpur, India.

The outcome of these pilot studies within India was conveyed to hospital staff and leadership within Nepal for comments. Staff and leaders at the Anandaban Leprosy hospital in Kathmandu and leaders of the Leprosy Mission Nepal agreed unreservedly with the recommendations from India. Therefore, researchers abandoned the use of the facial questions testing acquiescence and the facial scale App, in favour of the numeric 0-10 end-defined scale within Nepal. Methods for detecting acquiescent responding are listed in the methods section of the current study.

4.5 Discussion

The previous chapter identified an enduring threat posed from the introduction of bias during cross-cultural data collection. In addition, an examination of prior cross-cultural research discovered that very few studies, intent on comparing SWB data between Western and Asian contexts, include strategies designed to minimise the introduction of bias. Bias can infiltrate data when differences in responses are created by errors within the translated scale, causing participants to misunderstand the intent of questions, or from cultural influences that systematically impact how people choose to rate their feelings (Keith et al., 1995).

For example, the World Happiness Report documented happiness levels of Japanese participants averaged 59 points when standardised on a 0-100 percentage point scale, compared to Nicaragua (60) points, stating, that these subjective measures compliment objective measures of life quality (Helliwell, Layard, & Scahs, 2017). However, an objective measure of quality of life, the Human Development Index (2017), identifies a large discrepancy between the quality of life in these two countries. It ranks Japan 17th and Nicaragua, 125th. Therefore, the statement made by Helliwell et al. (2017) that these countries subjective and objective comparisons are complimentary, is hardly valid in light of large discrepancies between the reported subjective and objective rankings. The introduction of cultural bias to data collected using subjective measures may explain these discrepancies.

The existence of cultural influences impacting upon SWB responses proliferates literature. For example, Veenhoven (1996) identified the phenomenon that people of different cultures responding to subjective measures often vary in their interpretation of certain words, concepts or their conceptualisation of a questionnaire's response scale. This cultural impact upon subjective measures was also reported by Lau et al. (2005) who found the tendency for Asian people to value modesty. Their subsequent reluctance to report extreme expressions of emotion produced a predisposition for mid-point responses on an end-defined 0-10 numeric scale. By contrast, some Western contexts exhibit an extremities bias, whereby answers cluster towards the ends of a scale (Grossmann & Na, 2014).

Therefore, in anticipation of such bias occurring between Australian, Indian and Nepali participants, the current study included strategies designed to limit its introduction.

These strategies are largely built into the questionnaire and include the following:

1. A rigorous translation process outlined in Section 5.3.2.1.

2. Questions employing facial emoticons designed to identify acquiescent responding, defined by Hinz et al. (2007) as the tendency to provide "yes" or "true" answers to questions, regardless of the content of the question being asked.

3. A procedure to limit the influence of the researcher's proximity during data collection.

4. A series of questions designed to test response scale comprehension.

5. The use of a faces scale aimed to replace a numeric 0-10 end-defined response scale. This later precaution was developed in response to the low adult literacy and numeracy rates reported by Unicef (2015), which raised doubts regarding the ability of participants to project their SWB perspectives onto a numeric scale.

Regarding the use of faces within the composite questionnaire, prior to leaving for India and Nepal, personal communications with Diener (2015) were initiated to gather perspectives regarding his experiences with response scale designs within culturally diverse groups. His feedback regarding working in the slum areas of Calcutta included his "awareness of the progressive smiley faces that are sometimes used in happiness measures and similar types used in pain scales in hospitals [however] we considered these briefly but abandoned them as likely too culturally biased in their symbolic representation of facial expressions" (Diener, 2015, p. 1).

Preceding contacting Diener, the current study had anticipated the 0-10 end-defined numeric scale may be problematic for numerically non-literate participants. As noted in 4.3.2.2, in its place, a facial ordering App was constructed at Deakin University. This App was designed for use on an Apple iPad independent of an internet connection. The App was invented to replace the 11-point end-defined unipolar scale anchored by 0 ("no satisfaction at all") to 10 ("completely satisfied"). For participants unfamiliar with a numeric scale, responses to SWB questions could be made using 11 facial pictures, known as emoticons, anchored from "no happiness at all" to "completely happy." Therefore, despite Dieners apprehension surrounding the effectiveness of a facial response scale, one was employed.

To advise on the strategies to limit bias, a consultancy group was appointed, organised by the Shadarah Community Hospital in Delhi. This included surgeons, nurses and hospital administrative staff fluent in English and Hindi languages. Feedback from the pilot group gave rise to the current study's major findings. While unanimously agreeing on the accuracy of the translation and precautions designed to limit the proximity of researchers during data collection were both likely to be effective, the facial emoticons used within questions designed to identify acquiescence, and the facial response scale, were confusing. Lastly, the current study identified participants found abstract thinking difficult regarding questions designed to test scale comprehension. These are now discussed.

Participants were unanimous regarding the introduction of confusion by the facial emoticons. Clarifying the source of the confusion, first, the questions designed to identify acquiescent responding employed two faces that both appeared, to researchers, as happy. Participants were asked if both faces represented someone who is happy. The correct response is “yes.” After this, participants were given another two faces, this time, one representing someone happy, and the other, representing some with no happiness at all. Participants were then asked if both faces characterise someone who is happy. The correct response is “no,” however, someone responding acquiescently, is likely to respond with a “yes.”

Participants were confused by the first question, reporting that both faces represent separate emotions and not, as expected by researchers, someone who is happy. They identified the face they agreed represented a feeling of happiness; however, they explained the adjacent facial expression characterised someone feeling gracious. Therefore, for Indian participants, the correct response to this first question is “no.” This stands in contradiction to the intended response of “yes.” Further, they explained the same issue rendered the facial scale moot regarding graduations of happiness from “no happiness at all” to “completely happy.” It appears the devised facial scale was not equivalent to the 11-point end-defined scale it was created to replace. Diener’s apprehension regarding using faces within a facial scale as being too culturally biased in their symbolic representation of facial expressions, is well founded.

To resolve issues around the use of the facial scale, the consultancy group agreed that all potential respondents would be able to represent their responses on an orthodox, 11-point, end-defined scale, anchored from “no happiness at all” to “completely happy,” describing that doctors successfully use this type of scale to measure pain intensity when treating patients at the hospital.

Lastly, the finding that participants found abstract questions designed to test scale comprehension difficult, was unexpected. For example, after they were given the instruction, "If zero equals "no satisfaction at all” and 10 equals “completely satisfied,” circle the number (or select the face for those using the facial scale) you would choose if you felt “completely satisfied,” “no satisfaction at all” and “just a little bit satisfied.” Unanimous participant feedback in response to these questions was, “I am not feeling completely satisfied at the moment, so I cannot answer these questions.” A search within cross cultural literature has failed to explain this surprising result. However, in response to the feedback, the wording of the question was changed from first to the third person. The revised question asks, "If zero equals "no satisfaction at all” and 10 equals “completely satisfied,” circle the number (or select the face for those using the facial scale) you would choose if your someone you knew felt “completely satisfied,” “no satisfaction at all” and “just a little bit satisfied.” This change was unanimously agreed upon by all participants. A subsequent follow-up demonstrated all participants were able to correctly respond.

The suggestions made by the Indian cohort were then communicated to a second group within Nepal. This group, fluent in English and Nepali, unanimously agreed with the recommendations from their Indian peers.

Chapter 5: Confirming Psychometrics within Australia, India and Nepal

5.1 Introduction and Aims

The previous chapter evaluated the effectiveness of strategies designed to limit the influence of cross-cultural bias on data collected within India and Nepal. These strategies included, (a) a rigorous translation process outlined in Section 5.3.2.1, (b) questions within the composite questionnaire employing facial emoticons designed to identify acquiescent responding, (c) a detailed procedure to limit the influence of the researcher's proximity during data collection, (d) a series of questions designed to test the participant's comprehension of the response scale, and (e) the use of a faces scale aimed to replace a numeric 0-10 end-defined response scale.

It was found that a number of these strategies were ineffective and as such, were abandoned. This included the use of the facial response scale and questions using faces to identify acquiescent responding, as it was shown that cultural influence revealed the faces did not represent degrees of happiness, but discrete emotions. In place of the facial scale, an orthodox 0-10 end-defined numerical scale was employed. Finally, questions written in the first person designed to test a participant's comprehension of the response scale were not comprehensible until re-written into the third person.

To test the effectiveness of these strategies to limit bias, the current chapter seeks to establish measurement invariance (MI) between data collected by each measurement scale within three cultural groups. These are Australia, India and Nepal. The chapter proceeds in three parts. Part A aims to establish each scale's item content that produces the best fit between the hypothesized models and their observed data collected from within Australia. The final good-fitting factorial model for each scale employed within Study 1, is hereafter referred to as the model's *standard sample*. Following this, Part B, confirms separately whether standard samples are good fitting models to Indian and Nepali data. Finally, Part C, employs a series of multi-group CFA's to determine if the Australian standard samples are invariant across Australian, Indian and Nepali contexts.

5.2 Participants

5.2.1 Australia.

Beginning in April 2001, Deakin University in partnership with Australian Unity, has conducted bi-annual cross-sectional surveys of approximately 2000 Australian households. These surveys, referred to as The Australian Unity Wellbeing Index, measure the personal wellbeing of the Australian population (Cummins, Woerner, Weinberg, & Perera, 2010). For each survey, participants are enlisted by the same call centre by random telephone dialling. Callers telephone homes asking to speak to the person having the most recent birthday and are at least 18 years old. The selection of homes is made randomly within approximately 60 geographical regions which, together, cover the nation. The number of respondents from each region is proportional to each region's contribution to the national population, determined from the Australian Bureau of Statistics (Australian Bureau of Statistics, 2018).

Australian participants for the current study were contacted between 12th April and 2nd of May 2010. A total of 16,426 calls were initially made. From these calls, 4,940 eligible respondents were contacted and 2,115 people, fluent in English, agreed to participate by completing the 23rd Australian Unity Wellbeing Index survey over the phone. The sample comprised 48% male and 52% female respondents with a mean age of 61 years, and a standard deviation of 13.8, ranging between 18 and 93 years.

5.2.2 India.

Ethics approval was obtained from Deakin University Human Research Ethics Committee, the Consulate General of India, the Indian Leprosy Mission Trust, the Shadarah Community Hospital in Delhi, and The Leprosy Mission Hospital Muzaffarpur. After approval, data were collected in India from 305 participants. The sample consists of 114 people affected by leprosy and 169 individuals non-affected by leprosy or associated disability.

Participants retained for the current study are the 169 respondents unaffected by leprosy, consisting of 86 males (51%) and 83 (49%) female participants with a mean age of 35 years. These data were gathered from staff, volunteers, and local community members associated with the Shadarah Community Hospital in Delhi and its associated leprosy colony known as Tahirpur. Participants were also enlisted from a second location in the Tirhut region of Bihar, within a city called Muzaffarpur.

In both these contexts, The Leprosy Mission of India (TLMI) advertised the study to people unaffected by leprosy via internal communications that included a translated plain language statement (PLS) describing the study and giving instructions for informed consent by contacting Dr Annamma John, head of Research and Training for the Shadarah Community Hospital and Dr Stephen Levi, head of Surgery at Muzaffarpur. In addition, a translator introduced the researcher, the study, and consent methods to community gatherings at each location. At these assemblies, the PLS was read aloud, due to expected levels of illiteracy. From electronic communications and community gatherings, 204 people indicated a willingness to participate, 35 were ineligible due to either the presence of pathology or being under 18 years of age as determined by TLMI staff, leaving 169 participants.

5.2.3 Nepal.

Ethics approval was obtained from Deakin University Human Research Ethics Committee, the Nepal Health Research Council, the Lalgadh Leprosy Services Centre of the Nepal Leprosy Trust, Medical Director of the Anandaban Leprosy Hospital, and two universities within Kathmandu referred to as the Herald International College and the Universal Higher Secondary School. After approval, data were collected from 306 individuals over the age of 18 years. The sample consists of 140 people affected by leprosy and 166 individuals non-affected by leprosy or associated disability. The 166 respondents unaffected by leprosy or disability are retained for the current study, consisting of 88 males (53%) and 78 (47%) female participants with a mean age of 32 years.

These data were gathered from staff, volunteers, and local community members connected to the Anandaban Leprosy Hospital, its associated community workers, and students from two adult universities in Kathmandu, Nepal. In these contexts, and prior to the researcher’s arrival, Shovakhar Kandel, country leader of The Leprosy Mission of Nepal, advertised the study via email and newsletters that included a translated plain language statement and consent forms. Upon the researcher’s arrival at each location, Shovakhar or a Mission associate fluent in English and Nepali, introduced the researcher and the study. At this time, a translated version of the PLS was read to potential participants, who were given the opportunity to participate by either submitting consent forms or giving verbal consent to facility leadership. Of the 166 respondents, none were deemed ineligible by TLMN staff.

5.3 Method

5.3.1 Measures.

The measures used in this study are identical to those employed in Study 1. Therefore, they are listed in summary form only.

5.3.1.1 Global Life Satisfaction.

Global Life Satisfaction (GLS) characterizes an abstract rating of life satisfaction (International Wellbeing Group, 2013). GLS is measured by the single question, "how satisfied are you with your life-as-a-whole?" A response to this question is made on an 11-point end-defined unipolar scale anchored by 0 ("no satisfaction at all") to 10 ("completely satisfied"). The GLS score is an approximation of SWB and results are recoded onto a standard 0 –100-point distribution as suggested by the PWI-A manual (International Wellbeing Group, 2013).

5.3.1.2 The Personal Wellbeing Index.

The International Wellbeing Group (2013) describe the Personal Wellbeing Index (PWI) as a measure of the subjective experiences of wellbeing in accordance with homeostasis theory. The measure contains seven items of satisfaction that relate to different areas of quality of life domains. These domains are standard of living, health, achieving in life, personal relationships, safety, community connectedness, and future security. Participants who respond to all seven domains have their scores averaged and converted to a percentage point scale from zero to 100. The PWI is available from The Australian Centre on Quality of Life's website http://www.acqol.com.au/ in formats designed to measure personal wellbeing levels of adults (PWI-A), school children (PWI-SC) and intellectually disabled (PWI-ID) populations.

5.3.1.3 DASS-21D.

The shortened version of the Depression, Anxiety and Stress Scale (DASS-21, Lovibond & Lovibond, 1993) assesses symptoms of depression, anxiety, and stress over the past week. Only the depression sub-scale is used in the current study referred to hereafter as the DASS-7D.

The seven depression items are:

1. I couldn't seem to experience any positive feels at all.
2. I found it difficult to work up the initiative to do things.
3. I felt I had nothing to look forward to.
4. I felt down-hearted and blue.
5. I was unable to become enthusiastic about anything.
6. I felt I was not worth much as a person.
7. I felt that life was meaningless.

5.3.1.4 Rosenberg Self-esteem Scale.

The most widely employed instrument for measuring self-esteem is Rosenberg's Self-Esteem Scale (RSES, Rosenberg, 1965). The questionnaire asks people, regarding their current feelings, to indicate their level of agreement (measured on a 4-point scale, "strongly agree;" "agree;" "disagree;" and "strongly disagree") with the following 10 statements:

1. On the whole, I am satisfied with myself.
2. At times I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel I am a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude towards myself.

However, as discussed in Section 4.6 of this thesis, Song et al. (2011) and Chao et al. (2016) report differential item functioning for the negatively worded items. Therefore, the current thesis retains the following positively worded items for use within Australia, India and Nepal:

1. On the whole, I am satisfied with myself.
2. I feel that I have a number of good qualities.
3. I am able to do things as well as most other people.
4. I feel I am a person of worth, at least on an equal plane with others.
5. I take a positive attitude towards myself.

Finally, to match the scale formats of the other instruments delivered via the composite questionnaire to all participants, respondents are asked to assess their current feelings on an 11-point end defined scale.

5.3.1.5 Revised Life Orientation Test.

The Life Orientation Test (LOT) was first developed by Scheier and Carver (1985) to measure individual differences in perceived good versus bad outcomes in life.

However, as previously discussed in Section 4.3.1 and following Maher and Cummins (2001), only the three positively worded statements are retained to measure optimism throughout the current thesis. These statements are:

1. In uncertain times, I usually expect the best.
2. I'm always optimistic about my future.
3. Overall, I expect more good things to happen to me than bad.

5.3.1.6 Perceived Control Scale.

Perceived control is the extent to which individuals feel they are in control of their lives. To measure perceived control, the 23rd Australian Unity Wellbeing survey employed the revised version of Perlin and Schooler's scale (1978). However, for reasons outlined in Section 2.4.1, the scale used by the 23rd edition of the Australian Unity Wellbeing Index is simplified by rewording negative statements to read as positive affirmations. These are:

1. I am in control of my life.
2. I can change the important things in my life.
3. I feel I have control over the things that happen to me.
4. I feel I can solve the problems I have.
5. Nothing is stopping me doing the things I want to do.

To reflect these substantive changes, the original PPCS' name is changed hereafter to the Perceived Control Scale (PCS) and used within India and Nepal.

5.3.1.7 Homeostatically Protected Mood Scale.

Researchers theorise that the affective component of subjective wellbeing (SWB) is best described by a tri-cluster of terms that together form a construct referred to as homeostatically protected mood (HPMood, Cummins & Wooden, 2014). These terms are "happy," "content" and "alert" that together, explain 66% of the variance in SWB when assessed with linear methods (Blore et al., 2011), and 42.3% when assessed using a cosine wave analysis (Hartley-Clark, 2014).

To measure happy, content and alert, individuals are asked the following three questions and responses are made on an 11-point end defined scale ranging from 0="Not at all" and 10="Extremely."

1. "How happy do you generally feel?"
2. "How content do you generally feel?"
3. "How alert do you generally feel?"

The first two questions tap mood valance and the third, mood arousal. Researchers then average the three scores to calculate an individual's level of HPMood. A detailed discussion of HPMood, including measuring the construct is contained within Section 2.3.1 of the current thesis.

5.3.2 Procedure.

5.3.2.1 Data collection procedure.

The procedure for collecting data was identical in each location within India and Nepal. First, researchers asked participants if they could read. If they responded, "Yes" researchers invited them to read aloud the first question designed to test scale competency and answer the first question using the numeric scale in the presence of a translator and researcher. If translators deemed this first task successfully finished, researchers asked the participant to complete the remaining three scale comprehension questions. If accomplished accurately, the participant was given a paper version of the questionnaire to complete independently of either the translator or researcher. For example, if respondents were outdoors, many individuals would walk to a nearby location to complete the survey. Others remained within the immediate proximity of the researcher and completed their questionnaire. The vicinity of the researcher during responding was recorded to allow later analyses for the introduction of bias resulting from the researcher's presence.

If the participant was unable to read the questionnaire, researchers supplied the volunteer with a translator who read aloud each question as stated in the printed questionnaire. Instructions to translators were to read each question offering no further explanation. The researcher then excused themselves from the immediate location, and the translator completed the questionnaire with the participant, recording their responses on the scale. In this case, researchers noted the presence of a translator for later analyses regarding proximity and its impact on responding.

5.3.3 Data Preparation.

IBM SPSS Statistical Software (Version 24) and AMOS (Version 24) were employed for data analyses and cleaning. All original scores obtained from PWI-A, DASS-21, RSES, LOT-R, PPCS and the HPMood instruments were converted to a 0-100 range (Percentage of Scale Maximum referred to hereafter as percentage points). Since each item was initially rated from 0-10, the conversion involved multiplying each raw score by 10.

5.3.3.1 'Out-of-range' and missing data.

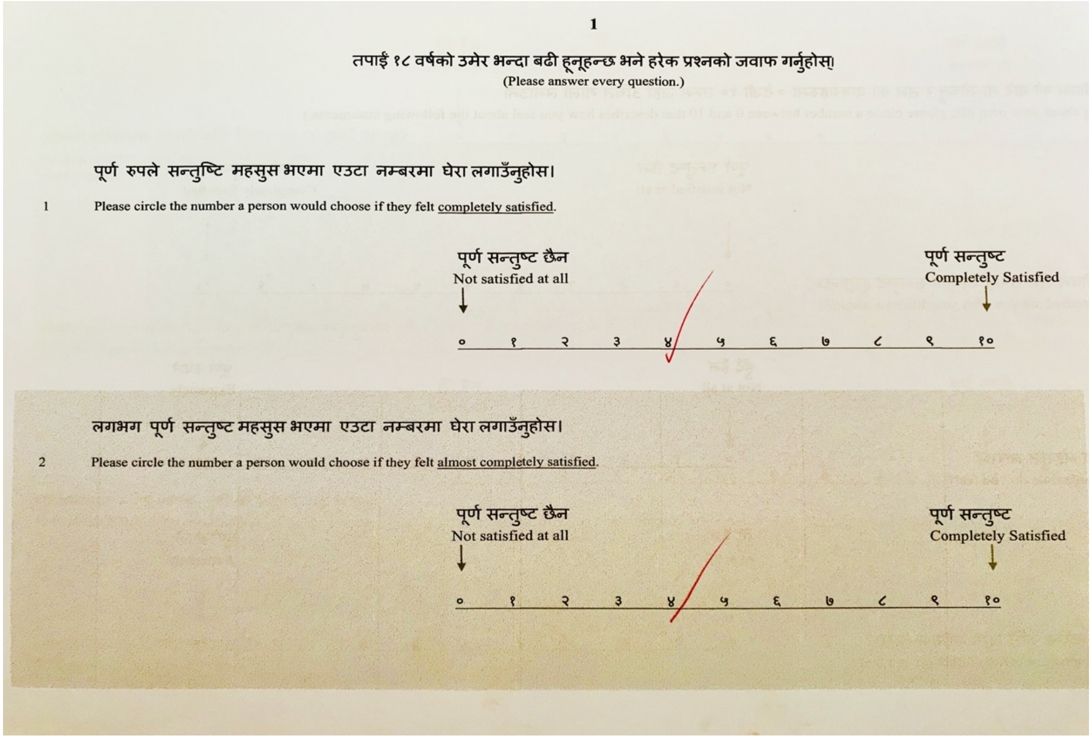
Prior to analyses, Australian, Indian and Nepali data were examined for out-of-range item values. None were found. SPSS's analyse patterns function of multiple imputation (MI) was then used to reveal 3.6% of Australian cases had missing values. SPSS revealed no patterns to these missing data, which were *missing at random* (MCaR, Pallant, 2005). Further, rates of missing data below 5% are regarded by Schafer (1999) as inconsequential. However, due to confirmatory factor analyses using AMOS 24, which is sensitive to missing values, SPSS's MI was used to provide missing values, ensuring all respondents provided a complete set of data. No data were missing within the Indian and Nepali cases.

5.3.3.2 Response Sets.

Response sets are defined here as occurring when a participant scores consistently at the top (10) or bottom (0) of the scale for all PWI-A domains. The International Wellbeing Group recommends deletion of these cases prior to final analysis as they indicate either acquiescent responding by the participant or a lack of scale comprehension (International Wellbeing Group, 2013). Analyses of PWI-A data revealed 28 response sets at the top and none at the bottom. Participants who had selected all 10's on items from the PWI-A, were removed from the dataset. Further, participants who failed to successfully complete all three of the Hindi and Nepali three scale competency questions were also deleted. From India, 7 cases were removed and 13 from Nepal.

In addition to the removal of response sets and failed scale competency, two questionnaires from the Hindi data revealed patterned responding with answers on all instruments consistently alternating from 3 to 7. These two questionnaires were also written in matching ink and in a colour inconsistent with the pens supplied to participants. Therefore, it is likely that a single person completed these two questionnaires. Researchers considered these two cases unreliable and removed them from the Hindi dataset before analysis.

Finally, within Nepal, 20 questionnaires were given to an employee of the Leprosy Mission Nepal (TLMN) who offered to conduct interviews with participants in Kathmandu, unaffected by leprosy or disability. Researchers coached this individual in the interview procedure that included instructions not to add any further explanation regarding individual questions. Three days later, the completed questionnaires were returned to researchers who deemed them inadmissible. The reason these 20 surveys were considered unacceptable was due to every question in the ten of the surveys marked with a red pen; only the number 4 was selected for every question. For the ten surveys written in blue pen, all questions revealed an alternating pattern of responses (see an extract from each in figure 7 below).



1

तपाई १८ वर्षको उमेर भन्दा बढी हूनूहन्छ भने हरेक प्रश्नको जवाफ गर्नुहोस्।
(Please answer every question.)

पूर्ण रुपले सन्तुष्टि महसुस भएमा एउटा नम्बरमा घेरा लगाउँनुहोस।
1 Please circle the number a person would choose if they felt completely satisfied.

पूर्ण सन्तुष्ट छैन
Not satisfied at all

पूर्ण सन्तुष्ट
Completely Satisfied

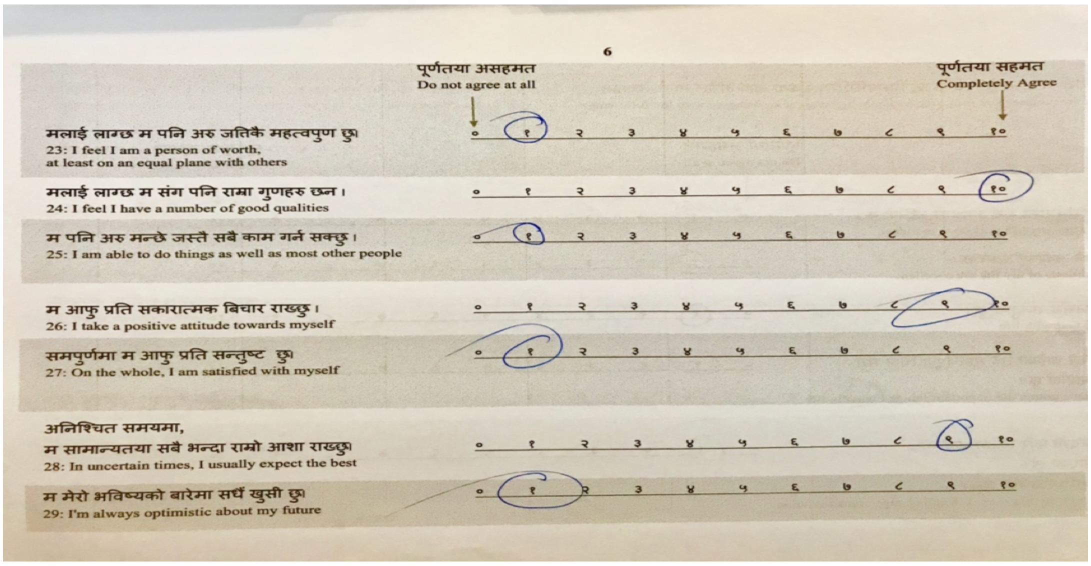
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

लगभग पूर्ण सन्तुष्ट महसुस भएमा एउटा नम्बरमा घेरा लगाउँनुहोस।
2 Please circle the number a person would choose if they felt almost completely satisfied.

पूर्ण सन्तुष्ट छैन
Not satisfied at all

पूर्ण सन्तुष्ट
Completely Satisfied

० १ २ ३ ४ ५ ६ ७ ८ ९ १०



6

पूर्णतया असहमत
Do not agree at all

पूर्णतया सहमत
Completely Agree

मलाई लाग्छ म पनि अरु जतिकै महत्वपुण छु।
23: I feel I am a person of worth,
at least on an equal plane with others
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

मलाई लाग्छ म संग पनि राम्रा गुणहरु छन।
24: I feel I have a number of good qualities
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

म पनि अरु मन्छे जस्तै सबै काम गर्न सक्छु।
25: I am able to do things as well as most other people
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

म आफु प्रति सकारात्मक बिचार राख्छु।
26: I take a positive attitude towards myself
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

समपुर्णमा म आफु प्रति सन्तुष्ट छु।
27: On the whole, I am satisfied with myself
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

अनिश्चित समयमा,
म सामान्यतया सबै भन्दा राम्रो आशा राख्छु।
28: In uncertain times, I usually expect the best
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

म मेरो भविष्यको बारेमा सधैं खुसी छु।
29: I'm always optimistic about my future
० १ २ ३ ४ ५ ६ ७ ८ ९ १०

Figure 7: Patterned responding from Nepal

Researchers agreed these responses are implausible and likely completed by the interviewer independent of any participants. Therefore, the 20 completed questionnaires were not entered into SPSS. All subsequent investigations below were applied to the reduced datasets.

5.3.3.3 Outliers.

A subsequent examination of z-scores revealed univariate outliers on all PWI-A items from each national context. However, a comparison of mean scores with each item's upper and lower mean trimmed at 5% revealed they produced no significant influence on mean scores. Therefore, all values were retained in subsequent analyses (Pallant, 2005).

In addition, the critical chi-square criterion of 22.46 ($df = 6$, $p < .001$) was used to identify 115 multivariate outliers on the seven PWI-A domains from Australian data, 12 from India and 9 from Nepal. An independent-samples t-test was conducted to compare the mean and standard deviation scores before and after the removal of the multivariate outliers. There was no significant difference in scores before and after removal of outliers on any of the instruments employed.

In addition, Mahalanobis distance scores above 22.46, once removed, maintained a mean score on the PWI-A close to a grand mean of 75.5 points, previously reported from a calculation of standardised mean scores of 32 Australian Unity Wellbeing Index surveys completed between 2001–2013 (Capic et al., 2017). These findings, along with recommendations from Tabachnick and Fidell (2014) that scores above the critical chi-square criterion of 22.46 ($df = 6$, $p < .001$) should be removed, and Byrne (2010), who states that multivariate outliers are problematic for *structural equation modelling* (SEM), deems the removal of multivariate outliers appropriate. Removing these outliers leaves 1972 Australian, 169 Indian and 166 Nepali participants.

5.3.3.4 Normality and linearity.

Following the removal of the 115 multivariate outliers, an examination of multivariate kurtosis using AMOS 24 revealed a *Mardia's coefficient* of 25.4 ($p < .05$)

and a *critical ratio* of 50.24 for the PWI-A, and the for the RSES, 56.94 ($p < .05$) and 151.10 respectively. According to Byrne (2010) and Bentler (2005), these values indicate substantial multivariate kurtosis, whereby the distribution of values accords with the description provided by Raykov and Marcoulides (2000), as peaky with thick tails.

High levels of multivariate kurtosis violate an essential assumption for SEM due to covariance structures forming the basis of this analytic technique (Mardia, 1970, 1974). However, these are also the typical characteristics of SWB data for two reasons. First, homeostasis theory predicts most scores clustering around 75% of scale maximum, thereby producing the leptokurtic component of the distribution. Second, the tail thickness is the negative skew exaggerated by the percentage of the sample experiencing homeostatic defeat.

However, when data exhibit multivariate kurtosis, Arbuckle (2012) underlines the importance of selecting the most appropriate estimation method. This decision is made using AMOS 24's bootstrapping function to choose from four competing estimation criteria. These criteria are Maximum Likelihood (ML), Generalized Least Squares (GLS), Unweighted Least Squares (ULS) and Asymptotically Distribution-free (ADF). After running the bootstrapping analyses for each of the four estimation methods, AMOS 24 produces a mean discrepancy and standard error score between sample moments in the original sample, and the implied moments from each bootstrapped sample. The recommendation from Arbuckle (2012) is to select the estimation method that produces the smallest mean discrepancy score for subsequent model fit analyses. Mean scores from the PWI-A and RSES, using the 23rd Australian Unity survey results, along with their standard errors, are shown in Table 2.

Table 2: Discrepancies from the Personal Wellbeing Index (PWI-A) and the Rosenberg Self-esteem Scale (RSES)

Measurement Method	**Discrepancy Score**			
	Mean		Standard Error	
	PWI-A	RSES	PWI-A	RSES
Maximum Likelihood	546.00	1260.20	1.57	7.02
Generalized Least Squares	323.18	500.34	0.45	1.65
Unweighted Least Squares	2157.09	1543.86	17.70	16.13
Asymptotically Distribution-free	205.77	139.60	0.14	0.15

According to Table 2, the ADF criterion approach produced the smallest mean discrepancy score. Further, the higher mean discrepancy scores for the alternate three estimation methods indicate their reduced performance with this combination of model, population, and sample size. This finding is in keeping with comments from Byrne (2010) who notes interpretations based on continuous data that exhibit multivariate kurtosis using AMOS 24's default ML estimation method are problematic. According to Byrne (2010), this is due to ML's underlying assumption that data being analysed are normally distributed. By contrast, the ADF criterion does not assume that the data are normally distributed and is reliable for samples above 1,000 participants (Olsson, Foss, Troye, & Howell, 2000). Therefore, the ADF criterion is employed for all subsequent estimation analyses with data collected using the PWI-A, DASS-21, PPCS, LOT-R and RSES.

After completing the examination for multivariate normality, the descriptive function in SPSS 24 was used to assess univariate skew and kurtosis. Absolute skew and kurtosis values suggested by Curran, West, and Finch (1996) were within the acceptable ranges of < 2.0 and < 7.0 respectively for all instruments, in each national context.

5.3.3.5 Multicollinearity and Singularity.

Using the cleaned dataset, the seven independent variables associated with the PWI-A were tested with collinearity diagnostics performed in SPSS 24 for multicollinearity and singularity. According to Pallant (2005), the cut-off points for determining the presence of multicollinearity are Tolerance values $< .10$ and Variance Inflation Factor (VIF) values > 10. The reported Tolerance values, as measures of multiple correlations with other variables and suggestive of multicollinearity, are all $>$ .10. The tolerance values for the PWI-A range from .42 (Achieving) to .62 (Health). The VIF represents the inverse of Tolerance values. Reported VIP values for the PWI-A ranged from 1.60 (Health) to 2.40 (Achieving). Therefore, there is no evidence of multicollinearity in these data.

5.3.3.6 Intact Homeostatic Systems

When researchers generate "normal samples," the reference to normality is typically based on the sample being demographically representative of the population concerned. However, for much psychological research, this definition is inadequate because it does not encompass the crucial criterion, that the sample characterises people who have normally functional psychological homeostatic systems.

The psychological process referred to as SWB homeostasis is described in detail in Chapter 2. This includes the criteria for determining normal homeostatic functioning for individuals. For example, data from 58,493 general-population Australians completing the Personal Wellbeing Index (PWI) returned a mean (M) of 75.29%SM with a standard deviation (SD) of 12.47 (Cummins et al., 2013). From these results, the Australian normative range for adult individuals is calculated as lower bound = M – 2SDs; upper bound = M + 2SDs (Capic et al., 2017). Application of these formula produce a normal SWB range for individuals of 50.35–100.23%SM. Based on this normative range, Cummins (2018) explains that any individual returning a PWI score of ≤ 50%SM is below the Australian normal range and likely experiencing homeostatic defeat. Thus, creating a representative sample of individuals with intact homeostatic systems requires the removal of respondents returning ≤ 50%SM.

Further empirical support for removing individuals ≤ 50%SM is reported by Richardson, Fuller Tyszkiewicz, Tomyn, and Cummins (2015). Data gathered from 45,192 respondent's found individuals with PWI scores ≤ 50%SM, produced haphazard variations in scores across all PWI domains, determined by Rasch modelling techniques. Further, data from the ≤ 50%SM group showed lower domain intercorrelations than the ≥ 51%SM group. Finally, a confirmatory factor analysis demonstrated that a one-factor model for the PWI is a poor fit for data from the ≤ 50%SM group (Richardson et al., 2015). These results suggest that the PWI does not perform as expected for this psychologically atypical group.

Therefore, based on (a) the calculated normal SWB range for individuals with intact homeostatic systems (Cummins, 2018), (b) the unreliable performance of the PWI using data from individuals ≤ 50%SM (Richardson et al., 2015), and (c) the aim of this current study to examine the validity of the PWI-A amongst people with intact homeostatic systems by removing individuals ≤ 50%SM; 176 individuals were removed. These people were removed from the sample of Australian data collected for this thesis, representing 9.8% thereby retaining 1,796 participants. From data collected from India, 14 participants (9%) were excluded, leaving 155. From the Nepali sample, 13 participants (7.8%) were removed, reducing the number to 153.

5.3.3.7 Sample size.

Tabachnick and Fidell (2014) suggest the determination of adequate sample sizes for multiple regression analysis is $N \geq 50 + 8m$. N = minimum number of respondents and m = number of independent variables (IVs) in the model. In the current study, the maximum number of IVs in any regression is 8. Applying the formula results in a required sample size of 114. The current Australian sample after data cleaning of 1,796 participants is adequate to achieve statistical power for all regression analyses. Likewise, the Indian and Nepali samples of 155 and 153 respectively are sufficient.

In addition to regression analyses, Study 1 includes an examination of the factor structure using CFA to confirm if the hypothesised models appropriately fit these data. To ascertain if the studies sample sizes are adequate for these CFA analyses, prior Monte Carlo data simulation techniques by Wolf, Harrington, Clark, and Miller (2013) were referenced. By systematically varying the number of indicators and factors, the size of factor loadings and path coefficients, as well as quantities of missing data, Wolf et al. (2013) explored how altering these parameters impacted the required sample sizes and their relationship to statistical power, bias, and solution properties. They reported minimum sample sizes for CFA conducted on one, two, and three-factor models as a function of various factor loadings (.50, .65, and .85) and the number of indicator variables.

Using the recommendations of Wolf et al. (2013), the Australian PWI-A factor loadings ranging from .45 (health) to .67 (achieving), and the RSES ranging from .71 ("I am able to do things as well as most other people") to .83 ("I feel I am a person of worth, at least on an equal plane to others"), a minimum sample size of 100 is required. Therefore, Wolf's (2013) suggestion of a minimum of 100 participants supports a CFA analysis of these data. In conclusion, the PWI-A, RSES, LOT-R, PPCS and HPMood scales used in India and Nepal returned loadings within the range suggested by Wolf et al. (2013) requiring the minimum sample size of 100 participants. This, along with the recommendation from Stokes, Fisher, Cummins, and Tunbridge (2018) confirm the current study yields sufficient sample sizes from Australian, Indian and Nepali data.

5.3.4 Data Analytic Strategy

To confirm that factor models for all instruments are consistent with their collected data, Study 1 proceeds in three parts. The aim of Study 1, Part A, is to produce a *standard sample* for each scale using Australian data and employs confirmatory factor analysis (CFA) using version 24 of AMOS. The aim of Part B is to confirm the Australian standard samples within the Indian and Nepali groups, separately. Finally, the aim of Part C is to employ a series of multi-group CFA's to determine if the Australian standard samples are invariant across Australian data and those groups where the Australian standard sample were confirmed by Part B's analyses. These analytic methods and associated nomenclature are now described.

5.3.4.1 Confirmatory Factor Analysis

Study 1, Part A begins by testing the plausibility of each scale's specified model, based on data collected by the 23rd Australian Wellbeing Unity Index (AUWI) survey (Cummins et al., 2010). The Australian sample is selected as an example of data which closely match data employed to establish the original factorial structures.

The primary Confirmatory Factor Analysis (CFA) statistic used to evaluate the plausibility of the factorial models is chi-square (χ^2) and its *p*-value. The χ^2 statistic measures the discrepancy (residual) between the proposed model's sample covariance matrix and its population covariance matrix. As such, the null hypothesis is that the proposed model holds within the population (Byrne, 2010). Therefore, a poor fitting model returns a *p*-value below .05, indicative of significant differences between the expected (population) and observed (proposed) models. Thus, a $p < .05$ provides empirical grounds for rejecting the the plausibility of the factorial model. By contrast, a good fitting model returns a non-significant *p*-value, interpreted as the hypothesised model not being significantly different from the population model.

However, Chen (2007) recommends disregarding χ^2 as the primary measure of fit due to its tendency for oversensitivity to sample size, such that large sample sizes return a significant χ^2 statistic, despite a small discrepancy between the model and population data. In addressing the problems associated with χ^2 limitations, Wheaton, Muthén, Alwin, and Summers (1977), created the χ^2/degrees of freedom ratio. This criterion was soon followed by other researchers who developed a suite of preferential statistics such as the comparative fit index (CFI), the Root Mean Square Error of Approximation (RMSEA) and the Standardised Root Mean Square Residual (SMRM, for a review see Gerbing & Anderson, 1993).

As one consequence of these developments, researchers today commonly overlook a significant χ^2 value preferencing statistics such as RMSEA, CFI and SRMR to determine model fit to data. This is unfortunate since χ^2 remains the strongest statistic by which to judge model fit (Byrne, 2010; Jöreskog, 1993), provided methodological procedures are enacted that address χ^2 limitations.

Two methods are now described that maintain χ^2 as the preeminent goodness-of-fit statistic by compensating for a large sample size. The first method involves extracting 20 randomly drawn, appropriately sized samples, with replacement, and submitting each to a CFA. This provides the minimum number of iterations to accommodate a 1 in 20 failure. This proportion is equivalent to the $p = .05$ statistic whereby a single fitting sample from 20 would be considered rare (Cohen, 1994). In terms of sample size, each contains the minimum number calculated from Wolf's (2013) Monte Carlo data simulation (see 5.3.3.7). Therefore, since the PWI-A contains the highest number of independent variables (7) of all instruments employed, 106 participants would be used for all subsequent CFA sample sizes.

However, to meet statistical convention, χ^2 results from 20 iterations would require fewer than 1 in 20 failures in order to justify the conclusion of a significant result $p < .05$. Therefore, using this criterion in association with the χ^2 statistic requires that the only statistically acceptable outcome would be 20/20 non-significant results. Within the context of the current study, this criterion was deemed overly stringent. In response, an alternative method is employed.

The second method proceeds by conducting a log transformation of CFA χ^2 results, a widely used method to improve the approximation of normality (Douglas & Wixley, 1986; Feng et al., 2014). In addition, by averaging results from eight (for a fuller discussion and justification for eaight samples see, Chi, 2019) randomly extracted smaller samples (n = 106), with redraw, from the original data set (N = 1796), the critique of χ^2 oversensitivity to sample size (discussed above) no longer applies.

The method proceeds as follows: First, each smaller sample is subjected to a CFA. Each χ^2 value is then log-transformed, the collective results averaged, converted back to a real number, and subjected to a χ^2 significance test using χ^2 significance tables, degrees of freedom and means. The subsequent p-value is then employed as the criterion for decisions regarding the factorial model's goodness of fit to data (Feng et al., 2014).

Employing this second methodology to overcome the limitations of χ^2, ratifies the log-transformed χ^2 as the primary fit statistic within the context of the current study. In addition, the adjunct statistics, CFI, RMSEA and SRMR are also reported in line with conventional practice and recommendations by Byrne (2010) and are now briefly described.

The CFI compares the hypothesised factorial model with a base-line model. The base-line model allows all variables to have variance, but no covariance. Therefore, comparisons examine how much improvement there is between the hypothesised model relative to the baseline model (Chen, 2007). The Criterion regarding improvement is based on simulation research by Hu and Bentler (1999), who recommend that the CFI cut-off value for a good fitting model is $\geq .95$.

A unique feature associated with the RMSEA is its estimation of a population covariance matrix as part of its formulation (for a detailed explaination of how the RMSEA statistic is derived, see Browne & Cudeck, 1993; Rigdon, 1996). As a result, a CFA produces *p*-values and confidence intervals around the RMSEA index as part of the AMOS output. These can then provide an estimate of confidence whereby a narrow confidence interval (lower limit near 0 with an upper limit of 0.08) provides evidence for the derived RMSEA value reflecting the model fit in the population (Hooper, Coughlan, & Michael, 2008).

The SMRM represents the average value across all residuals. The resultant value is then standardised for comparative purposes. For a good fitting model, Hu and Bentler (1999) recommend using the cut-off values of RMSEA, $< .06$ and SRMR, $< .05$.

To summarize, for each original factorial model, goodness-of-fit to data is assessed using a CFA's χ^2 and RMSEA, CFI and SMRM statistics. In addition, the CFA produces a ranked order of items as a function of their standardised regression weights. If the initial CFA's goodness-of-fit statistics do not confirm a good fitting model, instead of immediately removing the item with the lowest standardized regression weight and re-running another CFA, a log-transformed χ^2 analysis is employed to confirm that the initial χ^2 result was not the product of a large sample size. At this point, the log-transformed χ^2 constitutes the sole goodness-of-fit criterion.

This methodology for assessing model fit avoids the orthodox statistical approach of ignoring χ^2 and relying only on RMSEA, CFI and SRMR statistics as criteria for model fit. By contrast, the current method blends CFA's robust RMSEA, CFI and SRMR statistics with a log-transformed χ^2 analysis in response to χ^2 sensitivity to sample size.

5.3.4.2 Item deletion

If the CFA's χ^2, RMSEA, CFI and SRMR statistics does not yield an acceptable fit, and, the log-transformed χ^2 analysis confirms the χ^2 was not a product of a large sample size, the scale is modified by the progressive elimination of items based upon the relative strength of their standardised regression weights. The lowest is removed first (Stokes et al., 2018). The process of item removal concludes when fit is achieved, or the model contains no less than four items. Four items are the minimum allowed by AMOS. Below this number it reports the model as "just-identified" and cannot be validly tested for model fit as the degrees of freedom are exhausted by parameter estimation (i.e.; the number of free parameters is equivalent to the available degrees of freedom) preventing the ability to reject the model (Byrne, 2010).

One limitation of this 4-item minimum is that the Scheier, Carver, and Bridges' (1994) revised Life Orientation Test (LOT-R) and Homeostatically Protected Mood scale (HPMood, Cummins & Wooden, 2014) both contain only three items. Therefore, these scales, along with any revised scale consisting of less than 4-items, are verified within each country during Part B of the current study, using a principal component analysis (PCA).

A valid PCA is premised on assumptions that include adequate sample size and a correlation matrix showing at least one correlation of $r \geq .3$. At $N = 1796$ for Australian data, $N = 155$ for the Indian data and $N = 153$ for Nepal, sample sizes are adequate, meeting Tabachnick & Fidell's (2014) suggested 150 respondents, and, recommendations from Nunnally (1978), who suggests a minimum 10 respondents for each item that is factor analyzed.

In addition to sample size and item correlations, the suitability of each scales data for PCA are assessed using Bartlett's test of sphericity, which requires a significance level of $p < .05$, and, the Kaiser-Meyer-Olkin value, ≥ .6 (Tabachnick & Fidell, 2014).

After all assumptions are met, factors are then extracted based on eigenvalues exceeding 1 and after an inspection of the scree plot (Catell, 1966) to confirm the final structure. Finally, in addition to deploying a PCA for the HPMood scale, multiple regression analyses are performed to confirm the interrelationships between items and their contribution to the GLS conform to expectations from The Australian Centre on Quality of Life (2017).

5.3.4.3 Multi-group CFA: Establishing Measurement Invariance

Multi-group CFA's are performed within Part C of Study 1 using version 24 of AMOS. The multi-group CFA examines whether each measure functions identically (invariantly) for each national group by testing for systematic disparities between each group's data. If there are no systematic disparities between groups, the instrument is said to demonstrate measurement invariance. To establish invariance, the model-fit of the standard sample is compared at four, progressively stricter levels of measurement: *Configural*, *Metric*, *Scalar*, and *Strict*.

Multi-group CFA's examine changes in model fit to sample data at four increasingly stringent levels of measurement. Each level of measurement is now briefly described followed by a description of the comparative statistics used to asses invariance.

5.3.4.4 Measurement levels

Each measurement level answers the following research questions:

Configural:	Do the instrument's items load onto the same factor across each group?
Metric:	Are factor loadings the same across groups?
Scalar:	Are item intercepts the same across groups?
Strict:	Are the item residuals the same across groups?

Configural invariance tests the assumption that an instrument represents the same factors across groups (Gregorich, 2006). It is the least stringent of the four assumptions and is tested first. Upholding this assumption requires that the instrument's items load onto the same factor/s within each group (Tomyn et al., 2013). As a result, it can be concluded similar, but not identical, latent variables exist in the groups (Chen, Sousa, & West, 2005).

If configural invariance is supported, metric invariance is tested. If factor loadings of each item are identical, there is evidence for the factor having the same meaning within each group (Kamody et al., 2014). It follows that the inability to establish metric invariance indicates that respondents within different groups having different understanding of at least some items. Additionally, Gregorich suggests patterned response sets (e.g. high, middle, or low) also produce a biased subset of the factor loadings for one group. Therefore, considering earlier discussions, whereby some

Asian contexts avoid extreme responding on scales in favour of middle options, metric invariance is an important consideration when examining the results from India and Nepal.

If metric invariance is achieved, scalar invariance tests the association of latent factor and observed group means. This examines whether the groups share the same item intercepts (Gregorich, 2006). Failure at this point is indicative that at least one item intercept is of a different magnitude across groups. To examine these intercepts, AMOS constrains item intercepts to equality across the national groups. Establishing scalar invariance provides evidence that observed scores are related to the latent scores, indicating that respondents would obtain the same score on the observed variable irrespective of group membership (Milfont & Fischer, 2010). Therefore, when scalar invariance is reached, a valid comparison between latent means can be undertaken.

Assuming scalar invariance, strict invariance, is tested. To test this hypothesis, AMOS constrains all residual variances (the sum of specific and error variance) to equality across groups to determine, whether a comparison of means, calculated from items directly, are meaningful. Failure at this point suggests at least one item's residual variance is of different magnitude across groups.

Lastly, during invariance testing using AMOS, two methodological issues are now explained as impacting upon the accuracy of results from a multi-group CFA. For comparisons between the metric and configural supposition, AMOS constrains factor means to 0. This is necessary to ensure the model is identifiable for the configural and metric models but is unnecessary for scalar and strict models. Second, AMOS forces factor variances to be equal across groups for the strict supposition, which is an overly robust assumption and not part of evaluating strict invariance. In response, the multi-group CFA is run once to glean invariance results between the metric and configural models, then, run a second time with the equality of group means constraint removed and the factor variances freed to gather the scalar and strict invariance results.

5.3.4.5 Comparative statistics

Invariance between groups is tested by evaluating changes in model fit, as each more stringent assumption is compared to the prior model. For example, the metric is compared to the configural (baseline) assumption, followed by a comparison between the scalar and metric and lastly, the strict is compared to the scalar. For each comparison, to consider the model invariant across the Australian, Indian and Nepali groups of unequal sizes, changes (Δ) to any two CFI, RMSEA or SRMR statistic must not exceed the preset levels determined by Chen (2007). These cutoff values are as follows:

Factor loadings: ΔCFI $\geq$ .005, ΔRMSEA $\geq$ .015 or SRMR $\geq$ .025.

Intercepts/residuals: ΔCFI $\geq$ .005, ΔRMSEA $\geq$ .010 or SRMR $\geq$ .005.

The level of invariance reached by the model is determined by the level at which change in the goodness-of-fit indices does not exceed the pre-determined cut-off values suggested by Chen (2007). The level of invariance required to validly compare mean scores between groups is contentious. For example, while Stokes et al. (2018) state strict invariance is the ideal, Milfont and Fischer (2010) considers strict invariance produces a theoretically important finding that is unnecessary and rarely achieved, arguing that scalar invariance is adequate.

The current study favours establishing strict invariance. If strict invariance is not achieved, comparisons of mean scores across cultures are less precise. Such failure is indicative of one group exhibiting greater carelessness or indecision during responding

(Fuller-Tyszkiewicz, 2018), or the impact from various unknown cultural bias (Cummins, 2018) thereby, decreasing interpretive precision.

5.4 Summary and Conclusion

In summary, demonstrating strict invariance is integral to my choice of analytic strategy. A fundamental advantage of multi-group CFA's over comparisons employing multiple regression analysis is the inclusion of error within CFA's computations. Multiple regression analysis assumes errors in explanatory variables are non-existent, which "may lead, ultimately, to serious inaccuracies" (Byrne, 2010, p. 3). By contrast, as explained in Section 3.2, cross-cultural SWB research necessarily involves differences in language and culture, which introduce common method bias. This makes direct comparisons invalid without first demonstrating measurement invariance (Cummins, 2018). Therefore, allowing item residuals to inform the suitability of cross-cultural comparisons requires the multi-group CFA demonstrate invariance between groups at the strict level.

In conclusion, as explained above, the approach taken here is consistent with Van De Schoot, Schmidt, De Beuckelaer, Lek, and Zondervan-Zwijnenburg (2015) who assert that, without strict invariance being demonstrated, it is impossible to validly compare latent factor means between national groups.

Part A: Standard Sample

5.5 Introduction

The aim of Study 1, Part A, is to establish each scale's item content produce the best fit between the hypothesized models and their observed data collected from within Australia, using data gathered from the 23rd Australian Wellbeing Unity Index survey (*N* = 1796). The final good-fitting factorial model for each scale employed within Study 1, is hereafter referred to as the model's *standard sample.*

5.6 Results

5.6.1 Descriptive Statistics.

The descriptive statistics for each countries' sample are listed in Table 3 below.

Table 3. Number of participants prior to and after data cleaning

Country	Participants			
	Number		Gender[a]	
	Original	Cleaned data (%)[b]	Male	Female
Australia	2110	1796 (85.1%)	850 (47.3%)	946 (52.7%)
India	169	155 (91.7%)	82 (53%)	73 (47%)
Nepal	166	153 (92.2%)	83 (54%)	70 (46%)

Note: [a] Gender statistics after data were cleaned. [b] % of original participants remaining after cleaning.

Table 3 confirms that, after data are cleaned, the minimum required sample size of 106 (explained in 5.3.4.1) to establish an absolute fit for the PWI-A was achieved for each country.

5.6.2 Personal Wellbeing Index (PWI-A)

The International Wellbeing Group (2013) describe Personal Wellbeing Index (PWI) as a measure of the subjective experiences of wellbeing in accordance with homeostasis theory. To confirm that the factor models are invariant across the three countries, the first step is to establish a standard sample by testing the model fit using confirmatory factor analysis (CFA; AMOS, 24 Amos Development Corporation, PA).

Study 1 begins by applying a CFA to the PWI-A. The CFA returned a significant χ^2 statistic ($\chi^2_{(14)} = 159.03$; $p < .001$) indicative of a poor-fitting model. In response, a second analysis is conducted to confirm the χ^2 result by compensating for the χ^2 statistic's oversensitivity to sample size. Reiterating Section 5.3.4.1, the compensatory method includes randomly extracting eight samples ($n = 106$), with redraw, and submitting these to a CFA. The χ^2 values are then then log-transformed, and results averaged, converted back to a real number, and subjected to a χ^2 significance test using χ^2 significance tables, degrees of freedom and means. Results are reported in Table 4.

Table 4: Analysis of the PWI-A compensating for the χ^2 statistic's oversensitivity to sample size from eight samples, each n = 106, drawn from the 23rd Australian Wellbeing Unity Index survey (N = 1796).

χ^2						
Raw	**Transformed**	**Raw Mean**	**Transformed Mean**	**Re-converted Mean**	**d*f***	**p-*Value***
34.97	3.55	29.61	3.31	27.36	14	0.017
9.24	2.22					
31.65	3.45					
40.64	3.70					
24.13	3.18					
40.72	3.70					
29.00	3.36					
26.50	3.27					

Notes: Indicators of a good fitting model to data are: A non-significant (p < .05) χ^2 Hu and Bentler (1999).

Table 4 shows that despite compensating for the sensitivity of the χ^2 statistic, the log-transformed χ^2 ($\chi^2_{(14)} = 27.36$; p < .05) did not yield a good fit to these data. Therefore, recommendations from Stokes et al. (2018) suggest progressively removing items as a function of their standardised regression weights, beginning with the smallest. After the item is removed, SEM explores the subsequent impact on model fit. If the removal of the item does not produce a good fitting model to data, a second item is removed according to the same procedure. This process is continued until a minimum of 4 items is reached.

In response to the significant χ^2 statistic, the original CFA's ranked order of PWI-A items are reported in Table 5 to identify an item for removal.

Table 5: PWI-A: CFA item ranking and goodness-of-fit statistics from the 23rd Australian Wellbeing Unity Index survey (*N* = 1796).

Instrument	**Item**	**Rank**	**Standardised regression weight**
PWI-A	1. Standard of living	1	.70
	2. Health	7	.46
	3. Achieving	2	.68
	4. Personal relationships	6	.56
	5. Personal safety	4	.62
	6. Community	5	.59
	7. Future security	3	.66

5.6.2.1 PWI-A: Individual item removal

Excursus 1

Before proceeding to remove health, Table 6 highlights an anomalous finding from those reported over the last 16-years by The International Wellbeing Group. The finding relates to the rank order of PWI-A domains. For example, results over 16-years has shown that satisfaction with personal relationships, along with standard of living and achieving, are the three most significant contributors to global life satisfaction (GLS), a proxy used for the latent subjective wellbeing factor (LSW) employed within CFA (Cummins, 2017). So, to find that the personal relationships domain was the second lowest contributor (.62) to the latent subjective wellbeing (LSW) factor is surprising.

To confirm this anomalous CFA finding for the ranked order of the relationship item, a multiple regression analysis (MR) was conducted on the same data (23rd Australian Wellbeing Unity Index survey) regressed onto the GLS variable. Results reported in Table 6.

Table 6: Domains predicting global life satisfaction (GLS)

Australia			
Item	β	**sr²**	**Rank**
1. Standard of living	0.241***	3.700	2
2. Health	0.062**	0.310	4
3. Achieving	0.357***	7.900	1
4. Personal relationships	0.219***	3.530	3
5. Safety	0.009	0.006	7
6. Community connection	0.039*	0.110	6
7. Future security	0.046*	0.144	5
R^2		.51***	
Adjusted R^2		.51***	
Unique variance		15.7%	
Shared variance		35.30%	

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.
Key: sr^2 = part correlation squared X 100 (contribution to total variance in GLS).

Results from Table 6 show the R for the regressions is significantly different from zero, $F(7, 1788) = 269.02$, $p < .001$. In addition, three items making the strongest unique contribution to explaining GLS, in descending order are, achieving in life (sr^2 = 7.90), standard of living (sr^2 = 3.70) and personal relationships (sr^2 = 3.53).

Excursus 2

To confirm this unexpected finding, results from data collected by the 20th Australian Unity Wellbeing Index (AUWI-20) were also analysed using MR and CFA and then compared with those from AUWI-23. Data cleaning for the AUWI-20 were identical to this study and demographics were comparable [*N* = 1,423; females *(N* =767); males (*N* =595); ages ranged between 13 to 96 years old (M=60.88, SD= *1*4.16)]. MR and CFA results are reported within Table 7. In addition, Table 7 reproduces comparisons between these Australian data, a composite of all data collected from 33 AUWI surveys (AUWI:1-33) and data collected from India and Nepal. Considering the variant functioning of the PWI-A domains as a function of MR or CFA, and, the focus of the current thesis' cross-cultural comparisons between PWI-A performance within Australia, India and Nepal, these data are considered salient.

Table 7: Multiple Regression (MR) and confirmatory factor analysis (CFA) standardised regression weight comparisons of rank order of the PWI-A domains between data from a combined set of Australian Unity Index Surveys that includes Survey 1-33 (AUWI:1-33 (*N* =55,467), 23rd Australian Wellbeing Unity Index survey (AUWI:23; *N* = 1796), 20th Australian Wellbeing Unity Index survey (AUWI:20; *N* = 1423), India (*N* = 155) and Nepal (*N* = 153).

Ranking [MR =β-standardised coefficient (β-sc) and sr^2 (%); CFA=Standardised Regression Weights (SRW)]

	Standard of Living		Health		Achieving		Personal Relationships		Safety		Community		Security	
	MR	CFA	MR	CFA	MR	CFA	MR	CFA	MR	CFA	MR	CFA	MR	CFA
AUWI:1-33	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW
	.293	.648	.088	.412	.245	.643	.218	.468	.007	.487	.064	.498	.072	.674
β-sc Rank	1	2	4	7	2	3	3	6	7	5	6	4	5	1
	sr^2		sr^2		sr^2		sr^2		sr^2		sr^2		sr^2	
	6.0%		0.65%		4.20%		3.88%		0.005%		0.36%		0.33%	
sr^2 Rank	1		4		2		3		7		5		6	
AUWI:23	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW
	.241	.701	.062	.466	.357	.682	.219	.563	.009	.620	.039	.591	.046	.664
β-sc Rank	2	1	4	7	1	2	3	6	7	4	6	5	5	3
	sr^2		sr^2		sr^2		sr^2		sr^2		sr^2		sr^2	
	3.68%		0.31%		7.89%		3.53%		0.01%		0.19%		0.14%	
sr^2 Rank	2		4		1		3		7		5		6	
AUWI:20	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW
	.312	.646	.091	.479	.336	.680	.206	.508	.001	.592	.059	.532	.003	.742
β-sc Rank	2	3	4	7	1	2	3	6	7	4	5	5	6	1
	sr^2		sr^2		sr^2		sr^2		sr^2		sr^2		sr^2	
	6.86%		0.65%		7.07%		3.31%		0.0001%		0.26%		0.0004 %	
sr^2 Rank	2		4		1		3		7		5		6	
India	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW
	.283	.759	.058	.518	.016	.750	.194	.498	.031	.809	.082	.564	.135	.818
β-sc Rank	1	3	5	6	7	4	2	7	6	2	4	5	3	1
	sr^2		sr^2		sr^2		sr^2		sr^2		sr^2		sr^2	
	3.8%		0.20%		0.01%		2.53%		0.025%		0.24%		0.10%	
sr^2 Rank	1		4		7		2		6		3		5	
Nepal	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW	β-sc	SRW
	.347	.707	.146	.597	.149	.541	.092	.446	.029	.709	.233	.430	.060	.764
β-sc Rank	1	3	4	4	3	5	5	6	7	2	2	7	6	1
	sr^2		sr^2		sr^2		sr^2		sr^2		sr^2		sr^2	
	7.45%		1.61%		1.66%		0.67%		0.05%		4.16%		0.23%	
sr^2 Rank	1		4		3		5		7		2		6	

NB: The PWI-A relationship domain MR and CFA results are in bold for ease of comparisons.

Table 7 shows the same contradictory findings concerning the ranked order of the relationship and security domains between MR and CFA findings from all data, except for Nepal. The explanation for these contradictory findings is discussed in Section 5:11.

Health Removed

Returning to the production of the PWI-A standard sample, the 7-item CFA returned health with the lowest standardised regression weight; therefore, the original analysis was repeated omitting this domain. However, the analysis again produced a significant χ^2 statistic ($\chi^2_{(9)} = 109.68$; $p < .001$), showing the removal of health did not yield a good fitting model. The results are shown in Table 8.

Table 8: Revised PWI-A: Analysis compensating for the χ^2 statistic's oversensitivity to sample size from eight samples, each n = 106, drawn from the 23rd Australian Wellbeing Unity Index survey (N = 1796) with health removed.

χ^2						
Raw	Transformed	Raw Mean	Transformed Mean	Re-converted Mean	d*f*	p-*Value*
26.54	3.27	20.65	2.91	18.52	9	0.03
6.32	1.84					
17.80	2.87					
39.07	3.66					
15.46	2.73					
23.15	3.14					
21.32	3.05					
15.51	2.74					

Notes: Indicators of a good fitting model to data are: A non-significant ($p < .05$) χ^2 Hu and Bentler (1999).

In order to identify an additional item for removal, Table 9 identifies the personal relationships item with the lowest standardised regression weight.

Table 9: Revised PWI-A: CFA item ranking and goodness-of-fit statistics from the 23rd Australian Wellbeing Unity Index survey (N = 1796) with health removed.

Instrument	**Item**	**Rank**	**Standardised regression weight**
PWI-A	1. Standard of living	1	.69
	3. Achieving	3	.64
	4. Personal relationships	6	.57
	5. Personal safety	4	.63
	6. Community	5	.59
	7. Future security	2	.66

Notes: Indicators of a good fitting model to data, recommended by Hu and Bentler (1999), are CFI ≥ .95; RMSEA < .06; SRMR < .05.

Analysis of the 5-item PWI-A, with personal relationships removed, also returned a significant χ^2 statistic ($\chi^2_{(5)} = 83.14$; $p < .001$), which was also confirmed by a subsequent log-transformed χ^2 analysis, with results listed in Table 10.

Table 10: Revised PWI-A: Analysis compensating for the χ^2 statistic's oversensitivity to sample size from eight samples, each *n= 106* = 106, drawn from the 23rd Australian Wellbeing Unity Index survey (N = 1796) with health and personal relationships removed

χ^2						
Raw	Transformed	Raw Mean	Transformed Mean	Re-converted Mean	d*f*	p-*Value*
23.17	3.14	14.15	2.51	12.38	5	0.03
3.97	1.37					
10.14	2.31					
23.95	3.17					
9.28	2.22					
12.58	2.53					
18.94	2.94					
11.20	2.41					

Notes: Indicators of a good fitting model to data are: A non-significant χ^2, RMSEA < .06, CFI ≥ .95 and SRMR < .05 as recommended by Hu and Bentler (1999).

Results from Table 11 designates community with the next lowest standardised regression weight; therefore, this item is now removed and the 4-item PWI-A analysed for model fit.

Table 11: Revised PWI-A: CFA item ranking and goodness-of-fit statistics from the 23rd Australian Wellbeing Unity Index survey (N = 1796) with health and personal relationships removed

Instrument	**Item**	**Rank**	**Standardised regression weight**
PWI-A	1. Standard of living	1	.69
	3. Achieving	3	.62
	5. Personal safety	3	.62
	6. Community	4	.59
	7. Future security	2	.68

Notes: Indicators of a good fitting model to data, recommended by Hu and Bentler (1999), are CFI ≥ .95; RMSEA < .06; SRMR < .05.

CFA results from the log-transformed analysis (Table 12) returned a non-significant χ^2 statistic ($\chi^2_{(2)}$=2.22; p = .32).

Table 12: Revised PWI-A: Goodness-of-fit statistics from eight samples, each n = *106*, drawn from the 23rd Australian Wellbeing Unity Index survey (N = 1796) with health, personal relationships and community removed.

χ^2						
Raw	Transformed	Raw Mean	Transformed Mean	Re-converted Mean	d*f*	p-*Value*
8.64	2.15	4.36	0.79	2.22	2	0.32
0.33	-1.09					
1.95	0.67					
13.14	2.57					
0.42	-0.86					
1.80	0.59					
1.48	0.39					
7.16	1.96					

Notes: Indicators of a good fitting model to data are: A non-significant (p < .05) χ^2 Hu and Bentler (1999).

It is concluded, from the Chi-square results, that the 4-item PWI, omitting the items of health, personal relationships, and community yields an acceptable model fit. In addition, the adjunctive statistics of RMSEA, CFI and SRMR also confirm an acceptable model fit (.05, .98 and .01 respectively) to these Australian data. Therefore, it is concluded that a standard sample is validly achieved by removing health, personal relationships and community from the original PWI-A scale.

Results for the RSES, PCS, DASS-7D, R-LOT, HPMood

The preceding format for PWI-A results is now shortened for the remaining scales. This restriction is predicated on the pre-eminence of the χ^2 statistic as a measure of model fit, outlined in Section 5.3.4.1. Therefore, results for the log-transformed χ^2 statistic are reported in summary form as criterion for each scale's goodness of fit (See Appendix A for a list of full result tables). CFA results, listing a rank order of items as a function of their standardized regression weights are reported only when scale items require identification for deletion to improve model fit. Finally, RMSEA, CFI and SMRM statistics are described as an adjunct to the final log-transformed χ^2 statistic.

5.6.3 Rosenberg Self-esteem Scale (RSES)

Study 1 continues by examining the plausibility of the 5-item version of the RSES. The RSES is the most widely employed instrument for measuring self-esteem (Rosenberg, 1965). A CFA returned a significant χ^2 statistic ($\chi^2_{(5)}$= 136.41; p < .001), confirmed by the log-transformed χ^2 statistic ($\chi^2_{(5)}$= 11.04; p < .05), revealing the RSES is not a good fitting model (See Appendix A, Table 57). Continuing the analysis, item 3 ("I am able to do things as well as most other people") was identified with the lowest standardised regression weight (See Appendix A, Table 58), therefore, the original investigation was repeated omitting this item. The subsequent log-transformed χ^2 statistic ($\chi^2_{(2)} = 9.18$; $p = .05$) reveals the removal of item three did not produce a good fitting model, confirmed by RMSEA, CFI and SRMR statistics .121, .719 and .048 respectively (See Appendix A, Tables 59 and 60). Since CFA is valid only for a single factor model comprising a minimum of four items, a standard sample for the 4-item RSES was not produced.

Rather, the validity of the RSES is further examined by removing a second item, (Item 1: "On the whole, I am satisfied with myself"), which returned the next lowest standardised regression weight (See Appendix A, Table 61), and the 3-item RSES examined using a principal component analysis (PCA).

5.6.3.1 PCA results for the 3-item RSES

Descriptive statistics and PCA results for the 3-item RSES are listed in Table 13.

Table 13: Mean, Standard deviations (SD), correlations and component matrix for the 3-item RSES from the 23rd Australian Wellbeing Unity Index survey ($N = 1796$).

	Mean (%SM)	**SD**	**Correlations**			**Component matrix**
Item			2	4	5	Australian sample
2	81.10	13.95	-			.90
4	83.00	14.82	.77	-		.93
5	80.90	16.73	.71	.78	-	.91

Key: Item 2 = "I feel that I have a number of good qualities." Item 4 = "I feel I am a person of worth, at least on an equal plane with others." Item 5 = "I take a positive attitude towards myself."

The 3-item RSES was subjected to PCA using SPSS version 25. Prior to performing PCA, the suitability of these Australian data for factor analysis was assessed. Inspection of the correlation matrix (Table 13) revealed all coefficients above .3. In addition, the Kaiser-Meyer-Olkin value was .74, exceeding the recommended value of .6

and Bartlett's Test of Sphericity reached statistical significance (p < .001). These results support the factorability of the correlation matrix (Tabachnick & Fidell, 2014).

The PCA revealed the existence of one component with an eigenvalue exceeding 1, accounting for 83.61% of the variance. As only a single component was extracted, no rotation is available (Tabachnick & Fidell, 2014). Table 13 shows the factor loadings of the three RSES items.

These results support the validity of the 3-item RSES scale for Australia. Therefore, this revised version of the RSES scale is used as the reference for comparisons made between Australia, India and Nepal in Part B of the current study.

5.6.4 Perceived Control Scale (PCS)

The Perceived Control Scale measures the extent to which individuals feel they are in control of their lives. The scale, in its present form, was created for the current study and has never been employed beyond India and Nepal. Thus, as the PCS has not been utilised within Australia, invariance between the three countries cannot be established. However, if a standard sample is produced from either Indian or Nepali data, an invariance test can be applied between these two contexts. CFA results are reported from the Indian sample, as chronologically, this was the first group engaged.

A CFA analysis, to examine whether the scale produces a one-factor model that is a good fit to these Indian data (N = 155), returned a non-significant χ^2 ($\chi^2_{(5)} = 6.83$; p = .23), indicative of a good model fit, and an RMSEA= .048, CFI = .93 and SRMR = .07 (See Appendix A, Table 62). Therefore, a log-transformed χ^2, averaged from 8 sub-samples, was not required. In addition, no further alterations to the PCS were required to produce a standard sample.

5.6.5 Depression, Anxiety and Stress Scale (DASS-7D)

The 7-item version of the Depression, Anxiety and Stress Scale (DASS-21, Lovibond & Lovibond, 1993) assesses symptoms of depression over the past week. An initial CFA based on the log-transformed average of 8 sub-samples ($\chi^2_{(14)} = 19.22$; $p = .15$) reveals the DASS-21D is a good fitting model (See Appendix A, Table 63). The RMSEA and SRMR (.05 and .04 respectively) confirm the model is a good fit to these Australian data (See Appendix A, Table 64). Whilst the CFI (.84) is below the cut-off value recommended by Hu and Bentler (1999) (≥ .95), reiterating Section 5.3.4.1, the χ^2 statistic is the cardinal criterion for model fit. Therefore, a standard sample for the DASS-7D was produced.

Revised Life Orientation Test (LOT-R) and Homeostatically Protected Mood (HPMood)

Reiterating Section 5.3.4, for single factor models, four items are the minimum allowed by AMOS before the model is reported "just-identified" as AMOS is unable to calculate fit indices. Therefore, as the Revised Life Orientation Test (LOT-R) and Homeostatically Protected Mood scale (HPMood, Cummins & Wooden, 2014) both contain only three items, these scales are now verified using a PCA.

5.6.6 Revised Life Orientation Test (LOT-R)

Scheier and Carver (1985) designed the LOT-R as a 3-item measure of optimism. Descriptive statistics and PCA results for the LOT-R are listed in Table 14.

Table 14: Mean, Standard deviations (SD), correlations and component matrix for the LOT-R from the 23rd Australian Wellbeing Unity Index survey (*N* = 1796).

	Mean (%SM)	**SD**	**Correlations**			**Component matrix**
Item			1	2	3	Australian sample
1	83.50	8.52	-			.64
2	79.60	14.84	.34	-		.85
3	81.80	14.70	.28	.56	-	.82

Key: Item 1 = "In uncertain times, I usually expect the best." Item 2 = "I'm always optimistic about my future." Item 3 = "Overall, I expect more good things to happen to me than bad."

Prior to performing a PCA of the LOT-R, the suitability of these Australian data for factor analysis was assessed. Inspection of the correlation matrix (Table 14) revealed two coefficients above .3. To be considered suitable for factor analysis the correlation matrix ought to reveal at least some correlations of $r = .3$ or greater (Pallant, 2005). In addition, the Kaiser-Meyer-Olkin value was .60, equalling the recommended value of .6 and Bartlett's Test of Sphericity reached statistical significance ($p < .001$). These results support the factorability of the correlation matrix (Tabachnick & Fidell, 2014).

The PCA revealed the existence of one component with an eigenvalue exceeding 1, accounting for 60.1% of the variance. As only a single component was extracted, no rotation is available (Tabachnick & Fidell, 2014). Table 14 shows the factor loadings of the three LOT-R items.

These results support the validity of the 3-item LOT-R scale for Australia. Therefore, this revised version of the LOT-R scale is used as the reference for further comparisons between Australia, India and Nepal in Part B of the current study.

5.6.7 Homeostatically Protected Mood (HPMood)

Researchers theorise that the affective component of subjective wellbeing (SWB) is best described by a tri-cluster of terms that together form a construct referred to as homeostatically protected mood (HPMood, Cummins & Wooden, 2014). Descriptive statistics and PCA results for the HPMood are listed in Table 15.

Table 15: Mean, Standard deviations (SD), correlations and component matrix for the HPMood scale from the 23rd Australian Wellbeing Unity Index survey (*N* = 1796).

	Mean (%SM)	**SD**	**Correlations**			**Component matrix**
Item			1	2	3	Australian sample
1	78.34	15.85	-			.85
2	72.89	17.04	.39	-		.67
3	77.18	16.07	.48	.23	-	.75

Key: Item 1 = "How happy do you generally feel?" Item 2 = "How content do you generally feel?" Item 3 = "How alert do you generally feel?"

Prior to performing a PCA of the HPMood scale, the suitability of these Australian data for factor analysis was assessed. Inspection of the correlation matrix (Table 15) revealed two coefficients above .3. This meets the criterion from Pallant (2005) who states that suitability for factor analysis requires at least some correlations of $r = .3$ or greater. In addition, the Kaiser-Meyer-Olkin value was .6, equaling the recommended value of .6 and Bartlett's Test of Sphericity reached statistical significance ($p < .001$). These results support the factorability of the correlation matrix (Tabachnick & Fidell, 2014).

The PCA revealed the existence of one component with an eigenvalue exceeding 1, accounting for 58.2% of the variance. As only a single component was extracted, no rotation is available (Tabachnick & Fidell, 2014). Table 15 shows the factor loadings of the three HPMood items. These results provide evidence for the validity of the 3-item HPMood scale for Australia.

5.6.7.1 HPMood, GLS and the PWI-A

In addition to the PCA, to further confirm the HPMood scale is operating as expected, mean and standard deviations of HPMood, GLS and the PWI-A are compared, and a multiple regression conducted by regressing the HPMood items against GLS. These investigations, testing the validity of the HPMood scale to these Australian data are based upon prior results. First, GLS typically correlates about .70 with the PWI-A and is subsequently viewed as an approximation of SWB (See Table A2.6, Cummins et al., 2013), second, prior analyses by Davern et al. (2007) found HPMood items, together, share 64 % of the variance with the PWI-A (International Wellbeing Group, 2013).

Therefore, mean scores for HPMood, PWI-A and GLS are expected to approximate each other, and, as HPMood perfuses self-report variables such as the GLS, HPMood items are expected to provide significant unique contributions to the prediction of GLS. Results comparing mean GLS, PWI-A and HPMood scores, along with results from a multiple regression, predicting GLS using HPMood, are listed within Table 16.

Table 16: Comparison of means and standard deviations (SD) between GLS, PWI-A and HPMood and results predicting GLS using HPMood from the 23rd Australian Wellbeing Unity Index survey (*N* = 1796)

			Predicting GLS using HPMood			
	Mean (%SM)	**SD**	**HPMood Item**	**B**	**β**	**sr^2**
GLS	79.90	13.01	**1**	.47***	.58	.23
PWI-A	78.50	9.92	**2**	.06***	.08	.01
HPMood	76.13	12.39	**3**	.10***	.12	.01

Key: Item 1 = "How happy do you generally feel?" Item 2 = "How content do you generally feel?" Item 3 = "How alert do you generally feel?"

Unique Variance = .24 — R^2 = .47
Shared Variance = .23 — Adjusted R^2 = .47

* p < .05; ** p < .01; *** p < .001

Table 16 reveals similar mean scores for GLS, PWI-A and HPMood scales and significant contributions of unique variance to the GLS variable from the HPMood scale. In addition, the R for the regression was significantly different from zero, $F(3, 1{,}793) = 525.69$, $p < .001$. Finally, 47% of the variability in GLS was predicted from scores on these.

Combining these results with the PCA results listed in Table 15, support the validity of the 3-item HPMood scale for Australia is supported. Therefore, the original HPMood scale is retained as a reference for further comparisons of the HPMood's psychometric patterns between Australia, India and Nepal in Part B of the current study.

5.7 Conclusions

The main aim of Study 1 (Part A) was to confirm that the factor models for each instrument used within Australia, were consistent with their collected data. Australian data ($N = 1{,}796$), collected by the 23rd Australian Wellbeing Unity Index survey, were employed as these most closely match data used to establish the original factorial structures.

The primary statistic used to evaluate the plausibility of each factorial model was a log-transformed χ^2 and its p-value. χ^2 was calculated by structural equation modelling (SEM) analysis of results from eight randomly extracted smaller samples with redraw, each ($n = 106$).

Once each instrument's original factor model, or a revised version, validly reflected the factor loadings, factor variances and covariances, and error variances observed within the sample's data, the model was selected as the standard sample, or reference, for invariance testing within Part B of Study 1.

Results from Part A supported the production of standard samples for each instrument analysed. The standard samples include the following:

1. A 4-item version of the original 7-item PWI-A (Items retained: standard of living, achieving, personal safety and, future security).
2. A 3-item version of the original 5-item RSES scale (Items retained: "I feel that I have a number of good qualities," "I feel I am a person of worth, at least on an equal plane with others" and, "I take a positive attitude towards myself").
3. The original 5-item PCS scale.
4. The original 7-item DASS-7D scale.
5. The original 3-item LOT-R scale.
6. The original 3-item HPMood scale.

Therefore, following the production of these six standard samples, Study 1, Part B, now confirms the Australian standard samples within the Indian and Nepali groups, separately.

Part B: Confirming Standard Samples within Indian and Nepali Groups

5.8 Introduction

The aim of Study 1, Part A, was to produce a standard sample for each scale using Australian data. As shown, results from a series of confirmatory factor analyses (CFA) and principal component analyses (PCA) supported the production of standard samples for all instruments. The aim of Study 1, Part B, is to confirm the Australian standard samples within the Indian and Nepali groups, separately.

5.8.1 Testing Standard Samples with ≥ 4 items

Scales with standard samples consisting of ≥ 4 items are as follows:

1. A 4-item iteration of the adult Personal Wellbeing Index (PWI-A).
2. The original depression subscale from the Depression, Anxiety and Stress Scale (DASS-7D).
3. The original 5-item Perceived Control Scale (PCS).

5.8.1.1 CFA Results

For Indian and Nepali groups, CFA results for scales consisting of ≥ 4 items are listed in Table 17 (see Section 5.3.4.1 justifying χ^2 as the primary fit statistic).

Table 17: CFA results for each ≥ 4 item scale's standard sample within India and Nepal

Model	Country	χ^2	*p*	*df*
PWI-A4	India (N = 155)	18.76***	.000	2
	Nepal (N = 153)	3.74	.153	2
DASS-7D	India (N = 155)	28.14*	.013	14
	Nepal (N = 153)	6.94	.936	14
PCS	India (N = 155)	6.8	.233	5
	Nepal (N = 153)	9.6	.086	5

Notes: Indicators of a good fitting model to data are: A non-significant ($p < .05$) χ^2 Hu and Bentler (1999).
*p < .05; **p < .01; **p < .001

As shown in Table 17, the PWI-A4 and the DASS-7D standard samples are a good fit to Nepali data, however, not those data collected from India. In addition, the PCS is a good fitting model to data collected from both India and Nepal.

5.8.2 Testing Standard samples consisting of ≤ 3 items

For scales consisting of ≤ 3 items, a series of PCA's are employed to validate standard samples within Indian and Nepali groups (see Section 5.3.4.2 explaining the necessity of employing a PCA for scales with ≤ 3 items).

The scales with standard samples of ≤ 3 items are as follows:

1. A 3-item version of the Rosenberg Self-esteem Scale (RSES).
2. The Revised Life Orientation Test (LOT-R).
3. The Homeostatically Protected Mood scale (HPMood).

5.8.2.1 PCA Results

Descriptive statistics and PCA results for India and Nepal are listed in Table 18-19 respectively.

Table 18: Mean (%SM), Standard deviations (SD), correlations and component matrix for the 3-item RSES, the LOT-R scale and the HPMood scale from data collected within India (*N* = 155)

Standard Sample	Mean	SD	Correlations			Component matrix
3-item RSES			2	4	5	
2	76.94	18.97	-			.84
4	82.19	17.66	.52	-		.80
5	83.12	17.39	.44	.51	-	.79
LOT-R items						
			1	2	3	
1	67.71	24.74	-			.88
2	71.48	24.00	.63	-		.84
3	76.70	22.36	.56	.48	-	.80
HPMood scale items			1	2	3	
1. Happy	74.83	17.88	-			.86
2. Alert	74.06	19.32	.39	-		.80
3. Content	77.03	17.77	.57	.50	-	.76

Table 19: Mean (%SM), Standard deviations (SD), correlations and component matrix for the 3-item RSES, the LOT-R scale and the HPMood scale from data collected within Nepal (N = 153)

Standard Sample	**Mean**	**SD**	**Correlations**			**Component matrix**
3-item RSES			2	4	5	
2	84.34	15.63	-			.83
4	87.89	14.17	.49	-		.76
5	78.55	21.14	.30	.37	-	.68
LOT-R items						
			1	2	3	
1	77.96	18.81	-			.78
2	73.75	20.58	.23	-		.70
3	86.44	14.93	.17	.06	-	.49
HPMood scale items			1	2	3	
1. Happy	75.32	17.90	-			.83
2. Alert	75.59	21.11	.33	-		.81
3. Content	69.07	20.82	.54	.36	-	.70

The 3-item RSES

Prior to performing a PCA on the 3-item RSES, the suitability of these Indian and Nepali data for factor analyses were assessed. Results from Tables 18 and 19 reveal all correlation coefficients above .3. This matrix confirms the suitability of data for a PCA whereby at least some correlations are required to be r = .3 or greater (Pallant, 2005). In addition, the Kaiser-Meyer-Olkin value for India is.68, and for Nepal, .61. These Kaiser-Meyer-Olkin values exceed the recommended minimum value of .6 (Pallant, 2005). Finally, the Bartlett’s Test of Sphericity reached statistical significance for both India and Nepal (p < .001). Therefore, results support the factorability of the correlation matrix (Tabachnick & Fidell, 2014).

The PCA revealed the existence of one component with an eigenvalue exceeding 1, accounting for 66.10% and 58.40% of the variance for India and Nepal respectively. Table 18 and 19 report the factor loadings of the three RSES items.

PCA results support the internal validity of the 3-item RSES scale for India and Nepal. Therefore, this revised version of the RSES scale is used as the reference for comparisons made between Australia, India and Nepal in Part C of the current study.

The LOT-R scale

The LOT-R scale was also subjected separately to a PCA using Indian and Nepali data. However, prior to the PCA, the suitability of these data for factor analysis were assessed. The correlation matrix' from Table 18 and 19 revealed all Indian coefficients above .3 and Nepali coefficients below.3. To be considered suitable for factor analysis the correlation matrix ought to reveal at least some correlations of r = .3 or greater (Pallant, 2005). Therefore, further analyses assessing the suitability of Nepali data for a PCA are unacceptable.

Continuing the analyses of Indian data, the Kaiser-Meyer-Olkin value was .68, exceeding the recommended value of .6. Finally, the Bartlett's Test of Sphericity reached statistical significance ($p < .001$). These results support the factorability of the Indian correlation matrix (Tabachnick & Fidell, 2014).

A subsequent PCA revealed the existence of one component with an eigenvalue exceeding 1, accounting for 70.28% of the variance for India. Table 18 shows the factor loadings of the LOT-R items.

Results support the internal validity of the original 3-item LOT-R scale for India, but not Nepal. Therefore, the LOT-R scale is used as the reference for comparisons made between Australia and India in Part C of the current study.

The HPMood scale

Inspection of the HPMood scale's correlation matrix' for India and Nepal revealed all coefficients above .3 (Table 18 and 19). This meets the criterion from Pallant (2005) who states that suitability for factor analysis requires at least some correlations of $r = .3$ or greater. In addition, the Kaiser-Meyer-Olkin value was .65 for India and .62 for Nepal, surpassing Tabachnick and Fidell's (2014) minimum recommended value of .6. In addition, the Bartlett's Test of Sphericity reached statistical significance for both groups ($p < .001$). These results support the factorability of the correlation matrix (Tabachnick & Fidell, 2014).

A subsequent PCA identified one component with an eigenvalue exceeding 1, accounting for 65.87% and 60.91% of the variance for India and Nepal respectively. Table 18 and 19 report the factor loadings of the three HPMood items. These results provide evidence for the internal validity of the HPMood scale within India and Nepal.

5.9 Conclusions

The main aim of Study 1, Part B, was to confirm separately whether standard samples with ≥ 4 items were good fitting models to Indian and Nepali data. To test these, a series of CFA's were conducted. In addition, to validate the standard samples with ≤ 3 items within India and Nepali groups, a series of PCA's were conducted. Results are summarized in Table 20:

Table 20: Results summary from India and Nepal

Australian Standard Sample	**Analysis**	**Confirmed**	
		India	Nepal
PWI-A4	CFA	No	Yes
DASS-7D	CFA	No	Yes
PCS	CFA	Yes	Yes
RSES-3	PCA	Yes	Yes
LOT-R	PCA	Yes	No
HPMood	PCA	Yes	Yes

In response to these findings, Part C, can now validly employ a series of multi-group CFA's and PCA's to determine measurement invariance (or, in the case of a PCA, compare psychometric patterns) between the standard samples developed from Australian data, and those standard samples confirmed within Indian and Nepali groups, as listed in Table 20.

Part C: Multi-group CFA and PCA Analyses

5.10 Introduction

The aim of Study 1, Part A, was to produce a standard sample for each scale using Australian data. Subsequently, Part B confirmed separately those Australian standard samples within the Indian and Nepali groups. Results are summarized within Table 21.

Table 21: Part A and B: Results summary

Standard Sample	Analysis	Confirmed	
Part A: Standard samples produced from Australian data			
PWI-A4	CFA	Yes	
DASS-7D	CFA	Yes	
PCS	CFA	Yes	
RSES-3	CFA	Yes	
LOT-R	CFA	Yes	
HPMood	CFA	Yes	
Part B: Testing Standard Samples within India and Nepal		**India**	**Nepal**
Standard Samples with ≥ 4 items			
PWI-A4	CFA	No	Yes
DASS-7D	CFA	No	Yes
PCS	CFA	Yes	Yes
Standard Samples with ≤ 3 items			
RSES-3	PCA	Yes	Yes
LOT-R	PCA	Yes	No
HPMood	PCA	Yes	Yes

The aim of Part C is to employ a series of multi-group confirmatory factor analyses (CFA) and principal component analyses to determine if the Australian standard samples are invariant (or, in the case of PCA, have similar psychometric patterns) between Australian data and those groups where the Australian standard sample were confirmed by Part B's analyses.

In response, invariance testing using multi-group CFA's and PCA's can be validly employed across the combination of groups listed within Table 22.

Table 22: Multi-group CFA and PCA comparisons examined within Part C

Standard Sample	**Analysis**	**Groups**		
Standard Samples with ≥ 4 items		**Australia**	**India**	**Nepal**
PWI-A4	Multi-group CFA	Yes	No	Yes
DASS-7D	Multi-group CFA	Yes	No	Yes
PCS	Multi-group CFA	No	Yes	Yes
Standard Samples with ≤ 3 items				
RSES-3	PCA	Yes	Yes	Yes
LOT-R	PCA	Yes	Yes	No
HPMood	PCA	Yes	Yes	Yes

5.10.1 Invariance testing Standard Samples with ≥ 4 items.

Reiterating Section 5.8.1, a multi-group CFA is relevant only for scales whose standard sample consists of ≥ 4 items. For these scales, invariance across groups is tested at four progressively stricter levels of measurement: *Configural*, *Metric*, *Scalar*, and *Strict*. The invariance criterion recommended by Chen (2007); Cheung and Rensvold (2002) when sample sizes are unequal, is a change (Δ) in the CFI statistic of ≥ .005 between any two of these measurement levels. For example, a ΔCFI of ≥ .005 infers the groups being compared are non-invariant at the stricter of the two measurement levels.

In response to these recommendations, while RMSEA, CFI and SRMR statistics, along with changes to each are reported as a matter of convention, this study follows the cutoff criterion of ΔCFI ≥ .005 as the primary test for invariance, as, according to Cheung and Rensvold (2002) ΔCFI is “independent of both model complexity and sample size, and are not correlated to overall goodness-of-fit measures” (pp. 233, for a full justification for the selection of the ΔCFI criterion, see Section 5.3.4.5, “Comparative Statistics”).

5.10.1.1 The 4-item Personal Wellbeing Index (PWI-A4).

Results from a multi-group CFA using the PWI-A4 across Australia and Nepal are listed in Table 23.

Table 23: Evaluations of Measurement Invariance using the 4-item PWI-A across Australia and Nepal

Invariance Comparison (PWI-A4 Australia/Nepal)						
Model	χ^2	***df***	**ΔCFI**	**CFI**	**RMSEA**	**SRMR**
Configural	22.66***	4	-	.987	.05	.01
Metric	26.94***	7	.001	.986	.03	.01
Scalar	98.99***	11	.034	.952	.06	.02
Strict	282.01***	16	.082	.870	.08	.03

NB: The cut-off value indicating excessive change= Factor loadings: ΔCFI ≥ .005, ΔRMSEA ≥ .015 or SRMR ≥ .025. Intercepts/residuals: ΔCFI ≥ .005, ΔRMSEA ≥ .010 or SRMR ≥ .005.
**p* = .05, ***p* = .01, ****p* = .001

Table 23 reveals the PWI-A4 operates invariantly across Australia and Nepal, at the metric level. Confirmation of invariance at the metric-level ratifies that factor loadings for each item are identical across groups. However, for scalar and strict measurement levels, the ΔCFI exceeds the pre-determined cut-off values (ΔCFI ≥ .005) suggested by Chen (2007). Since scalar invariance has not been achieved, the group mean scores cannot be validly compared.

5.10.1.2 The 7-item Depression Anxiety Stress Scale (DASS-7D).

Results from a multi-group CFA using the DASS-7D across Australia and Nepal are listed within Table 24.

Table 24: Evaluations of Measurement Invariance using the DASS-7D across Australia and Nepal

Invariance comparison (DASS-7D Australia/Nepal)						
Model	**χ^2**	***df***	**ΔCFI**	**CFI**	**RMSEA**	**SRMR**
Configural	274.27***	28	-	.966	.067	.032
Metric	289.09***	34	.001	.965	.062	.032
Scalar	306.40***	40	.002	.963	.058	.032
Strict	1259.97***	47	.128	.835	.115	.054

NB: The cut-off value indicating excessive change= Factor loadings: ΔCFI ≥ .005, ΔRMSEA ≥ .015 or SRMR ≥ .025. Intercepts/residuals: ΔCFI ≥ .005, ΔRMSEA ≥ .010 or SRMR ≥ .005.
**p* = .05, ***p* = .01, ****p* = .001

Table 24 reveals the DASS-7D operates invariantly across Australia and Nepal, at the metric and scalar levels. However, the ΔCFI exceeds the pre-determined cut-off values (ΔCFI ≥ .005) suggested by Chen (2007) at the strict level. Since scalar invariance has been achieved, the group mean scores can be validly compared. In response, mean and standard deviations are reported between the Australian and Nepali groups within Table 25.

Table 25: DASS-7D: Comparisons of scale item mean (%SM) and standard deviations (SD) between Australia and Nepal

Items	**Reference Group**		**Comparison Group**			
	Australia (*N* = 1796)		Nepal (N = 153)			
	Mean	SD	Mean	SD	*F*	Mean difference
1	16.36	21.03	30.65	29.80	70.67***	-14.29
2	24.04	24.75	33.48	32.57	20.41***	-6.6
3	12.02	19.76	26.18	30.92	96.63***	-14.16
4	15.12	22.04	31.38	30.58	102.22***	-33.36
5	13.54	20.18	30.72	29.63	84.12***	-17.18
6	10.33	18.91	24.67	30.09	109.22***	-14.34
7	7.40	16.21	25.26	29.56	190.31***	-17.86

**p* < .05; ***p* < .01; ****p* < .001
Key: Item 1 = “I couldn't seem to experience any positive feels at all.” Item 2 = “I found it difficult to work up the initiative to do things.” Item 3 = “I felt I had nothing to look forward to.” Item 4 = “I felt down-hearted and blue.” Item 5 = “I was unable to become enthusiastic about anything.” Item 6 = “I felt I was not worth much as a person.” Item 7 = “I felt that life was meaningless.”

Table 25 summarizes the mean and standard deviations (SD) for the DASS-7D scale items. The mean scores from Nepal (range: 24.67-33.48; SD: 29.56-32.57) are significantly higher on all items than those drawn from Australia (range: 7.40-24.04; SD: 16.21-24.75).

5.10.1.3 The Perceived Control Scale (PCS).

Due to the construction of the PCS for Study 1, and its subsequent deployment exclusively within India and Nepal, invariance testing is only possible across these two contexts. Therefore, as the scales factorial structure was confirmed within Indian and Nepali groups separately (Study 1, Part B), invariance testing across India and Nepal can now be validly undertaken. Results from a multi-group CFA using the PCS across India and Nepal are listed within Table 26.

Table 26: Evaluations of Measurement Invariance using the PCS across India and Nepal

Invariance Comparison (PCS India/Nepal)						
Model	χ^2	*df*	ΔCFI	CFI	RMSEA	SRMR
Configural	30.11***	10	-	.927	.081	.067
Metric	35.89***	14	.006	.921	.071	.071
Scalar	56.70***	18	.061	.860	.084	.079
Strict	90.05***	23	.102	.758	.097	.085

NB: The cut-off value indicating excessive change= Factor loadings: ΔCFI ≥ .005, ΔRMSEA ≥ .015 or SRMR ≥ .025. Intercepts/residuals: ΔCFI ≥ .005, ΔRMSEA ≥ .010 or SRMR ≥ .005.
**p* = .05, ***p* = .01, ****p* = .001

Results from Table 26 reveal the PCS failed to reach metric invariance. In response, no between country comparisons can be validly drawn.

5.10.2 Invariance testing Standard Samples with ≤ 3 items.

5.10.2.1 Multi-group CFA Results.

For scales consisting of ≤ 3 items, invariance across Australian, Indian and Nepali groups cannot be validly tested for model fit as the degrees of freedom are exhausted by the parameter estimation (i.e.; the number of free parameters is equivalent to the available degrees of freedom) preventing the ability to reject the model (Byrne, 2010). In order to circumvent this limitation, an unrelated variable, case ID, was included within each 3-item model.

Upon the inclusion of case ID, its weight was initially fixed to zero, thus, ensuring no contribution to the model was made by its inclusion. The model was then run as described in Section 5.3.4.1. Incorporating case ID within the model produced a dual effect. First, enough additional degrees of freedom were manufactured to estimate fit indices for the configural model and, upon running the initial analysis, unconstrained estimated standardised regression weights for each selected scale item were produced for each group. Because the unrelated variable cannot contribute to the model, the parameter estimates of the other variables are unaffected. Results listing these weights for a randomly selected item from each scale, are listed within Table 27.

Table 27: Unconstrained estimated standardised regression weights for randomly selected items of the RSES-3, LOT-R and HPMood scales

Scale	Item	Australia	India	Nepal
RSES-3	Item 2: “I feel that I have a number of good qualities.”	.837	.669	.591
LOT-R	Item 2: “I'm always optimistic about my future.”	.827	.726	N/A
HPMood	Item 2: “How content do you generally feel?”	.419	.858	.768

Once each group's estimated item weight was fixed, and the ID variable was removed, the model was re-run and the metric model fit aspects obtained. Removing the inert variable was necessary, because while the variable did not contribute to the parameter estimates, it still contained variance that contributed to the estimate of model fit thus inflating the chi-square.

Finally, the equality of group means constraint was removed and the factor variances freed (see Section 5.3.4.4 justifying this necessity), before the final multi-group CFA was run to gather the scalar and strict fit indices. Results from the multi-group CFA's for all 3-item scales are listed within Table 28.

Table 28: Evaluations of Measurement Invariance using the RSES-3, LOT-R and HPMood scale across Australia, India and Nepal

Invariance Comparison 1: RSES-3 (Australia/India/Nepal)								
Model	χ^2	*df*	ΔCFI	CFI	ΔRMSEA	RMSEA	ΔSRMR	SRMR
Configural	25.93**	9	-	.995	-	.029	-	.009
Metric	15.59**	4	.001	.996	.008	.037	.008	.001
Scalar	53.23***	9	.008	.988	.011	.048	.015	.016
Strict	590.13***	15	.147	.841	.087	.135	.037	.053
Invariance Comparison 2: LOT-R (Australia/India)								
Model	χ^2	*df*	ΔCFI	CFI	ΔRMSEA	RMSEA	ΔSRMR	SRMR
Configural	16.92**	6	-	.989	-	.031	-	.019
Metric	64.81***	2	.048	.941	.095	.126	.008	.011
Scalar	119.21***	4	.049	.892	.004	.122	0	.011
Strict	574.27***	7	.422	.470	.082	.204	.169	.180
Invariance Comparison 3: HPMood scale (Australia/India/Nepal)								
Model	χ^2	*df*	ΔCFI	CFI	ΔRMSEA	RMSEA	ΔSRMR	SRMR
Configural	26.29*	9	-	.982	-	.030	-	.027
Metric	8.56	4	.013	.995	.007	.023	.009	.018
Scalar	45.30***	9	.032	.963	.021	.044	.009	.009
Strict	127.26***	15	.078	.885	.015	.059	.014	.023

NB: The cut-off value indicating excessive change= Factor loadings: ΔCFI ≥ .005, ΔRMSEA ≥ .015 or SRMR ≥ .025. Intercepts/residuals: ΔCFI ≥ .005, ΔRMSEA ≥ .010 or SRMR ≥ .005.
**p* = .05, ***p* = .01, ****p* = .001.

Results from Table 28 reveal the RSES-3 operates invariantly across Australia, India and Nepal, at the metric level. However, for scalar and strict measurement levels, the cut-off values were exceeded (ΔCFI= .008, ΔRMSEA= .011 and ΔSRMR = .015). In addition, Table 28 reveals the LOT-R and HPMood scales failed to reach metric invariance as the cut-off values suggested by Cheung and Rensvold (2002) were exceeded (ΔCFI= .032, .048 ΔRMSEA= .021, .095 and ΔSRMR = .009, .008 respectively. See Section 5.10.1 for a summary of these cut-off values).

5.10.3 Conclusions.

The main aim of Study 1, Part C, was to employ a series of multi-group confirmatory factor analyses (CFA) to determine if the Australian standard samples are invariant between Australian data and those data collected from India and Nepal. Part C's Multi-group CFA results for all scales are summarized in Table 29.

Table 29: Summary of standard sample multi-group CFA results of all employed scales

Scale	**Level of Invariance Reached**				**Countries Compared**		
	Configural	Metric	Scalar	Strict	Australia	India	Nepal
PWI-A4	Yes	Yes	No	No	Yes	Yes	Yes
DASS-7D	Yes	Yes	Yes	No	Yes	N/A	Yes
PCS	Yes	Yes	No	No	N/A	Yes	Yes
RSES-3	Yes	Yes	No	No	Yes	Yes	Yes
LOT-R	Yes	Yes	No	No	Yes	Yes	N/A
HPMood	Yes	No	No	No	Yes	Yes	Yes

To aid inferences, the implications for scales reaching each level of invariance are first summarised as follows:

1. Configural = Scale items load onto the same factor across each group.
2. Metric = The factor loadings are the same across each group.
3. Scalar = The item intercepts are the same across each group.
4. Strict = The item residuals (error) are the same across each group.

5.10.3.1 Configural Invariance.

Results from Table 29 show all standard samples were invariant at the configural level.

5.10.3.2 Metric Invariance.

For the HPMood scale, metric invariance was not achieved. Failure at the metric level of invariance implies at least one factor loading is of a different magnitude across the groups, indicating the factorial model does not have the same meaning within Australia, India and Nepal. While further analyses using AMOS reveal non-invariance between groups on the following two item's factor loadings: "How content do you generally feel?" and "How happy do you generally feel?", these analyses go beyond the aims of Study 1, Part C and are not explored.

5.10.3.3 Scalar Invariance.

Only the DASS-7D reached scalar level. Failure of scales to reach scalar invariance indicates that at least one item intercept is of a different size across groups. This infers the groups are responding differently to one or more items. Confirmation of scalar invariance across Australia and Nepal for the DASS-7D provides evidence that Australian and Nepali groups share the same item intercepts (observed scores are related to the latent scores). Therefore, a valid, albeit cautious comparison of latent mean scores can be made between Australia and Nepal using the DASS-7D (Fuller-Tyszkiewicz, 2018; Milfont & Fischer, 2010).

In response to the DASS-7D reaching the scalar level of invariance, group mean scores from Nepal (range: 24.67-33.48; SD: 29.56-32.57) were then compared to those collected within Australia (range: 7.40-24.04; SD: 16.21-24.75). Results indicated that mean scores within the Nepali group were significantly higher on all items. Implications for this finding are made explicit within Section 5.11.

5.10.3.4 Strict Invariance.

Strict invariance was not achieved by any of the scale's standard samples. Non-invariance at the strict level is indicative of one item's residual variance being of a different size across the groups. Within cross-cultural contexts, the degree groups differ regarding error variance is highly relevant. Failure at the strict level is indicative of the unknown influence of culture (Cummins, 2018). Therefore, as the current study required each standard sample reach the level of strict invariance, valid between country comparisons cannot be made. Implications from these results, along with those returned from Part A and B are now conflated and discussed within the context of cross-cultural use of the scales within India and Nepal.

5.11 Discussion.

The literature review found that many cross-cultural studies comparing subjective wellbeing (SWB) data did not include strategies to minimise the introduction of bias. Bias is introduced to data when variations in responses are produced by a poorly translated scale whereby people misunderstand the intended question or from cultural response tendencies that systematically influence how people rate their feelings. The result is a data set containing bias in addition to the actual inclinations of participants (Lai et al., 2013). For example, when the World Happiness Report documented happiness levels for Japanese participants, averaged 59 points when standardised on a 0-100 percentage point scale, compared to Australia's 73 points, researchers inferred Japanese respondents were less happy than Australians (Helliwell et al., 2017). However, the study did not include precautions to minimise or assess the impact of cultural differences on responding, with the implied premise that the measurement scale performed identically between these two cultural groups. This implication is almost certainly false.

The existence of cultural variations in responding is well attested within SWB literature. For example, research reports the tendency for Asian contexts to value modesty, whereby extreme expressions of emotion are inappropriate (Lau et al., 2005; Zax & Takahashi, 1967). As a consequence, if an Asian respondent is asked to quantify the level of anger felt in the past week, as is the case with the Depression, Anxiety and Stress Scale (DASS), the questionnaire would likely elicit a modest, mid-point response, on an end-defined 0-10 numeric scale (Cummins, 2018). This responding tendency would result in lower scores and would contribute to the difference between the Japanese and Australian groups reported by The World Happiness Report.

5.11.1 Study 1

Therefore, in anticipation of such bias occurring between Australian, Indian and Nepali participants, the prior study assessed strategies designed to limit this confounding influence. To advise on such strategies, a consultancy group was appointed, organised by the Shadarah Community Hospital in Delhi. This included surgeons, nurses and hospital administrative staff fluent in English and Hindi languages. The strategies to limit bias were built into the questionnaire and included a rigorous translation process, outlined in Section 4.3.2.1, and, the use of a faces scale aimed to replace a numeric 0-10 end-defined response scale, described in Section 4.3.2.2. This later precaution was developed in response to the low adult literacy and numeracy rates reported by Unicef (2015), which raised doubts regarding the ability of participants to project their SWB perspectives onto a numeric scale.

To assess the questionnaire and its response scale, the consultation group were given instructions regarding the studies purpose and how to answer the questionnaire using the facial scale. They were then invited to complete the survey. After completion, feedback was sought from the group and recorded. The group unanimously agreed the accuracy of the translation was excellent and affirmed that no changes were required, however, every participant found using the facial scale confusing.

Explaining the source of the confusion, participants reported that each of the 11 faces comprising the facial scale did not represent graduations of happiness from “no happiness at all” to “completely happy.” Rather, the group stated that each face represented a discrete emotion. For example, they identified the single face that represented a feeling of happiness; however, its adjacent facial expression represented someone feeling gracious. Clearly, therefore, the devised scale was not equivalent to the 11-point end-defined scale it was created to replace.

In response, the consultancy group unanimously agreed that all potential respondents would have no difficulty representing their responses on an unadorned, 11-point, end-defined scale, explaining that doctors and staff successfully use this scale as a measure of pain intensity when treating patients at the hospital. The suggestions made by the Indian cohort were then communicated to a second group within Nepal. This group, fluent in English and Nepali, unanimously agreed with the recommendations from their Indian peers. Therefore, after the facial scale was replaced by an 11-point end defined scale, data collection commenced within India and Nepal.

5.11.2 Study 2.

The aim of the study was to confirm whether the introduction of bias was minimized in the SWB data collected within India and Nepal. This was evaluated through measurement invariance (MI) conducted between Australian, Indian and Nepali data. A three-step process was followed.

Step one involved a series of confirmatory factor (CFA) analyses to determine a model that produced the best fit between each scale's hypothesized model and the observed Australian data. The determined model is referred to as the *standard sample*. For two scales, it was necessary to remove some items to produce a standard sample. The adult version of the personal wellbeing index (PWI-A) required the removal of health, connectedness to community and personal relationships. In addition, the Rosenberg Self-esteem Scale (RSES) required the removal of "On the whole, I am satisfied with myself" and "I am able to do things as well as most other people." All other scales required no alterations to their original factorial structure to produce their standard samples.

5.11.2.1 Step 1.

Two major findings associated with the application of CFA are as follows:

1. It was unexpected that the PWI-A scale would require the deletion of items to produce a standard sample using Australian data.

Within the psychological literature, the PWI-A, in its original form, has been confirmed using CFA. For example, examining data from 1,965 Australian participants that were collected using the PWI-A, a CFA by Tomyn et al. (2013) confirmed the uni-dimensional factorial structure of the PWI-A. Further, after an inspection of the CFA's modification indices, these authors report that no modifications to the original model were found "that would substantially improve overall model function" (p. 918). Certain common elements accentuate the salience of the variance. These include the following:

- Data for the 22nd Australian Unity Wellbeing Survey (AUWI-22) and the 23rd Australian Unity Wellbeing Index survey (AUWI-23) were gathered only 12-months apart (2009 and 2010 respectively).

- Each survey used the same 11-point, end-defined measurement scale.

- Both surveys gathered data from English speaking Australian citizens.

- Gender and age sample demographics were similar (the AUWI-22 sample consisted of 54% female and 46% male with ages ranging from 18 to 92 years; the AUWI-23 sample was 48% male and 52% female respondents, with ages ranging between 18 and 93 years).

In the light of these common features, disparate CFA findings were unanticipated. However, it is possible that this anomaly can be explained by statistical methodological differences. In their explanation of incongruent CFA findings in the original PWI-A's model fit to data, the confirmation of factorial structure by Tomyn et al. (2013) was obtained by relaxing the application of goodness-of-fit statistics. Unlike the current study, Tomyn et al. (2013) overlooked the χ^2 goodness-of-fit statistic entirely, citing Chen (2007) who recommends disregarding χ^2 as the primary measure of fit due to its tendency for oversensitivity to sample non-normality and size, such that large sample sizes return a significant χ^2 statistic, despite a small discrepancy between the model and population data.

Although pervasive within SWB literature, the practice of ignoring χ^2 as a goodness-of-fit statistic during CFA is regrettable since it remains the most robust statistic by which to judge model fit (Byrne, 2010; Jöreskog, 1993), provided that methodological procedures are enacted that address χ^2 limitations. In response, the current study averaged results from eight randomly extracted smaller samples (n = 106), with redraw, from the original data set (N = 1,796), therefore, the critique of χ^2 oversensitivity to sample size no longer applies. Also, this study applied a log transformation of its CFA χ^2 results, a widely used method to improve their approximation of normality (Douglas & Wixley, 1986; Feng et al., 2014). This methodology then paved the way for the application of χ^2 as the primary fit statistic whereby a good fitting model to its data requires a non-significant p-value.

The CFA conducted on the PWI-A by Tomyn et al. (2013) returned a χ^2 of 139.43 ($p < .001$). Under the conditions set for the current study, Tomyn's significant χ^2 would not have represented a good fitting model. Therefore, with no strategies in place by Tomyn et al. (2013) to utilize the χ^2 statistic, it is impossible to assess whether the application of the current studies analytic method would have required the removal of PWI-A items to produce a good fitting model. As such, future analyses of the 22nd AUWI, using identical methods to those employed by the current study, would determine whether the original PWI-A or a shortened version best fits data collected within Australia.

2. The second matter requiring explanation is why the removal of personal relationships was required for CFA success. Again, the answer might lie within the statistical

methodology employed and the different variables used within each method.

A review of PWI-A data over 16-years has shown that the domains, satisfaction with personal relationships, along with standard of living and achieving, are the biggest contributors to global life satisfaction, while the security domain usually ranks within the bottom two along with safety (GLS, Cummins, 2017). So, it is surprising to find that relationship was the second lowest contributor and security was amongst the strongest domains associated with the latent subjective wellbeing (LSW) factor. The International Wellbeing Group recommends GLS as a proxy for LSW, stating GLS is "an excellent measure of SWB," (2013, p. 6). However, this recommendation is based on the use of multiple regression, where the PWI-A domains are regressed against GLS (International Wellbeing Group, 2013).

MR involves entering all seven PWI-A domains into the regression equation concurrently. The configuration of this analysis is the variance representing the response to GLS being predicted by the variance resulting from the individual responses to the PWI-A domains.

This predicted variance exists in two forms, shared and unique. The shared variance is shared by the other PWI-A domains. The unique variance is the additional variance contributed by each individual domain and can be used to rank the domains in terms of the strength of their linkage to GLS. The percentage of unique variance is provided by the sr^2 statistic, which is determined by squaring the 'Part' statistic given by the SPSS multiple regression output. This technique places personal relationships consistently within the three PWI-A domains most strongly linked to GLS, and security within the bottom two domains along with safety (Cummins, 2017).

By contrast, the basis for a CFA's generation of PWI-A domain rankings can be described as follows:

1. Rather than focusing on the measured links between PWI-A domains and GLS, CFA is entirely internal to the structure created by the domains to produce a single latent subjective wellbeing factor, LSW.

2. CFA concerns the extent to which the variance represented by LSW corresponds with the measured variance of the PWI-A domains. Further, within CFA, the PWI-A domains are ranked by the strength of their individual connection to the latent factor (Fuller-Tyszkiewicz, 2018). The CFA metric for the strength of these connections is referred to as the standardised regression weight, which measures the linkage between each domain and the LSW factor using the combination of shared and unique variance. Therefore, CFA's standardized regression weight and MR's β-standardised coefficient are analogous.

3. In contrast to the ranking of domains within CFA, MR ranks domains depending on their contribution of unique variance to GLS. As a result, it might be expected that the final MR and CFA ranking of domains would differ from one another. However, this is usually not the case. This is because links between each PWI-A domain and GLS, or LSW, consists mostly of shared variance supplied by the composite affect referred to as homeostatically protected mood (HPMood). As such, unique variance makes "only a very small contribution to the prediction of GLS variance" (Cummins, 2017, p. 19). Therefore, due to the dominant influence of HPMood, CFA and MR, PWI-A domain rankings tend to be approximately the same.

However, similarity of the current studies domain rankings were bought into question by a Spearman's rho analysis, which revealed a statistically non-significant relationship between the CFA ranked order of domains and the MR's sr^2 ($rs[6] = -.107$, $p = .819$). The contrast between rankings was most evident for the relationship and security domains, each returning opposite CFA rankings compared to their MR rankings.

This finding may be suggestive that the relationship and security domains may function differently depending on whether the GLS or LSW variable (and associated analytic method) are employed. If this is the case, theoretical inferences regarding the role of personal relationships and security, drawn from MR analysis, may be applicable only to the measured GLS variable and not the LSW factor. To confirm this study finding rank order differences for the relationship and security domains using MR or CFA, subsequent analyses were performed.

Confirming findings from the PWI-A.

Subsequent MR and CFA analyses were performed using data from four additional sources. These are, (1) a combined set of Australian Unity Index Surveys that includes Survey 1-33 (AUWI:1-33; *N* =55,467), (2) the 20th Australian Wellbeing Unity Index Survey (AUWI:20; *N* = 1423), (3) India (*N* = 155) and (4) Nepal (*N* = 153). Results are listed in Table 7.

In agreement with findings from the AUWI-23, a CFA on data from the AUWI:1-33, AUWI:20 and India found the CFA's standardised regression weight for the relationship domain assigned it to the bottom two domains generated by the LSW factor. By contrast, the security domain ranked the highest. By contrast, using MR, relationship was amongst the top three and security amongst the weakest contributors to GLS.

The exception regarding the MR and CFA contrasting rating of the personal relationship domain (shown in Table 7) is within the Nepali sample. These Nepali findings do not support the argument that the personal relationships domain functions differently between the GLS variable and the LWB factor. Implications for these are now discussed.

PWI-A Summary and Conclusions.

In previous Australian studies, three of the PWI-A domains, standard, achieving, and personal relationships have consistently been found to make the strongest unique contribution of variance to GLS, while security is amongst the lowest. The methodology of these studies has been MR. However, the current study used a different statistical technique, CFA. Using CFA, the major finding was the personal relationship domain was consistently found amongst the lowest contributors to the model using data from the AUWI:1-33, AUWI:23, AUWI:20 and India. In addition, while the security domain is reported as a very weak contributor of unique variance to GLS using MR, using CFA, its standardized regression weight ranks it as number one.

Consequently, all previous studies reporting the dominant influence of the personal relationship domain and the insignificant contribution of security, within the PWI-A model, are only valid concerning the GLS variable. Therefore, statements such as, “over many studies, researchers have found considerable agreement that three kinds of resources — “the Golden Triangle” — are consistently more relevant to subjective well-being than the others” (p. 12), may require tempering. The statement holds for the GLS variable and not, as claimed, for the LWB factor. Likewise, inferences regarding the generation of PWI-A domain rankings by the LSW factor are not valid for the GLS variable.

Finally, by employing the ranked order of items as a function of their standardised regression weights within CFA, the current study was able to validly remove the personal relationship, health and community items, and produce a 4-item standard sample from the AUWI-23 data set. The items retained are standard of living, achieving, personal safety and, future security.

CFA and the χ^2 statistic.

The other major finding stemmed from the common practice of ignoring the χ^2 statistic during CFA. In response, a method was developed retaining the primacy of the χ^2 statistic as a measure of the PWI-A's model fit. The method includes averaging χ^2 results from eight randomly drawn smaller samples, with redraw and employing a log transformation. Both these analytical techniques combat the χ^2 sensitivity to sample size and non-normality. As a result of applying these strategies, the current study was able to produce a good fitting standard sample for the PWI-A using the robust χ^2 goodness of fit statistic.

Therefore, future studies assessing the factorial model of the PWI-A may benefit from adopting an approach that allows for the retention of χ^2 goodness-of-fit statistic. Pressing this point, for PWI-A researchers reluctant to improve their χ^2 due to (a) not having a method that maintains the pre-eminence of the χ^2 statistic, and or (b) holding a-priori resistance to removing domains such as personal relationship based upon the development of SWB theory based on correlations using GLS, this studies method gives a valid way to uphold the primacy of χ^2 and validly remove domains from the model to achieve a good fitting CFA model.

RSES.

The major finding associated with the Rosenberg Self-Esteem Scale (RSES, Rosenberg, 1965) was the unexpected deletion of two items to produce a standard sample using Australian data.

Self-esteem is described by Rosenberg (1979) as an attitude of self-worth held by an individual towards an object. In this case, the object is one's self. Further, an individual's attitude towards themselves gives rise to either positive or negative feelings, at a certain intensity. Finally, Rosenberg (1979) agrees with Kaplan (1975) that maintaining a positive self-worth is fundamental and ubiquitous to human beings.

The most widely employed instrument for measuring self-esteem is the RSES (Rosenberg, 1965). It is favoured by researchers because of its concision, multiple translations and invariance across cultures (Franck, De Raedt, Barbez, & Rosseel, 2008; Schmitt & Allik, 2005). In its original form, the questionnaire asks people, regarding their current feelings, to indicate their level of agreement (measured on a 4-point scale "strongly agree, agree, disagree, strongly disagree), with the following 10 statements:

1. On the whole, I am satisfied with myself.
2. At times I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel I am a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude towards myself.

A self-esteem score is obtained by summing the five positively worded items and five negatively worded items (reverse scored). High scores indicate robust levels of self-esteem. The measure is reported as having sound psychometric properties with test-retest correlations ranging between .82 to .88 and a Cronbach's alpha reported at .86 (Mellor et al., 2008).

However, the original 10-item RSES has been criticised by some researchers. For example, despite researchers using CFA to confirm a single factor RSES (Meng Lin & Shing On, 2018; Michaelides et al., 2016), Song et al. (2011) and Chao et al. (2016) report differential item functioning for the negatively worded items between Western and cross-cultural contexts produce a bi-factorial model. These, and other authors, argue that the differential item functioning is suggestive of the increased cognition required in responding to negatively worded questions on an agree-disagree scale (Quilty et al., 2006; Salerno et al., 2017).

In response, Quilty et al. (2006) recommends using only the five positively worded items, "as the advantages of including both positively and negatively worded items seem to be offset by methodological issues" (p. 114). Therefore, to reduce the possible introduction of bias from the negatively worded items, the Australian Unity Wellbeing Index survey regularly employs the five positively worded items RSES as a measure of self-esteem. The current thesis also adheres to this practice.

Therefore, having anticipated removing a source of bias introduced by the negatively worded items, and the scale's deployment within the current study amongst a culturally similar cohort to its origin, the unexpected finding from the current study was the need to remove a further two items to obtain a good fit to Australian data. The items removed were "On the whole, I am satisfied with myself," and, "I am able to do things as well as most other people."

To investigate this study's finding within SWB literature, despite the construction and recent use of a single-item measures of global self-esteem (Brailovskaia & Margraf, 2018), a search of Medline Complete, MeSH, PsycINFO, socINDEX and Google Scholar failed to locate studies using CFA to confirm a positively worded version of the RSES. In fact, no studies were found employing the 5-item RSES.

Therefore, the current studies finding that the 5-item RSES was not a good fit to its Australian data, is novel. It also follows that a validated 3-item version of the RSES has never been employed within any context. In response, while this study's RSES standard sample would require additional research to confirm its validity within the Australian context, the aim of step 1 is to produce a valid standard sample. This has been achieved. Step 2 now takes the standard sample for each scale and seeks to confirm these within India and Nepal separately, before being utilised in Step 3, within a multi-group CFA to test invariance between Australian, Indian and Nepali data.

5.11.2.2 Step 2.

The aim of Step 1 was to produce a standard sample for each scale using Australian data. Results supported the production of standard samples for all instruments (see 5.7 for a list of each scale's standard sample). The aim of Step 2 is to confirm separately the Australian standard samples within the Indian and Nepali groups.

The major finding is the failure to confirm the standard samples for the 4-item version of the Personal Wellbeing Index (PWI-A4) and the depression subscale of the Depression, Anxiety, Stress Scale (DASS-7D) within India. In addition, within Nepal, the revised Life Orientation Test (LOT-R) is not confirmed.

Before a multi-group confirmatory factor analysis (CFA) can be validly employed to determine measurement invariance across Australian, Indian and Nepali groups, each scale's standard sample requires prior confirmation within Indian and Nepali groups. The multi-group CFA examines whether each measure functions identically (invariantly) for each national group by testing for systematic disparities between each group's data. If there are no systematic disparities between groups, the instrument is said to demonstrate measurement invariance. Therefore, the failure of the PWI-A4 and DASS-7D within

India means a multi-group CFA cannot be conducted comparing Australian and Indian data using these scales. In addition, due to the inability to confirm the LOT-R's standard sample within Nepal, the test for invariance between Australia and Nepal, using this scale, is not valid.

Producing standard samples in Step 1 demonstrated the credibility of each scale's specified model based on data collected by the 23rd Australian Wellbeing Unity Index survey (Cummins et al., 2010). The Australian sample is selected because it most closely matches data employed initially to establish the various factorial structures of each scale. As such, the failure of the PWI-A4, DASS-7D's standard samples within India, and the LOT-R within Nepal, constitute a failure of theory within each of these national contexts (Stokes et al., 2018).

Failure of the PWI-A4 and DASS-7D within India.

In determining the cause of these failures, an examination of results for the PWI-A4 and DASS-7D within India revealed the CFA's returned significant χ^2 statistics ($\chi^2_{(2)} = 18.76$; $p < .001$; $\chi^2_{(14)} = 28.14$; $p < .05$ respectively) indicative of poor-fitting models. A recap of Section 5.3.4.1 reveals why no further analysis of model fit to these Indian data was undertaken. During Step 1, a further compensatory method was applied to the Australian group (N = 1796), which adjusted for the χ^2 statistic's oversensitivity to sample size. This included randomly extracting eight samples (n = 106), with redraw, and submitting these to a CFA. The χ^2 values are then log-transformed, and results averaged, converted back to a real number, and subjected to a χ^2 significance test using χ^2 significance tables, degrees of freedom and means. However, this compensation for sample size was not required for the Indian group due to the already small sample size (N = 155).

To investigate possible causes for the misfitting models, a *post hoc* examination of modification indices (MI) did not identify any obvious modifications to each scale's standard sample that would substantively improve their fit. MI are values given to fixed parameters and represent the expected drop in χ^2 if the fixed parameter was freely estimated in a subsequent re-run of the model. However, analyses of MI and other plausible sources of misfit move the investigation into the domain of exploration and not confirmation, and, as such, are not applicable to this phase of establishing measurement invariance.

Step 2 seeks to confirm each model's standard sample. Once a hypothesized CFA model is rejected, as was the case for the standard samples of the PWI-A4 and DASS-7D, "this spells the end of the confirmatory factor analytic approach, in its truest sense" (Byrne, 2010, p. 89). Therefore, as each scale's standard sample was not confirmed within Indian data, invariance between Australia and Indian data collected by the PWI-A4 and DASS-7D cannot be assessed in the final step of the study using multi-group CFA. Consequently, future research, including specification searchers for the source of misfit between these two scales and their Indian data would be relevant if researchers intend to draw valid comparisons between Australian and India levels of SWB and depressive symptomology.

Failure of the LOT-R within Nepal.

The principal component analysis conducted from data gathered by the LOT-R within Nepal reveals small correlations between all three items (Cohen, 1988). These are reproduced within Table 30.

Table 30: Mean (%SM), Standard deviations (SD) and correlations for the LOT-R scale from data collected within Nepal (N = 153)

Standard Sample	Mean	SD	Correlations		
LOT-R items					
			1	2	3
1	77.96	18.81	-		
2	73.75	20.58	.23	-	
3	86.44	14.93	.17	.06	-

Key: Item 1 = ”In uncertain times, I usually expect the best.” Item 2 = ”I'm always optimistic about my future.” Item 3 = ”Overall, I expect more good things to happen to me than bad.”

To be considered suitable for factor analysis, the correlation matrix between items ought to reveal at least some correlations of r = .3 or higher (Pallant, 2005). However, Table 30 reveals all correlations under .3, with the weakest relationship between Items 2 and 3 (.06). A correlation this small suggests Items 2 and 3 are hardly related. This is surprising for two reasons. First, the correlation between these two items within the Australian data is .56 (p < .001), therefore, the expectation was for a similar relationship from Nepali data, and second, the similarity of the wording for each item.

Regarding the latter, as the LOT-R is a single construct measure that combines three items designed to tap optimism, individual items are not intended to have separate meanings apart from the optimism construct. As such, all items are expected to correlate at least above .3 if they are tapping the same construct (Pallant, 2005). By contrast, the correlation between Items 2 and 3 of .06, suggests that despite the implied similarities between the English rendering of each item, for Nepali respondents, “I’m always optimistic about my future” (Item 2) and, or, “Overall, I expect more good things to happen to me than bad” (Item 3) are possibly being understood apart from the optimism construct. In response, the LOT-R’s standard sample would benefit from additional research identifying the source of these low correlations.

Causal candidates for low correlations between LOT-R items may stem from the translation of the scale from English to Nepali, the official language of Nepal. Despite Nepali researchers confirming the accuracy of the Nepali translation, Nepal is home to 123 languages spoken as a mother tongue, with Nepali spoken by only 44.6% of the population (National Planning Commission Secretariat, 2012). Therefore, it is possible that some respondents where not fluent in Nepali resulting in confusion around the meaning of LOT-R items. This confusion may produce variant meanings unrelated to the optimism construct. In response, while this study's LOT-R standard sample would require additional investigations and possible modifications to confirm its validity within the Nepali context, the aim of Step 2 is to confirm a valid standard sample within Nepal. This has not been achieved and consequently, invariance between Australia and Nepali data cannot be assessed in the final step of the study.

5.11.2.3 Step 3

It is widely acknowledged that cross-cultural use of self-report questionnaires increases the vulnerability of these collected data to bias that threaten the validity of drawn inferences (Cummins, 2018; Gnambs, Scharl, & Schroeders, 2018). Therefore, subjective wellbeing (SWB) investigators must try to minimise the source of potential bias during all stages of their project. This includes the processes of data gathering and subsequent analytic methods, such as a multi-group confirmatory factor analysis (CFA), to determine whether these precautions were successful. Once known factors contributing to bias are identified and minimised, as was the case in Chapter 5, Study 1, a multi-group CFA can confirm whether respondents in each cross-cultural group ascribe identical meanings to principal constructs. Only after establishing this *invariance*, can researchers validly defend between-group differences.

Demonstrating measurement invariance is especially relevant when employing scales created within Western contexts to gather data from groups within cultures such as India and Nepal. Within these cultures, and with only a few exceptions (Bense et al., 2013; Raju et al., 2014; Stevelink et al., 2013; Stevelink & van Brakel, 2013; Van Brakel et al., 2006), previously employed SWB questionnaires originate from Western contexts and do not contain procedures to either limit or test for introduced bias. In addition, the problematic use of Western measures is heightened considering that within national contexts such as Nepal and India, in fact, within all countries, many variant cultures exist alongside each other. This point is succinctly made by Keith (2019) who, in defining culture, notes that it is not synonymous with a person's nationality. Therefore, while the SWB of individuals from within Nepal and India are measured using Western measures, it is likely that a range of variant cultures are simultaneously engaged (Varnum et al., 2010).

Therefore, the main aim of Step 3 was to employ a multi-group CFA to determine if the Australian standard samples created in Step 1 are invariant between Australian, Indian and Nepali groups. The major finding was that no scale reached strict invariance, and only the depression sub-subscale of the Depression, Anxiety, and Stress Scale (DASS-7D) reached scalar invariance across Australia and Nepal. Reaching scalar invariance verifies that both groups are responding the same way to each DASS-7D item. As a result, confirming scalar invariance allows valid comparisons between Australian and Nepali group mean scores (Fuller-Tyszkiewicz, 2018; Milfont & Fischer, 2010).

This finding was expected. Initial doubts regarding the ability of scales to function identically across these countries were raised during Step 1. During this step, the Rosenberg Self-Esteem Scale (RSES) and the adult version of the Personal Wellbeing Index (PWI-A) required the removal of original items to produce good fitting models to

Australian data. Therefore, it was anticipated that if the original factorial structures of these widely used scales failed to fit data akin to those used to construct the scale in the first place, it was highly unlikely they would reach scalar invariance when deployed cross-culturally. The multi-group CFA's confirmed these doubts. It became evident that even modified versions of the RSES and PWI-A failed to demonstrate invariance, along with the Revised Life Orientation Test (LOT-R), Homeostatically Protected Mood Scale (HPMood) and the Perceived Control Scale (PCS). Thus, the conclusion is reinforced that scales developed within Western contexts are vulnerable to strong cultural influences rendering the use of their data for comparative purposes invalid.

This concern remains despite a subsequent study by Jovanovic, Cummins, Weinberg, Kaliterna, and Prizmic-Larsen (2019) reporting the cross-cultural invariance of a 5-item version of the PWI-A. In this study, a multi-group CFA was conducted on data from 5,275 Australian, Bosnian and Croatian respondents. The initial analysis found the PWI-A was not a good fit to these data. In response, a decision was made to remove the community and security domains based upon a conflation of results from CFA and multiple regression analysis. However, during Step 1, a problem was highlighted when researchers identify PWI-A domains for removal during a CFA based upon prior theoretical perspectives developed from multiple regression using the measured global life satisfaction (GLS) construct. The problem is that a CFA, used to confirm the PWI-A, does not employ the GLS construct. By contrast, it uses a latent subjective wellbeing factor (LSW). The difference was found to be crucial. GLS and the LSW factor are not the same variable. Therefore, during Step 1, domains, especially the security domain, were found to function differently depending on which of these two variables is employed.

As a result, Jovanovic's (2019) conclusion that results "indicated that dropping these two items from the PWI is both theoretically and statistically justified" (p. 767), may not be entirely valid. Their conclusion to remove community and security is based on multiple regression showing that these domains were contributing the lowest levels of unique variance to GLS. However, because CFA does not employ GLS, decisions regarding the deletion of domains to improve model fit during CFA, cannot be validly applied to the LSW factor. As such, the finding of invariance is based upon a theoretically fragile premise.

Accordingly, the only published study claiming cross cultural invariance for a modified PWI-A (Jovanovic, Cummins, Weinberg, Kaliterna, & Prizmic-Larsen, 2019) cannot be accepted as valid. Moreover, the inability of this current study's version of the PWI-A to reach scalar invariance and the inability to establish invariance for most other scales, invalidates between country comparisons. The only valid between-country comparison is between Australian and Nepali data gathered using the DASS-7D. Originally, as the data collected by Lovibond and Lovibond (1995) during construction of the original DASS were gathered from university students, adults working within railway-yards, banks, naval docks and an airline company, it was doubtful the depression subscale would fit Australian data.

However, despite the likely demographic differences, the DASS-7D's standard sample was a good fit to both Australian and Nepali contexts and were invariant. Therefore, a valid comparison revealed that mean scores of items measuring depressive symptoms from Nepal are significantly higher on all seven items than those drawn from Australia.

To substantively compare these differences, results comparing depression thresholds for categories of severity reveal that respondents from Australia and those unaffected by leprosy or disability within Nepal, both fell within the *normal* category of severity (see Section 6.4.3.6 for details). However, individual item comparisons reveal the item, “I felt down-hearted and blue,” produces the largest cross-cultural difference in mean scores, the highest from Nepal (Australia = 15.12 and Nepal = 31.38).

An examination of Step 1’s CFA results reveals no obvious reason for Nepal’s higher mean on “I felt down-hearted and blue.” However, during translation, it was noted that this item reflects an Australian vernacular that does not translate. Therefore, during translation, its general meaning, *sadness,* was explained and subsequently translated into Nepali. The resultant translation may have been misunderstood by respondents. In response, further research using a RASH analysis examining differential item functioning may identify any difficulties associated with this item that were not unearthed by Step 1’s CFA. Nevertheless, the current multi-group CFA on these Australian and Nepali data reached scalar invariance, therefore, it is valid to say that whilst participants in both contexts had normal levels of depressive symptoms, Nepali adults, on average, have higher levels within this normal range of scores.

Finally, as all other scales failed to demonstrate scalar invariance, the next study will examine within-country comparisons between people affected by leprosy compared to participants not affected by leprosy using standard samples from all scales.

Chapter 6: Within Country Comparisons

6.1 Introduction and Aims

The previous chapter failed to establish measurement invariance between Australia, Nepal and India on all scales except the depression subscale of the Depression Anxiety and Stress Scale (DASS-7D) between Australia and Nepal. As a result, the only valid between-country comparisons generated were these two contexts regarding depression symptoms. These are shown in Chapter 5.

Chapter 6 concerns the within-country comparisons between people with and without leprosy in Nepal and India. Comparisons use the *standard samples* created for each scale, as these were previously confirmed within both countries using confirmatory factor analysis (CFA) during Step 1 of Chapter 5. Accordingly, the item content of each scale has already been confirmed, and within country comparisons can now be validly drawn using each confirmed scale. The only exception is the optimism scale (LOT-R). These scales, along with whether or not the CFA confirmed their factorial structure within Nepal and India, are reproduced in Table 31 for convenience.

Table 31: Confirmed standard samples within Nepal and India

Australian Standard Sample	Confirmed	
	Nepal	India
PWI-A4	Yes	No
DASS-7D	Yes	No
PCS	Yes	Yes
RSES-3	Yes	Yes
LOT-R	No	Yes
HPMood	Yes	Yes

Key: PWI-A4 = Adult 4-item version of the Personal Wellbeing Index, DASS-7D = Depression subscale of the Depression Anxiety and Stress Scale. PCS = Perceived Control Scale. RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale. LOT-R = Revised Life Orientation Test. HPMood = Homeostatically Protected Mood scale.

The first aim is to examine the differences between people with and without leprosy, as measured by the scales in Table 31 with confirmed factor structure within each country.

The second aim is to examine differences in SWB between Nepali adults, with and without leprosy. This will be expressed as a function of gender, employment, income, literacy, the proximity of the researcher during data collection and depression symptoms. Differences between groups within India are similar, except failure to confirm the DASS-7D excludes the exploration of associations between depression and SWB.

The third aim is to examine the unique contributions to GLS, within Nepal, by each of the PWI-A4 domains, self-esteem, depression symptoms and HPMood of people with and without leprosy as a function of their level of SWB (≥ 70, 51-69, ≤ 50). For the Indian sample, an examination is conducted of unique contributions to GLS variance by HPMood, optimism, self-esteem and perceived control.

The fourth aim is to examine, within both Nepal and India, the extent to which other SWB variables predict GLS for people with and without leprosy, before and after controlling for HPMood.

6.2 Participants

6.2.1 Nepal.

After ethics approval, data were collected from 306 adults, 140 with and 166 without leprosy or disability. Participants were staff, volunteers, and local community members connected to the Anandaban Leprosy Hospital, its associated community workers and outreach clinics, and, students from two adult universities in Kathmandu, Nepal. For a full description of recruitment, see Section 5.2.

6.2.2 India.

Participants were 169 adults unaffected by leprosy or disability and 114 affected by leprosy. Respondents were staff, volunteers, and local community members associated with the Shadarah Community Hospital in Delhi and its associated leprosy colony known as Tahirpur and a second location in the Tirhut region of Bihar, within Muzaffarpur. For a description regarding ethics approvals and methods of recruitment of participants, see Section 5.2.

6.3 Method

6.3.1 Measures.

The measures used to draw within-country comparisons include the following (a full description of scales and their psychometric properties are listed within Section 5.3.1):

1. A 4-item form of the original adult version of the 7-item Personal Wellbeing Index (PWI-A), referred to hereafter as the PWI-A4.

   Items include:

   1. Standard of living
   2. Achieving in life
   3. Personal safety
   4. Future security

2. A 3-item version of the original 5-item Rosenberg Self Esteem Scale (RSES).

   Items include:

   1. I feel that I have a number of good qualities.
   2. I feel I am a person of worth, at least on an equal plane with others.
   3. I take a positive attitude towards myself.

3. The original 5-item Perceived Control Scale (PCS).

   Items include:

   1. I am in control of my life.
   2. I can change the important things in my life.
   3. I feel I have control over the things that happen to me.
   4. I feel I can solve the problems I have.

5. Nothing is stopping me doing the things I want to do.

4. The original 7-item depression subscale of the Depression, Anxiety and Stress Scale (DASS-7D).

   The seven depression items are:

   1. I couldn't seem to experience any positive feels at all.
   2. I found it difficult to work up the initiative to do things.
   3. I felt I had nothing to look forward to.
   4. I felt down-hearted and blue.
   5. I was unable to become enthusiastic about anything.
   6. I felt I was not worth much as a person.
   7. I felt that life was meaningless.

5. The original 3-item Revised Life Orientation Test (LOT-R).

   These items are:

   1. In uncertain times, I usually expect the best.
   2. I'm always optimistic about my future.
   3. Overall, I expect more good things to happen to me than bad.

6. The original 3-item Homeostatically Protected Mood scale (HPMood).

   These items are:

   1. How happy do you generally feel?
   2. How content do you generally feel?
   3. How alert do you generally feel?

6.3.2 Depression Scores.

Regarding depression scores derived from this study's 11-point response scale, according to Lovibond and Lovibond (1995) an individual or group mean score can be placed within one of five categories. These categories constitute different levels of depression severity and are classified as normal, mild, moderate, severe or extremely severe. Converting Lovibond and Lovibond's (1995) category cut-off scores to a % of scale maximum (%SM) to interpret scores derived from the study's 11-point scale, the following formula from Bittar (2009): (cut-off score/42) x (100/1) is applied.

However, this conversion creates discrepancies between each category. For example, applying this formula results in each category's upper cut-off score not reaching the lower cut-off score for the subsequent category. This creates a non-assigned cluster of scores between each category. In response, Bittar (2009) recommends adjusting the lower cut-off scores downwards to prevent omitting valid depression scores. Accordingly, the subsequent converted range of scores (Adj. %SM) for each category are listed in Table 32 and used throughout this study.

Table 32: Original severity cut-off scores for the DASS derived from a 4-point response scale, converted to a percentage of the scale maximum (%SM) and Adjusted %SM (Adj. %SM)

Severity Rating	**4-point**	**%SM**	**Adj. %SM**
Normal	0 - 9	0 - 21.42	0 - 21.42
Mild	10 - 13	23.81-30.95	21.43 - 30.95
Moderate	14 - 20	33.33 - 47.62	30.96 - 47.62
Severe	21 - 27	50.00 - 54.29	47.63 - 64.29
Extremely Severe	28^{+}	66.67^{+}	64.30^{+}

6.3.3 Procedure.

6.3.3.1 Data collection procedure.

Identical procedures were followed within India and Nepal and are previously described within Section 5.3.2.1.

6.3.4 Data Preparation.

IBM 6Statistical Software (Version 26) is employed for data analyses and all cleaning tasks. Original scores on all scales were converted to a 0-100 range (Percentage of Scale Maximum referred to hereafter as percentage points: pp). Since each item was initially rated from 0-10, the conversion was completed by multiplying each raw score by 10. Data cleaning for Indian and Nepali samples for people without leprosy are previously described within Section 5.3.3, therefore, preparation of data related to people affected by leprosy is now listed.

6.3.4.1 'Out-of-range' and missing data.

Prior to analyses, no out-of-range item values were found within data from India or Nepal. SPSS's analyse patterns function of multiple imputation (MI) was then used to reveal no missing values (Pallant, 2005).

6.3.4.2 Response sets.

Response sets occur when a participant scores consistently at the top (10) or bottom (0) of the scale for all PWI-A4 domains. Deleting these cases is recommended by The International Wellbeing Group as they indicate either acquiescent responding or a lack of scale understanding (International Wellbeing Group, 2013). Analyses of PWI-A4 data revealed nine response sets at the top (four from India and five from Nepal) and none at the bottom. These participants were removed from the dataset. Further, participants who failed to successfully complete all three of the Hindi and Nepali scale competency questions were deleted. From India, four such cases were removed and seven from Nepal.

6.3.4.3 Outliers.

An examination of z-scores revealed univariate outliers on all PWI-A4 items from each national context. However, a comparison of mean scores with each item's upper and lower mean trimmed at 5% produced no significant influence on mean scores. Accordingly, all values were retained (Pallant, 2005).

In addition, the critical Chi-square criterion of 22.46 ($df = 6$, $p < .001$) identified one multivariate outlier on the PWI-A4 domains from India, and eight from Nepal. An independent-samples t-test revealed no significant difference in mean scores before and after removal of outliers on any instrument. Removing these outliers leaves 114 Indian and 140 Nepali participants affected by leprosy.

6.3.4.4 Skew and Kurtosis.

Skewness and Kurtosis are considered acceptable within the range of -7.0 to 7.0 (Pallant, 2005). All variables are within this range.

6.3.4.5 Multicollinearity and Singularity.

Using the cleaned dataset, the independent variables associated with the PWI-A4 were tested with collinearity diagnostics performed in SPSS 26 for multicollinearity and singularity. According to Pallant (2005), the cut-off points for determining the presence of multicollinearity are Tolerance values < .10 and Variance Inflation Factor (VIF) values >10. The reported Tolerance values, as measures of multiple correlations with other variables and suggestive of multicollinearity, are all >.10. The Tolerance values for the PWI-A4 range from .60 (Safety) to .65 (Achieving). The VIF represents the inverse of Tolerance values. Reported VIF values for the PWI-A4 ranged from 1.53 (Achieving) to 1.64 (Safety). These results indicate no multicollinearity in these data.

6.3.4.6 Sample size.

Tabachnick and Fidell (2014) suggest the determination of adequate sample sizes for multiple regression analysis is $N \geq 50 + 8m$. N = minimum number of respondents and m = number of independent variables (IVs) in the model. In the current study, the maximum number of independent variables in any regression analysis is 5. Accordingly, applying the formula produces a minimum required sample size of 90. Thus, the Indian sample of 114, and the Nepali sample of 140 participants are both adequate to achieve statistical power for all regression analyses.

6.3.5 Analytic Strategy.

To examine the SWB differences between people with and without leprosy within Nepal and India, a series of one-way analysis of variance's (ANOVA) and two-way between-groups ANOVA's are employed using IBM SPSS Statistical Software (Version 26). Regarding the advantage of the two-way between-groups ANOVA, not only are *main effects* for each independent variable explored, but *interaction effects* are also identified. An interaction effect occurs when the independent variable's impact on a dependent variable is reliant on a contribution from a second independent variable (Pallant, 2005).

In addition to reporting resultant p-values from the ANOVA's, a measure of effect size (*eta squared*) is employed to assess the size of any differences between groups. Cohen (1988) reports an eta squared of .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size. To calculate the eta squared, the following formula is employed:

$$\text{Eta squared} = \frac{\text{Sum of squares between groups}}{\text{Total sum of squares}}$$

Before conducting the analyses, assumptions relevant to one-way ANOVA's and two-way between-groups ANOVA's are verified. These include, confirmation that the dependant variables are continuous, the independent variables are categorical, observations are independent, the absence of significant outliers, and, Levene's test for homogeneity of variances is verified.

Finally, to examine the extent to which SWB variables predict GLS for people with and without leprosy, multiple regression analyses are employed. These analyses predict the GLS variable from a group of independent SWB variables. It is used to assess the predictive power of each SWB variable and their relative contributions of unique variance (Pallant, 2005). In addition, to examine the amount to which SWB variables predict GLS for people with and without leprosy, before and after controlling for HPMood, a *hierarchical multiple regression* is employed. The advantage of using this analytic strategy is its ability to explore the unique contribution of self-esteem to SWB, while controlling for the influence of HPMood amongst people with and without leprosy.

Associations between leprosy, self-esteem and HPMood were discussed in Chapter 2. In this chapter, stigma, which leads to social isolation was discussed as significant threats to an individual's self-esteem. Further, Chapter 2 also revealed that unlike optimism and perceived control, self-esteem continues contributing unique variance to SWB after controlling for HPMood. Therefore, a hierarchical multiple regression explores whether these findings are replicable from people unaffected by leprosy and whether the self-esteem of leprosy affected participants remains as resistant to the influence of HPMood as those without leprosy.

Hierarchical regression involves entering independent variables into the regression equation in a series of ordered steps based on theoretical grounds (Pallant, 2005). For example, Cummins et al. (2018) found evidence that HPMood infuses SWB variables. Accordingly, by employing a hierarchical multiple regression, researchers can enter the SWB variables and HPMood sequentially. This allows the independent variables to be assessed in terms of what they add to the dependent variable, in this instance, after controlling for HPMood. An example of a hierarchical multiple regression is described within the manual for the PWI-A (International Wellbeing Group, 2013), and summarized, using the current example, as follows:

Step 1: A hierarchical regression predicting GLS commences by entering the seven PWI-A domains in combination into the regression equation. Results pertaining to each domain's contribution of unique variance can then be assessed.

Step 2: To examine the impact of a subsequent variable such as HPMood, Step 2 involves entering the variable and examining two results. These are (a) when entered into the regression equation, does HPMood contribute unique variance to GLS, and (b) what is the impact on the original PWI-A domains with the addition of HPMood? For example, if adding HPMood "systematically reduces the contribution of unique variance, made by any of the existing [PWI-A] domains, to the point that their contribution

> becomes non-significant" (p. 8), the contention from Cummins et al. (2018) that HPMood saturates the PWI-A domains would be supported.

6.4 Results

6.4.1 Descriptive Statistics.

Descriptive statistics for gender, employment status, income, marital status, the proximity of the researcher during data gathering and literacy within Nepal and India are presented in Table 33. Regarding the income variable, during data collection participants were asked to indicate their annual household income. The amounts were used to assign each participant into one of two income categories, above or below the poverty line. The World Bank (2015) puts the poverty line for India at 136 Indian Rupee per day and Nepal, at 217 Rupee per day. Feedback from Nepali and Indian colleagues suggested employing these categories due to a majority of respondents living within the data-collection regions likely experiencing extreme levels of poverty. This advice was followed. Accordingly, estimates for the poverty line from The World Bank (2015) were used to create the two categories of income shown within Table 33.

Table 33: Descriptive statistics for people in Nepal and India with and without leprosy

	Nepal				**India**			
	Leprosy (*N* = 140)		No Leprosy (*N* = 166)		Leprosy (*N* = 114)		No Leprosy (*N* = 169)	
	n	%	*n*	%	*n*	%	*n*	%
Gender								
Male	66	47.10	88	53.00	73	64.00	86	51.00
Female	73	52.90	78	47.00	41	36.00	83	49.00
Employment								
Employed	38	27.10	96	57.80	36	31.58	91	53.84
Unemployed	102	72.90	70	42.20	77	68.42	76	46.16
Income								
> PL	0	0.00	160	96.39	9	7.89	59	34.91
< PL	140	100.00	6	3.61	105	92.11	110	65.09
Marital Status								
Yes	107	76.42	95	57.20	65	57.00	109	64.50
No	32	23.58	71	42.80	49	43.00	59	35.50
Researcher Present during data collection								
Yes	66	47.10	52	31.30	65	57.00	79	46.74
No	74	52.90	114	68.70	49	43.00	90	53.26
Literate								
Yes	84	60.00	134	80.70	67	58.77	143	84.61
No	56	40.00	32	19.30	47	41.23	26	15.39

Key: < PL = below the poverty line and > PL = above the poverty line as determined by The World Bank (2015).

To determine whether these demographic differences are significant between people with and without leprosy within Nepal and India, a Chi-square was performed for each. Results are listed in Table 34.

Table 34: Chi-square results demographic differences between numbers of people with and without leprosy for Nepal and India

Chi-square results				
	Nepal		**India**	
Numbers of people with and without Leprosy	Ns		$\chi^2(1) = 10.68$, $p = .001$ (No Leprosy > Leprosy)	
Demographic	Leprosy	No Leprosy	Leprosy	No Leprosy
Gender	Ns	Ns	$\chi^2(1) = 8.98$, $p = .003$ Male > Female	Ns
Employment	$\chi^2(1) = 29.25$, $p < .001$ Unemployed > Employed	$\chi^2(1) = 4.07$, $p = .044$ Employed > Unemployed	$\chi^2(1) = 14.87$, $p < .001$ Unemployed > Employed	Ns
Income	Variable is constant	$\chi^2(1) = 142.68$, $p < .001$ Above PL > Under PL	$\chi^2(1) = 102.31$, $p < .001$ Under PL > Above PL	$\chi^2(1) = 49.00$, $p < .001$ Under PL > Above PL
Marital status	$\chi^2(1) = 41.25$, $p < .001$ Married > Not Married	Ns	Ns	$\chi^2(1) = 102.46$, $p < .001$ Married > Not Married
Researcher present	Ns	$\chi^2(1) = 23.15$, $p < .001$ No Researcher > Researcher	Ns	Ns
Literacy	$\chi^2(1) = 5.60$, $p = .018$ Literate > Non-Literate	$\chi^2(1) = 62.67$, $p < .001$ Literate > Non-Literate	Ns	$\chi^2(1) = 81.00$, $p < .001$ Literate > Non-Literate

NOTE. A non-significant Chi-square (χ^2) result indicates there are no significant differences between the demographic variable between people with and without leprosy. Key: Ns = Non-significant

6.4.2 Differences with and without leprosy in Nepal and India.

The differences in wellbeing between people with and without leprosy in Nepal are shown in Table 35. This presents the group differences for Global Life Satisfaction (GLS), Subjective Wellbeing (SWB), Homeostatically Protected Mood (HPMood), self-esteem, perceived control, and depression symptoms. Between-groups differences are tested using a one-way ANOVA.

Table 35: Mean (%SM) and Standard Deviations (SD), ANOVA and effect size for all variables measured within Nepal from people with and without leprosy

Nepal	**Leprosy (N = 140)**		**No Leprosy (N = 166)**			
Scale	Mean	SD	Mean	SD	ANOVA	Eta Squared
GLS	58.00	22.82	70.10	19.62	$F(1, 304) = 24.70, p < .001$	.08
PWI-A4	53.89	20.79	70.06	17.29	$F(1, 304) = 55.09, p < .001$	.18
HPMood	58.59	22.53	71.06	17.85	$F(1, 304) = 29.13, p < .001$	.10
RSES-3	65.74	20.02	81.64	15.34	$F(1, 304) = 61.96, p < .001$	.20
PCS	58.98	21.26	73.73	15.91	$F(1, 304) = 48.01, p < .001$	.16
DASS-7D	46.75	22.81	30.51	21.26	$F(1, 304) = 39.42, p < .001$	.13

Key: %SM = percentage of scale maximum. GLS = Global Life Satisfaction, PWI-A4 = Adult 4-item version of the Personal Wellbeing Index, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale, DASS-7D = Depression subscale of the Depression Anxiety and Stress Scale. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

Table 35 reveals that people in Nepal with leprosy have lower levels of all measured positive variables, and higher levels of depressive symptoms. The effect sizes are large to medium. Notably, higher variance is shown for each variable within the leprosy group. Possible reasons for this will be discussed in Section 6.5.

The equivalent differences in India are shown in Table 36. These reveal a similar pattern of differences, but with generally lower effect sizes.

Table 36: Mean (%SM) and Standard Deviations (SD), ANOVA and effect size for all variables measured within India for people with and without leprosy

India	**Leprosy (N = 114)**		**No Leprosy (N = 169)**			
Scale	Mean	SD	Mean	SD	ANOVA	Eta Squared
GLS	52.60	25.07	72.60	20.13	$F(1, 281) = 54.87, p < .001$	.20
HPMood	60.99	20.13	72.74	17.22	$F(1, 281) = 27.58, p < .001$	.10
LOT-R	62.83	22.61	70.07	20.77	$F(1, 281) = 7.68, p < .001$	.03
RSES-3	67.48	29.37	78.75	16.28	$F(1, 281) = 17.11, p < .001$	.06
PCS	59.52	20.68	68.13	16.85	$F(1, 281) = 14.75, p < .001$	.05

Key: %SM = percentage of scale maximum. GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, LOT-R = Revised Life Orientation Test, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale.
Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

In summary, the first aim examined differences between people with and without leprosy in Nepal and India and found that people with leprosy returned lower levels of GLS, HPMood, optimism, perceived control and self-esteem, along with higher levels of depression severity.

6.4.3 GLS, Leprosy and Descriptive Variables.

The second aim examines differences between Nepali adults with and without leprosy in regard to their Global Life Satisfaction (GLS) and as a function of gender, employment, income, literacy, the proximity of the researcher during data collection and depression symptoms. Differences between groups within India will focus only on gender, employment, income and the proximity of the foreign researcher during data collection.

Examining these differences is conducted using two-way between-groups analyses of variance (ANOVA). Due to small sample sizes within two depression severity groups (the *with leprosy* and *mild* severity = 9, and *without leprosy* and *extremely severe* = 8), the normal and mild groups were combined into a single group, as were also the severe and extremely severe groups. This created three depression groups as (1) normal/mild, (2) moderate, and (3) severe/extremely severe.

The Levene's Test of Equality of Error Variances is examined prior to each analysis and discussed only if found to be significant, which is suggestive of non-equal variance of dependent variables across groups. Finally, to control for the likely introduction of Type 1 errors, a Bonferroni adjustment to alpha values is introduced whereby the orthodox alpha level of .05 is replaced by the more stringent alpha level of .01.

Nepal

6.4.3.1 Gender.

The means, standard deviations and ANOVA's for GLS, as a function of gender within Nepal, are listed in Table 37.

Table 37: Comparing gender and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in Nepal

	With Leprosy			**Without Leprosy**				
Gender	**Number**	**M**	**SD**	**Number**	**M**	**SD**	**ANOVA**	**Eta Squared**
Male	66	57.57	23.40	88	73.18	19.03	$F(1, 152) = 20.80$, $p < .001$	.12
Female	74	58.37	22.45	78	66.53	19.79	$F(1, 150) = 5.66$, $p < .05$	.04
ANOVA (Eta Squared)	$F(1, 138) = .043$, $p = .84$			$F(1, 164) = 4.85$, $p < .03$ (.03)				
<u>95% Confidence Intervals</u>								
Male	51.80 – 63.30			69.10 – 77.20				
Female	53.20 – 63.60			62.10 – 71.00				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

Neither the interaction between leprosy and gender $F(1, 302) = 2.36$, $p = .12$. nor the main effect for gender, $F(1, 302) = 1.45$, $p = .23$ were significant. The main effect for leprosy $F(1, 302) = 24.07$, $p < .001$ was significant, as expected. Both men and women affected by leprosy had lower GLS scores, however the effect size is larger for men than for females (partial eta squared = .12). The reasons for this will be discussed in Section 6.5. Finally, while the ANOVA returned a significant difference between Nepali women with and without leprosy [$F(1, 150) = 5.66$, $p = .04$], the 95% confidence intervals estimating the population mean, overlapped (53.20 – 63.60; 62.10 – 71.00), as did the male/female comparison for those without leprosy. Thus, the comparison's predictive effect is reduced.

6.4.3.2 Employment.

Table 38 reports the mean and standard deviations and ANOVAs for GLS as a function of employment in Nepal.

Table 38: Comparing employment and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in Nepal

	With Leprosy			**Without Leprosy**				
Employment	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Employed	38	65.00	21.64	96	74.17	17.63	$F(1, 132) = 5.79$, $p = .01$	.04
Unemployed	102	55.39	24.68	70	64.43	20.89	$F(1, 170) = 7.44$, $p = .01$	.04
ANOVA (Eta Squared)	$F(1, 138) = 5.05$, $p < .05$ (.03)			$F(1, 164) = 10.55$, $p = .001$ (.06)				
95% Confidence Intervals								
Employed	56.88 – 73.11			70.59 – 77.73				
Unemployed	51.14 – 59.64			59.44 – 69.41				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

All trends are as expected. Results of a two-way between-groups ANOVA showed the interaction effect between leprosy and employment was not statistically significant $F(1, 302) = 0.001$, $p = .98$. There was a statistically significant main effect for leprosy $F(1, 302) = 12.70$, $p < .001$ with a small effect size (partial eta squared = .04). The main effect for employment, $F(1, 302) = 14.34$, $p < .001$, also reached statistical significance with a small effect size (partial eta squared = .04).

Table 38 shows people affected by leprosy report significantly lower GLS regardless of their employment status. In addition, unemployed participants report lower GLS in both leprosy groups. However, confident interval overlaps add a cautionary note to result interpretation.

6.4.3.3 Income.

Investigating differences between GLS scores from Nepali participant's with and without leprosy and income levels found the Levene's Test of Equality of Error Variances was significant, indicating the variance of dependent variables across both groups was not equal. Therefore, a more stringent significance level (.01) was used to evaluate the results of the two-way between groups ANOVA. Table 39 reports the mean and standard deviations and ANOVAs for GLS as a function of respondent income levels.

Table 39: Comparing income and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in Nepal

	With Leprosy			**Without Leprosy**				
Income	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
> PL	0	N/A	N/A	5	82.00	13.03	N/A	N/A
< PL	140	58.00	22.82	161	69.68	19.69	$F(1, 303) = 22.93, p < .001$	.01
ANOVA (Eta Squared)	N/A			$F(1, 160) = 3.53, p = .005$ (.10)				

Key: > PL = Over the poverty line. < PL = Under poverty line. N/A = Not applicable.
Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

The interaction effect between leprosy and income was unable to be calculated due to insufficient degrees of freedom. There was a statistically significant main effect for leprosy $F(1, 302) = 22.93$, $p < .001$ with a medium effect size (partial eta squared = .07). The main effect for income, $F(1, 302) = 1.64$, $p < .001$, also reached statistical significance with a small effect size (partial eta squared = .01).

In summary, Table 39 shows people under the poverty line and affected by leprosy report significantly lower GLS scores compared to people under the poverty line without leprosy. Finally, Table 39 shows people without leprosy, and under the poverty line, report significantly lower levels of GLS, with a medium effect size (partial eta squared = .10), than those over the poverty line.

6.4.3.4 Literacy.

Literacy was assessed during data collection by inviting respondents to read a sentence aloud from the questionnaire. Those unable to read were assigned a local Nepali research assistant to read the text as outlined in detail in Section 5.3.2.1.

The Levene's Test of Equality of Error Variances was significant implying that the variance of dependent variables across both groups was not equal. In response, a significance level (.01) was used to evaluate the results of the two-way between groups ANOVA. Table 40 reports the mean and standard deviations and ANOVAs for GLS as a function of literacy in Nepal.

Table 40: Comparing literacy and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in Nepal

	With Leprosy			**Without Leprosy**				
Literacy	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Literate	84	58.09	21.48	134	71.04	19.00	$F(1, 302) = 14.42$, $p < .001$	.08
Non-literate	56	57.85	24.91	32	65.93	21.82	$F(1, 260) = 0.76$, $p < .001$	.05
ANOVA (Eta Squared)	$F(1, 138) = 0.004$, $p = .952$			$F(1, 164) = 1.76$, $p = .187$ (.01)				
95% Confidence Intervals								
Literate	53.43 – 62.75			67.79 – 74.29				
Non-literate	51.18 – 64.53			58.06 – 73.80				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

The interaction effect between leprosy and literacy was not statistically significant $F(1, 302) = 0.77$, $p = .38$. There was a statistically significant main effect for leprosy $F(1, 302) = 14.42$, $p = < .001$ with a small effect size (partial eta squared = .05). The main effect for literacy, $F(1, 302) = 0.932$, $p = .34$, was non-significant.

Trends from Table 40 show people with leprosy have significantly lower GLS scores that those without leprosy, irrespective of literacy. In addition, differences in GLS scores between those with and without leprosy for literate participants is greater than for non-literate participants (partial eta squared = .08 and .05 respectively).

6.4.3.5 Proximity of Researcher.

Differences between GLS scores for Nepali participant's with and without leprosy and the proximity of the researcher during data collection are reported in Table 41.

Table 41: Comparing researcher proximity and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in Nepal

	With Leprosy			**Without Leprosy**				
Researcher	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Present	66	57.72	23.12	52	67.50	21.50	$F(1, 116) = 5.52$, $p = .02$	.04
Not present	74	58.24	22.71	114	71.22	18.67	$F(1, 186) = 18.25$, $p < .001$	.09
ANOVA (Eta Squared)	$F(1, 138) = 0.02$, $p = .894$			$F(1, 164) = 1.29$, $p = .257$				
95% Confidence Intervals								
Present	52.04 – 63.41			61.51 – 73.48				
Not present	52.98 – 63.50			67.76 – 74.69				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

A two-way between groups ANOVA showed the interaction effect between leprosy and proximity of researcher was not statistically significant $F(1, 302) = 0.41$, $p = .52$. There was a statistically significant main effect for leprosy $F(1, 302) = 20.38$, $p = < .001$ with a medium effect size (partial eta squared = .06). The main effect for the proximity of the researcher, $F(1, 302) = 0.709$, $p = .40$, was non-significant.

Table 41 reveals the proximity of the researcher during data collection had no bearing on the participant's measured GLS score. Those with leprosy returned lower GLS scores than those without leprosy, irrespective of researcher location. Finally, the differences in GLS scores between people with and without leprosy was greatest in the absence of the researcher (partial eta squared = .09).

6.4.3.6 Severity of depression symptoms.

Differences between GLS scores from Nepali participants with and without leprosy and the severity of their depression scores are reported in Table 42.

Table 42: Comparing depression severity and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in Nepal

	With Leprosy			**Without Leprosy**				
Depression Severity	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Normal/Mild	29	69.65	22.43	86	75.34	17.40	$F(1, 113) = 1.99$, $p = .16$	.02
Moderate	46	55.87	20.71	41	70.24	16.65	$F(1, 85) = 12.51$, $p = .001$	.12
Severe/ Extremely Severe	65	54.30	23.04	39	58.20	23.04	$F(1, 102) = 0.716$, $p = .40$	.01
ANOVA (Eta Squared)	$F(2, 137) = 5.12$, $p = .007$ (.07)			$F(2, 163) = 11.56$, $p < .001$ (.12)				
95% Confidence Intervals								
Normal/Mild	61.12 – 78.19			71.61 – 79.08				
Moderate	49.71 – 62.02			64.98 – 75.50				
Severe/Ext. Severe	48.59 – 60.02			51.00 – 65.41				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

The interaction effect from a two-way between-groups ANOVA between leprosy and depression severity was not statistically significant $F(1, 300) = 1.71$, $p = .182$. There was a statistically significant main effect for leprosy $F(1, 300) = 10.51$, $p = .001$ with a small effect size (partial eta squared = .03). The main effect for depression severity, $F(1, 300) = 14.82$, $p < .001$, was also significant with a medium effect size (partial eta squared = .09).

Table 42 reveals an unexpected result. The only statistically significant differences between the leprosy groups was within the moderate depression level grouping. This is confirmed by confidence interval overlap in the normal/mild and sever/extremely severe groups. Possible reasons for this are profited within the discussion.

Finally, as expected, within each leprosy group, GLS scores decreased with an increase in depression severity with post-hoc comparisons using the Tukey HSD test indicating the mean GLS score for the normal/mild depression severity group (M = 73.91, SD = 18.85) was significantly different from the moderate (M = 62.64, SD = 20.14, $p < .001$) and the severe/extremely severe group (M = 55.76, SD = 22.71, $p < .001$). The moderate depression group's GLS score (M = 73.52, SD = 16.93) differed significantly from the normal/mild group ($p < .001$).

India

6.4.3.7 Gender.

The means, standard deviations and ANOVAs for GLS, as a function of gender within India, are listed in Table 43.

Table 43: Comparing gender and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in India

	With Leprosy			**Without Leprosy**				
Gender	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Male	73	54.93	26.04	86	75.81	19.55	$F(1, 157) = 33.24$, $p < .001$	.17
Female	41	48.54	22.97	83	69.28	20.29	$F(1, 122) = 26.25$, $p < .001$	.18
ANOVA (Eta Squared)	$F(1, 112) = 6.24$, $p = .19$			$F(1, 167) = 4.55$, $p < .03$ (.03)				
95% Confidence Intervals								
Male	48.85 – 61.00			71.62 – 80.00				
Female	41.28 – 55.78			64.84 – 73.70				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

Results are as expected. Overall, a two-way between groups ANOVA revealed the interaction effect between leprosy and gender was not statistically significant $F(1, 279) = 0.001$, $p = .98$. There was a statistically significant main effect for leprosy $F(1, 279) = 57.46$, $p < .001$ with a large effect size (partial eta squared = .17). The main effect for gender, $F(1, 279) = 5.55$, $p = .02$, did not reach statistical significance of the Bonferroni adjusted alpha level for statistical significance ($p < .01$).

The trends within Table 43 show that both men and women affected by leprosy yield significantly lower GLS scores with large effect sizes (partial eta squared = .17 and .18 respectively and no overlapping confidence intervals, except for the male/female without leprosy comparison).

6.4.3.8 Employment.

Table 44 reports the mean and standard deviations and ANOVAs for GLS as a function of employment.

Table 44: Comparing employment and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in India

	With Leprosy			**Without Leprosy**				
Employment	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Employed	36	58.33	26.77	91	73.95	19.82	$F(1, 125) = 11.01$, $p < .001$	.09
Unemployed	77	49.87	24.08	76	70.52	20.45	$F(1, 151) = 32.64$, $p < .001$	.18
ANOVA (Eta Squared)	$F(1, 112) = 2.76$, $p = .09$			$F(1, 167) = 0.89$, $p = .35$				
<u>**95% Confidence Intervals**</u>								
Employed	49.27 – 67.39			69.82 – 78.08				
Unemployed	44.40 – 55.33			65.85 – 73.57				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

Results of a two-way between-groups ANOVA showed the interaction effect between leprosy and employment was not statistically significant $F(1, 279) = 0.923$, $p = .34$. There was a statistically significant main effect for leprosy $F(1, 279) = 42.47$, $p <$

.001 with a medium effect size (partial eta squared = .13). The main effect for employment, $F(1, 279) = 4.01$, $p < .05$, failed to reach the Bonferroni adjusted alpha level for statistical significance ($p < .01$). In addition, the ANOVA's reported within Table 44 show people affected by leprosy report significantly lower GLS regardless of their employment status.

6.4.3.9 Income.

Table 45 reports the mean and standard deviations and ANOVAs for GLS as a function of participant income levels.

Table 45: Comparing income and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in India

	With Leprosy			**Without Leprosy**				
Income	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
> PL	9	63.33	24.49	59	74.07	17.53	$F(1, 40) = 2.09$, $p = .156$	.05
< PL	105	51.71	25.01	110	71.81	21.42	$F(1, 239) = 43.03$, $p < .001$	.15
ANOVA (Eta Squared)	$F(1, 112) = 1.79$, $p = .183$			$F(1, 167) = 0.48$, $p = .49$				
<u>**95% Confidence Intervals**</u>								
> PL	35.16 – 84.84			59.06 – 80.13				
< PL	46.87 – 56.55			67.76 – 75.86				

Key: > PL = Over the poverty line. < PL = Under poverty line. N/A = Not applicable.
Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

A two-way between-groups ANOVA showed the interaction effect between leprosy and income was not statistically significant $F(1, 279) = 1.21$, $p = .27$. There was a statistically significant main effect for leprosy $F(1, 279) = 13.13$, $p < .001$ with a medium effect size (partial eta squared = .04). The main effect for income, $F(1, 279) = 2.66$, $p = .10$, failed to reach statistical significance.

In addition, and as expected, Table 45 shows people under the poverty line who are affected by leprosy report significantly lower GLS scores than people under the poverty line without leprosy.

6.4.3.10 Literacy

Literacy within India was also assessed during data collection by inviting respondents to read a sentence aloud from the questionnaire. Those unable to read were assigned a local Indian research assistant to read the text as outlined in detail in Section 5.3.2.1.

Table 46 reports the mean and standard deviations and ANOVAs for GLS as a function of literacy.

Table 46: Comparing literacy and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in India

	With Leprosy			Without Leprosy				
Literacy	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Literate	67	56.11	24.30	143	71.46	19.85	$F(1, 208) = 23.53$, $p < .001$	.10
Non-literate	47	47.66	25.55	26	78.84	20.84	$F(1, 71) = 28.25$, $p < .001$	.28
ANOVA (Eta Squared)	$F(1, 112) = 3.21$, $p = .07$			$F(1, 167) = 2.99$, $p = .08$				
95% Confidence Intervals								
Literate	50.19 – 62.05			68.18 – 74.75				
Non-literate	40.15 – 55.16			70.42 – 87.26				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

The interaction effect between the leprosy and literacy was not statistically significant at the Bonferroni adjusted alpha level for statistical significance ($p < .01$), $F(1, 279) = 6.30$, $p = .01$. There was a statistically significant main effect for leprosy $F(1, 279) = 54.45$, $p = < .001$ with a medium effect size (partial eta squared = .16). The main effect for literacy, $F(1, 279) = 0.029$, $p = .86$, was not significant.

Trends from Table 46 show people with leprosy have significantly lower GLS scores that those without leprosy, irrespective of literacy capability. In addition, differences in GLS scores between those with and without leprosy for literate participants is greater than for non-literate participants (partial eta squared = .28 and .10 respectively).

6.4.3.11 Proximity of Researcher.

Differences between GLS scores from Indian participant's with and without leprosy and the proximity of the researcher during data collection are reported in Table 47.

Table 47: Comparing researcher proximity and GLS mean (M = %SM) and standard deviations (SD) between those with and without leprosy in India

	With Leprosy			**Without Leprosy**				
Researcher	Number	M	SD	Number	M	SD	ANOVA	Eta Squared
Present	65	51.23	24.96	79	71.51	20.82	$F(1, 142) = 28.27$, $p < .001$	.16
Not present	49	54.49	25.33	90	73.55	19.56	$F(1, 137) = 24.35$, $p < .001$	.15
ANOVA (Eta Squared)	$F(1, 112) = 0.47, p = .49$			$F(1, 167) = 0.43, p = .51$				
<u>95% Confidence Intervals</u>								
Present	45.04 – 57.41			66.85 – 76.18				
Not present	47.21 – 61.76			69.45 – 77.65				

Note. Eta squared = A measure of effect size, which Cohen (1988) reports as .01 as a small effect size, .06 as a medium effect size and .14 as a large effect size.

A two-way between groups ANOVA showed the interaction effect between leprosy and proximity of researcher was not statistically significant $F(1, 279) = 0.05$, $p = .82$. There was a statistically significant main effect for leprosy $F(1, 279) = 52.34$, $p = < .001$ with a large effect size (partial eta squared = .16). The main effect for the proximity of the researcher, $F(1, 279) = 0.95$, $p = .33$, was non-significant.

Table 47 reveals the proximity of the researcher during data collection had no bearing on the participant's measured GLS score. Those with leprosy returned significantly lower GLS scores than those without leprosy, irrespective of researcher location.

6.4.3.12 Summary

In summary, the second aim examined differences between people with and without leprosy regarding their Global Life Satisfaction (GLS) and as a function of demographic variables. Findings within Nepal and India were generally as expected. People affected by leprosy consistently reported lower levels of GLS than people without leprosy. However, within Nepal and India, there were some unexpected results. For example, as expected, women had generally lower GLS scores than men, however, it was unforeseen that these differences reached statistical significance between men and women without leprosy. In addition, within Nepal, a significant difference in depression severity between people with and without leprosy was only seen within the moderate depression severity group. Possible reasons for these are explored within the discussion.

6.4.4 Relative contribution to SWB under high and low SWB conditions.

The third aim takes a more person-centred approach "based on differences among individuals, or groups of individuals, characterized by distinct SWB profiles" (Busseri, Sadava, Molnar, & DeCourville, 2009, p. 164). This is accomplished by examining the unique contributions to GLS, within Nepal, by self-esteem, perceived control and HPMood for people with and without leprosy as a function of their level of SWB (≥ 70%SM, 51- 69%SM, ≤ 50%SM). SWB scores were derived from the confirmed PWI-A4 scale within Nepal, and GLS scores within India, as the PWI-A4 was not confirmed within this context. As a SWB proxy (Cummins, 2018), GLS is an excellent measure of SWB (International Wellbeing Group, 2013, p. 6). The optimism scale failed confirmation and cannot validly be included. For the Indian sample, an examination is conducted of unique contributions to GLS variance by HPMood, optimism, self-esteem and perceived control as the validity of these scales were confirmed within India.

Reiterating Section 2.5, individuals whose SWB is ≤ 50%SM are likely experiencing homeostatic defeat and have engaged cognitive buffers as adaptive mechanisms, which have failed to maintain the individual's contact with HPMood (Cummins, 2018). Similarly, those with SWB levels between 51 and 69%SM are almost certainly experiencing some challenge to their SWB and engaging buffers in response to a threat. Finally, those with levels of SWB ≥ 70%SM are functioning normally and are under the influence of HPMood with little if any engagement of cognitive buffers (Cummins & Nistico, 2002).

Therefore, testing the relative contribution of unique variance of HPMood and three cognitive buffers (self-esteem, optimism and perceived control) to the prediction of GLS scores in each group, is predicted to show that for the ≥ 70%SM group, HPMood contributes the highest level of unique variance to GLS. By contrast, those within the 51 - 69 and ≤ 50%SM groups are expected to show increasing contributions of unique variance to GLS by the cognitive buffers and decreasing contributions from HPMood. Finally, it is expected that these predictions will hold irrespective of whether participants are affected by leprosy or not. These predictions, are tested using multiple regression analyses, performed for each SWB group (≥ 70, 51-69, ≤ 50%SM), with and without leprosy.

6.4.4.1 Group 1: Nepali and Indian participants with SWB levels of ≥ 70%SM

The first multiple regression tests the relative contribution of HPMood, self-esteem and perceived control to the prediction of GLS for the group whose SWB scores are ≥ 70%SM for Nepali participants with and without leprosy. For Indian participants, the relative contribution of HPMood, optimism, self-esteem and perceived control to the prediction of GLS is tested. It is predicted that HPMood will provide unique variance to

GLS and that the cognitive buffers, self-esteem and perceived control, will contribute little to no unique variance.

Table 48 lists the means, standard deviations and correlations for both leprosy groups.

Table 48: Mean (%SM) and Standard Deviations (SD) and correlations for the SWB scores ≥ 70%SM with and without leprosy samples within Nepal and India

Scale	Mean	SD	1	2	3	4	5
Nepal							
Leprosy (*n* = 31)							
1. GLS	83.22	15.35	-				
2. HPMood	82.90	12.46	.50**				
3. RSES-3	83.87	17.17	.56***	.44**			
4. PCS	78.71	13.35	.31*	.24	.77***	-	
No Leprosy (*n* = 96)							
1. GLS	77.70	17.68	-				
2. HPMood	79.16	12.73	.53***	-			
3. RSES-3	86.80	11.40	.49***	.39***	-		
4. PCS	80.33	10.53	.22*	.21*	.46***	-	
India							
Leprosy (*n* = 34)							
1. GLS	70.58	24.73	-				
2. HPMood	77.45	15.91	.37*	-			
3. LOT-R	74.12	18.67	.32*	.10	-		
4. RSES-3	79.51	29.37	.24	.62***	.10	-	
5. PCS	69.94	18.48	.01	.05	.53**	.24	-
No Leprosy (*n* = 99)							
1. GLS	80.70	17.51	-				
2. HPMood	83.43	9.93	.40***	-			
3. LOT-R	74.64	20.82	.32***	.23**	-		
4. RSES-3	85.99	10.52	.25**	.36***	.31***	-	
5. PCS	75.11	14.34	.12	.23**	.34***	.47***	-

Note. **p* = < .05, ***p* = < .01, ****p* = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Sample sizes for each leprosy affected group do not provide enough statistical power to be deemed reliable (Pallant, 2005). Accordingly, the regression analyses for those affected by leprosy are interpreted cautiously.

The results show no evidence of multicollinearity (correlations above 0.90) demonstrating the variables for both leprosy groups are appropriate for a multiple regression (Tabachnick & Fidell, 2014). In addition, GLS scores for Nepali respondents approximate the theoretical average (80%SM) for a group with SWB scores ≥ 70%SM (Cummins & Wooden, 2014). In addition, correlation values for HPMood and the cognitive buffers were lower than the range between .40 and .60 reported by (Cummins et al., 2018) for Australian data. Reasons for these anomalies are explored within the discussion.

Finally, the multiple regression analyses are presented in Table 49.

Table 49: Multiple regression testing the relative contribution of HPMood, self-esteem, perceived control and optimism to the prediction of GLS for the group whose SWB scores are ≥ 70%SM for Nepali and Indian participants with and without leprosy

Nepal								
		Leprosy (*n* = 31)			No Leprosy (*n* = 96)			
Scale	DV: GLS	B	β	sr^2	DV: GLS	B	β	sr^2
HPMood		.39	.30	.10		.59***	.40	.14
RSES-3		.50*	.55	.10		.52***	.37	.08
PCS		.20	.18	.013		.03	.02	.001
Unique Variance = .21				R^2 = .40	Unique Variance = .22			R^2 = .37
Shared Variance = .12				Adjusted R^2 = .33	Shared Variance = .13			Adjusted R^2 = .35
India								
		Leprosy (*n* = 34)			No Leprosy (*n* = 99)			
Scale	DV: GLS	B	β	sr^2	DV: GLS	B	β	sr^2
HPMood		.44	.29	.05		.58**	.33	.09
RSES-3		.14	.10	.004		.18	.11	.01
PCS		.33	.25	.04		.13	.11	.01
LOT-R		.55*	.41	.12		.20*	.24	.05
Unique Variance = .21				R^2 = .25	Unique Variance = .16			R^2 = .22
Shared Variance = -.06				Adjusted R^2 = .15	Shared Variance = .03			Adjusted R^2 = .19

Within Nepal, HPMood contributed unique variance only for those unaffected by leprosy. Self-esteem made a significant unique prediction to SWB within both leprosy groups. Overall, regressions for participants with and without leprosy were significant, $F(3, 27) = 5.94$, $p < .01$ and $F(3, 91) = 18.18$, $p < .001$; with 33% and 35% respectively of the variability in GLS predicted from the independent variables.

For India, the R for the regression for participants affected by leprosy was not significantly different from zero, $F(4, 29) = 2.47$, $p = .07$); with 15% of the variability in GLS predicted from the four independent variables. By contrast, the R for the regression of people unaffected by leprosy was significantly different from zero, $F(4, 94) = 6.79$, $p < .001$; with 19% of GLS variability predicted from the independent variables.

These results were unexpected. Optimism made a significant unique contribution to GLS in the leprosy affected group while HPMood did not. By contrast, for people unaffected by leprosy, HPMood made a unique contribution of variance, as expected, however, optimism also contributed significant levels of unique variance. Finally, there are large discrepancies between the R^2 and Adjusted R^2 within India.

6.4.4.2 Group 2: Nepali and Indian participants with SWB levels of 51 – 69%SM

The second group of multiple regression analyses test the relative contribution of HPMood, self-esteem and perceived control to the prediction of GLS for the group whose SWB scores are between 51 and 69%SM for Nepali participants with and without leprosy. For Indian participants, the relative contribution of HPMood, optimism, self-esteem and perceived control to the prediction of GLS is tested.

Table 50 lists the means, standard deviations and correlations for both leprosy groups.

Table 50: Mean (%SM) and Standard Deviations (SD) and correlations for the SWB scores between 51 and 69 %SM with and without leprosy samples within Nepal and India

Scale	Mean	SD	1	2	3	4	5
Nepal							
Leprosy (*n* = 52)							
1. GLS	64.61	15.77	-				
2. HPMood	62.95	17.12	.20				
3. RSES-3	63.18	14.97	.32**	.40**			
4. PCS	61.61	17.98	.15	.43***	.60***	-	
No Leprosy (*n* = 63)							
1. GLS	63.50	11.23	-				
2. HPMood	65.71	15.84	.09	-			
3. RSES-3	78.41	13.92	.12	.30**	-		
4. PCS	69.39	15.14	.06	.31**	.24*	-	
India							
Leprosy (*n* = 36)							
1. GLS	50.55	20.09	-				
2. HPMood	62.87	18.10	.10	-			
3. LOT-R	62.50	19.73	.10	.45**	-		
4. RSES-3	66.02	19.12	.24	.26	.60***	-	
5. PCS	59.77	19.45	.08	.50***	.40**	.40**	-
No Leprosy (*n* = 44)							
1. GLS	64.77	17.04	-				
2. HPMood	64.69	13.09	.24	-			
3. LOT-R	67.08	16.94	.01	.28*	-		
4. RSES-3	71.28	17.21	.13	.23	.61***	-	
5. PCS	60.25	16.09	.18	.10	.16***	.22	-

Note. *p = < .05, **p = < .01, ***p = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Sample sizes for each group within Nepal and India do not provide enough statistical power to be deemed reliable (Pallant, 2005). Therefore, the regression analyses for those affected by leprosy are interpreted cautiously.

The results show no evidence of multicollinearity demonstrating the variables for both leprosy groups are suitable for a multiple regression (Tabachnick & Fidell, 2014). The general trends from Table 50 are as expected with all variable mean scores falling below those from the ≥ 70%SM SWB group. However, correlations between HPMood and GLS are low and non-significant. This is at-odds to theory. SWB homeostasis states that for people not experiencing homeostatic defeat, HPMood saturates all self-reported SWB variables (Cummins et al., 2018).

The multiple regression analyses testing the relative contribution of HPMood, self-esteem and perceived control to the prediction of GLS are presented in Table 51.

Table 51: Multiple regression testing the relative contribution of HPMood, self-esteem, perceived control and optimism to the prediction of GLS for the group whose SWB is between 51 and 69%SM for Nepali and Indian participants with and without leprosy

Nepal								
		Leprosy (*n* = 52)			No Leprosy (*n* = 63)			
Scale	DV: GLS	B	β	sr^2	DV: GLS	B	β	sr^2
HPMood		.10	.11	.01		.11	.16	.02
RSES-3		.34	.33	.07		.13	.16	.02
PCS		.08	.09	.005		.05	.07	.004
Unique Variance = .09				R^2 = .11	Unique Variance = .04			R^2 = .04
Shared Variance = -.03				Adjusted R^2 = .06	Shared Variance = -.03			Adjusted R^2 = .01
India								
		Leprosy (*n* = 36)			No Leprosy (*n* = 44)			
Scale	DV: GLS	B	β	sr^2	DV: GLS	B	β	sr^2
HPMood		.11	.09	.01		.27	.22	.04
RSES-3		.33	.30	.05		.23	.23	.03
PCS		.04	.11	.01		.19	.18	.03
LOT-R		.12	.04	.001		.18	.18	.02
Unique Variance = .07				R^2 = .07	Unique Variance = .12			R^2 = .12
Shared Variance = -.02				Adjusted R^2 = .05	Shared Variance = -.01			Adjusted R^2 = .02

Note. *p = < .05, **p = < .01, ***p = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Table 51 shows no cognitive buffers made a contribution of unique variance to GLS. With the 51 - 69%SM group likely experiencing some form of homeostatic threat, it was expected that the cognitive buffers would be significantly engaged.

In addition, the R for the regression for participants affected by leprosy within Nepal and India were not significantly different from zero, For Nepal, results were $F(3, 48) = 2.00$, $p = .13$, with 5% of the variability in GLS predicted from the independent variables, and, India, $F(4, 31) = .55$, $p = .70$, with only 5.4% of the variability in GLS predicted from the independent variables.

For people unaffected by leprosy, in Nepal and India, the R for the regressions were not significantly different from zero, $F(3, 59) = .76$, $p = .52$, with 1.2% of the variability in GLS predicted from the independent variables and $F(4, 39) = 1.26$, $p = .30$ with 2.4% of the variability in GLS predicted from the independent variables respectively.

6.4.4.3 Group 3: Nepali and Indian participants with SWB levels of ≤ 50%SM

The final multiple regression analyses test the relative contribution of HPMood, self-esteem and perceived control to the prediction of GLS for the ≤ 50%SM group for Nepali participants with and without leprosy. For Indian participants, the relative contribution of HPMood, optimism, self-esteem and perceived control to the prediction of GLS is tested.

Table 52 lists the means, standard deviations and correlations for both leprosy groups and shows no evidence of multicollinearity (Tabachnick & Fidell, 2014).

Table 52: Mean (%SM) and Standard Deviations (SD) and correlations for the ≤ 50%SM SWB scores with and without leprosy samples within Nepal and India

Scale	Mean	SD	1	2	3	4	5
Nepal							
Leprosy (n = 66)							
1. GLS	41.36	13.23	-				
2. HPMood	43.08	16.62	.26*				
3. RSES-3	54.89	17.23	.07	.12			
4. PCS	50.18	18.98	.10	.37***	.50***	-	
No Leprosy (n = 24)							
1. GLS	49.58	20.10	-				
2. HPMood	52.77	20.65	.47**	-			
3. RSES-3	66.80	20.32	.38	.56**	-		
4. PCS	63.50	18.55	.25	.24	.64***	-	
India							
Leprosy (n = 44)							
1. GLS	40.45	20.34	-				
2. HPMood	50.64	19.45	.56***	-			
3. LOT-R	54.39	24.19	.12	.35**	-		
4. RSES-3	54.84	17.58	.24	.38**	.32*	-	
5. PCS	51.27	19.97	.38**	.44***	.33*	.36**	-
No Leprosy (n = 26)							
1. GLS	55.00	18.16	-				
2. HPMood	53.07	18.80	.27	-			
3. LOT-R	57.69	21.22	.02	.30	-		
4. RSES-3	63.84	17.32	.12	.29	.40*	-	
5. PCS	54.92	13.18	.16	.05	.18	.20	-

Note. *p = < .05, **p = < .01, ***p = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Similarly, small sample sizes, require the regression analyses in Table 52 be interpreted cautiously. The results in Table 52 are sporadic with no discernible trends. For example, SWB homeostatic theory predicts that, the ≤ 50%SM Nepali group affected by leprosy ought to be experiencing homeostatic defeat and therefore, having lost contact with HPMood, are actively engaging cognitive buffers. Results do not support this.

Rather, HPMood makes a significant contribution of unique variance to GLS while the opposite is shown for those without leprosy. Further, apart from perceived control within the Indian group affected by leprosy, no cognitive buffer contributes unique variance.

The multiple regression analyses testing the relative contribution of HPMood, self-esteem and perceived control to the prediction of GLS are presented in Table 53.

Table 53: Multiple regression testing the relative contribution of HPMood, self-esteem, perceived control and optimism to the prediction of GLS for the ≤ 50%SM SWB group for Nepali and Indian participants with and without leprosy

Nepal								
		Leprosy (*n* = 66)			No Leprosy (*n* = 24)			
Scale	DV: GLS	B	β	sr^2	DV: GLS	B	β	sr^2
HPMood		.21	.27	.06		.42	.44	.13
RSES-3		.04	.06	.002		.002	.002	.000
PCS		.02	.03	.001		.15	.14	.01
Unique Variance = .06				R^2 = .07	Unique Variance = .14			R^2 = .24
Shared Variance = -.03				Adjusted R^2 = .03	Shared Variance = -.01			Adjusted R^2 = .13

India								
		Leprosy (*n* = 36)			No Leprosy (*n* = 44)			
Scale	DV: GLS	B	β	sr^2	DV: GLS	B	β	sr^2
HPMood		.54***	.52	.20		.32	.33	.10
RSES-3		.19	.16	.02		.19	.18	.03
PCS		.19	.18	.03		.18	.13	.02
LOT-R		.04	.05	.002		.02	.03	.001
Unique Variance = .25				R^2 = .36	Unique Variance = .15			R^2 = .13
Shared Variance = .04				Adjusted R^2 = .29	Shared Variance = -.12			Adjusted R^2 = .03

Note. **p* = < .05, ***p* = < .01, ****p* = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Unexpectedly, Table 53 shows no cognitive buffers made any contribution of unique variance to GLS. In addition, the R for the regression for participants affected by leprosy within Nepal was not significantly different from zero, $F(3, 62) = 1.58$, $p = .20$, and, only 2.6% of the variability in GLS was predicted from the independent variables. Similarly, for people unaffected by leprosy, the R for the regression was not significantly different from zero, $F(3, 20) = 2.10$, $p = .13$, with 12.6% of the variability in GLS predicted from the independent variables.

For India, the R for the regression for participants affected by leprosy was significantly different from zero, $F(3, 39) = 5.39$, $p < .001$, and, 29% of the variability in GLS was predicted from the independent variables. By contrast, for people unaffected by leprosy, the R for the regression was not significantly different from zero, $F(3, 21) = 0.80$, $p = .54$, with only 3.2% of the variability in GLS predicted from the independent variables. These results also provide evidence of poor performing models and reasons are considered within the discussion.

6.4.4.4 Summary.

In summary, testing the relative contributions of unique variance to GLS within each of the SWB groups (≥ 70, 51-69, ≤ 50%SM) produced a set of results that were largely uninterpretable. There were no general trends and few results that validly expressed SWB homeostatic theory. Overall, the expected trend of higher significant levels of unique variance supplied to GLS by HPMood within the ≥ 70%SM group than other SWB groups did not eventuate. Neither did results support increasing levels of cognitive engagement with falling SWB levels.

6.4.5 Controlling for HPMood, does self-esteem still predict GLS in Nepal and India?

To test if self-esteem still predicts GLS after controlling for HPMood within Nepal and India, a hierarchical regression will be performed for people with and without leprosy. Associations between leprosy, self-esteem, and SWB were discussed in Chapter 2 and highlighted that stigma associated with contracting leprosy results in people becoming socially isolated, unable to engage in meaningful work and having associated low levels of self-esteem (Adhikari et al., 2014). These conditions are likely precursors for homeostatic defeat, characterised by a loss of contact with HPMood as homeostatic buffers are increasingly engaged, but eventually overwhelmed by strong, sustained, emotional threats (Cummins, 2018).

However, unlike optimism and perceived control, the cognitive buffer, self-esteem, appears more robust and continues contributing unique variance to SWB, even after controlling for HPMood (Mellor et al., 2008). Therefore, a hierarchical multiple regression explores whether these findings are replicable from data collected from people unaffected by leprosy and whether the self-esteem of people affected by leprosy, remains as resistant to the influence of HPMood as those without leprosy.

6.4.5.1 Mean, standard deviations and correlations for people with and without leprosy in Nepal and India.

Table 54 displays the mean and standard deviations and correlations for both leprosy conditions in Nepal and India.

Table 54: Mean (%SM) and Standard Deviations (SD) and correlations for people with and without leprosy within Nepal and India

Nepal							
			Leprosy (N = 140)				
Scale	Mean	SD	1	2	3	4	5
1. GLS	58.07	22.66	-				
2. HPMood	58.59	22.53	.66***				
3. RSES-3	65.74	20.02	.57***	.58***			
4. PCS	60.25	20.81	.49***	.60***	.70***	-	
			No Leprosy (N = 166)				
1. GLS	70.06	19.61	-				
2. HPMood	71.06	17.85	.59***	-			
3. RSES-3	81.64	15.34	.46***	.53***	-		
4. PCS	74.30	15.21	.35***	.42***	.53***	-	
India							
			Leprosy (N = 114)				
1. GLS	52.63	25.06	-				
2. HPMood	62.50	21.01	.52***	-			
3. LOT-R	63.01	20.08	.34***	.46***	-		
4. RSES-3	67.48	29.37	.27**	.30**	.39***	-	
5. PCS	59.52	20.68	.32***	.48***	.51***	.25**	-
			No Leprosy (N = 169)				
1. GLS	72.60	20.12	-				
2. HPMood	73.88	17.39	.54***	-			
3. LOT-R	71.01	19.76	.23***	.33***	-		
4. RSES-3	78.75	16.28	.37***	.55***	.51***	-	
5. PCS	68.13	16.85	.25**	.41***	.34***	.51***	-

Note. *p = < .05, **p = < .01, ***p = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Results from Table 54 show no sign of multicollinearity and singularity therefore variables for both groups are appropriate for a hierarchical multiple regression.

6.4.5.2 The hierarchical regressions for the leprosy samples from Nepal.

The hierarchical regressions for the leprosy samples from Nepal are presented in Table 55.

Table 55: Predicting GLS using self-esteem, perceived control and HPMood for people with and without leprosy in Nepal (*n* = 140 and 166 respectively)

Nepal							
				Leprosy			
	R^2	*Adj.* R^2	ΔR^2	*B*	*SE B*	β	sr^2
Step 1							
PCS				.53***	.08	.49	.24
	.23	.23					
Step 2							
PCS				.18	.11	.17	.01
RSES-3				.51***	.11	.45	.10
	.34	.33	.10				
Step 3							
PCS				.04	.10	.06	.001
RSES-3				.35**	.10	.19	.05
HPMood				.52***	.08	.46	.16
	.50	.49	.16				
				No Leprosy			
Step 1							
PCS				.45***	.09	.35	.13
	.12	.12					
Step 2							
PCS				.19	.10	.15	.02
RSES-3				.49***	.10	.38	.11
	.23	.22	.10				
Step 3							
PCS				.08	.10	.06	.003
RSES-3				.24*	.10	.19	.02
HPMood				.51***	.08	.46	.15
	.38	.37	.15				

Note. **p* = < .05, ***p* = < .01, ****p* = < .001.
Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Two hierarchical multiple regressions were conducted using Nepali data for people with and without leprosy to establish how much variance in GLS can be accounted for by perceived control and self-esteem, after eliminating the variance of HPMood.

For people with leprosy, perceived control was entered at Step 1, accounting for 23% of the variance in GLS. After entering self-esteem in Step 2, the total variance explained by the model increased to 33%, $F(2, 137) = 35.07, p < .001$. However, with the addition of self-esteem, the unique variance contributed by perceived control became non-significant and fell to 1% ($\Delta R^2 = .10$, F change $(1, 137) = 21.50$, $p < .001$. Finally, Step 3 introduced HPMood. The total variance increased to 49%, $F(3, 136) = 44.87, p < .001$, further reducing the unique contribution of variance to GLS by perceived control to only .3%, and for self-esteem, while retaining significance, its unique contribution fell from 11% to 3%. Finally, the unique contribution of variance to GLS made by HPMood was significant ($p < .001$) and at 16%.

For people with no leprosy, perceived control was entered at Step 1, accounting for 12% of the variance in GLS. After entering self-esteem at Step 2, the total variance explained by the model increased to 22%, $F(2, 163) = 24.49, p < .001$. However, with the addition of self-esteem, the unique variance contributed by perceived control became non-significant and fell to only 2% ($\Delta R^2 = .10$, F change $(1, 163) = 22.63$, $p < .001$. Finally, Step 3 introduced HPMood. The total variance increased to 37%, $F(3, 162) = 33.06, p < .001$ further reducing the unique contribution of variance to GLS by perceived control to only .3%, and for self-esteem, while retaining significance, its unique contribution fell from 11% to 2%. Finally, the unique contribution of variance to GLS made by HPMood was significant ($p < .001$) and at 15%.

6.4.5.3 The hierarchical regressions for the leprosy samples from India.

The hierarchical regressions for the leprosy samples from India are presented in Table 56.

Table 56: Predicting GLS using self-esteem perceived control and HPMood for people with and without leprosy in India (*n* = 114 and 169 respectively).

India							
				Leprosy			
	R^2	*Adj.* R^2	ΔR^2	*B*	*SE B*	β	sr^2
Step 1							
LOT-R				.29*	.13	.24	.04
PCS				.24	.12	.20	.03
	.14	.13					
Step 2							
LOT-R				.23	.13	.19	.02
PCS				.22	.12	.19	.03
RSES-3				.13	.08	.15	.02
	.16	.14	.01				
Step 3							
LOT-R				.10	.13	.08	.004
PCS				.05	.12	.04	.001
RSES-3				.08	.07	.09	.007
HPMood				.52***	.12	.44	.13
	.29	.26	.12				
				No Leprosy			
Step 1							
LOT-R				.21**	.08	.21	.04
PCS				.21*	.09	.18	.03
	.10	.09					
Step 2							
LOT-R				.10	.09	.10	.006
PCS				.08	.10	.07	.004
RSES-3				.35**	.11	.29	.05
	.15	.13	.04				
Step 3							
LOT-R				.08	.08	.08	.004
PCS				.01	.09	.009	< .001
RSES-3				.08	.11	.07	.002
HPMood				.56***	.09	.48	.16
	.31	.29	.16				

Note. *p = < .05, **p = < .01, ***p = < .001.

Key: GLS = Global Life Satisfaction, HPMood = Homeostatically Protected Mood scale, RSES-3 = 3-item version of the Rosenberg Self-Esteem Scale, PCS = Perceived Control Scale and LOT-R = Revised Life Orientation Test.

Two hierarchical multiple regressions were conducted using Indian data for people with and without leprosy to establish how much variance in GLS can be accounted for by perceived control and self-esteem after eliminating the variance of HPMood.

For people with leprosy, optimism and perceived control were entered at Step 1, accounting for 13% of the variance in GLS. After entering self-esteem in Step 2, the total variance explained by the model increased to 14%, $F(3, 110) = 6.97$, $p < .001$. However, with the addition of self-esteem, the unique variance contributed by optimism and perceived control became non-significant, while a significant ($p < .01$) amount of unique variance was contributed to GLS by self-esteem. Finally, with the introduction of HPMood during Step 3, the total variance increased to 29%, $F(4, 109) = 11.25$, $p < .001$ and eradicated all the unique contribution of variance to GLS by optimism, perceived control and self-esteem. Finally, the unique contribution of variance to GLS made by HPMood was significant ($p < .001$) and at 1.7%.

For people without leprosy, optimism and perceived control were entered at Step 1, accounting for 9% of the variance in GLS. After entering self-esteem at Step 2, the total variance explained increased to 13%, $F(3, 165) = 9.61$, $p < .001$. However, with the addition of self-esteem, the unique variance contributed by optimism and perceived control both became non-significant. Finally, introducing HPMood during Step 3 increased the total variance to 29%, $F(4, 164) = 18.07$, $p < .001$, and eradicated the unique contributions of variance to GLS by optimism, perceived control and self-esteem. Finally, the unique contribution of variance to GLS made by HPMood was significant ($p < .001$) at 2.6%.

6.5 Discussion

Results support the proposition that people with leprosy are likely experiencing homeostatic defeat. For these individuals, “the basic psychological particle that homeostasis seeks to protect,” HPMood (Capic et al., 2018, p. 1), has become experientially opaque and systemic control arrested by the negatively valenced emotions that are moderated by leprosy.

Results suggestive of people with leprosy experiencing homeostatic defeat include the observation that affected participants returned lower levels of HPMood and higher levels of depression severity. By contrast, results from unaffected people indicate normal transitory homeostatic threats were being effectively buffered by systemic internal and external protective mechanisms. This is evidenced by their higher levels of self-esteem, optimism and perceived control.

Resilience to homeostatic defeat depends on the ability of someone's SWB homeostatic management system to defend against threats such as leprosy. This ability is a function of the capacity of available resources to act against challenges (Cummins, 2010), as outlined in detail within Chapter 2. Leprosy appears to severely compromise the availability of these buffering resources. For example, physical disability's such as blindness and amputation associated with untreated leprosy, makes employment impracticable, thus, removing access to money, a major mechanism supporting SWB (Cummins, 2016). Further, due to stigma, leprosy affected people are excluded from social relationships, including their own families. Lastly, the vernacular understanding that leprosy is the result of divine punishment, coupled with their social exclusion and unemployment means a person's self-esteem, perceived control and optimism regarding their future are significantly compromised.

While people affected by leprosy reported lower SWB levels than unaffected people, results also show an effect for gender. SWB levels for affected men are significantly lower than affected women. For some researchers, this finding is likely anomalous. For example, Dov (1990) reports no gender differences in SWB between

Israeli men and women and Argyle (1987) suggest men are generally happier than women.

However, for Cummins (2014), the current study's findings regarding gender differences are entirely consistent with expectations derived from SWB theory. In fact, Cummins (2014) provides a theoretical explanatory lens for not only this study's findings, but the mixed set of gender results presented elsewhere within SWB literature (Easterlin, 2003). For example, findings reporting no SWB gender differences are easily explained by the central tenant of SWB homeostasis. Specifically, all people, irrespective of gender, have the same genetically determined, unchanging level of a biologically hard-wired, mildly positive mood, referred to as HPMood (Blore et al., 2011; Cummins, 2017; Davern et al., 2007).

Regarding SWB gender differences, SWB homeostasis predicts that if emotional threats are exceptional in either strength or duration, the homeostatic system can fail to maintain a person's contact with HPMood. Gender differences may emerge from the differential salience of emotional catalysts such as unemployment. This was found to be the case by Cummins (2014) and (Joshanloo & Jovanović, 2019). In the study by Cummins (2014), data collected from 38,000 Australian adults between 2001 and 2008 found unemployed Australian women have an almost 4% higher level of SWB than unemployed men. This led Cummins (2014) to conclude that under homeostatic threat from unemployment, "females appear to be more resilient than males" (p. 25). More recently, Joshanloo and Jovanović (2019) and Joshanloo (2018) confirmed the moderating influence of unemployment as a greater predictor of life satisfaction amongst men than women.

Therefore, the current study's finding of affected women returning higher SWB levels than affected men may result from the differential impact of unemployment experienced within patriarchal nations such as Nepal and India. Within these countries, a women's role and value emerge within the family context, not employment (Adhikari et al., 2014). Women generally raise children and care for the family home.

By contrast, men are expected to provide financial resources to the family. Accordingly, contracting leprosy and the subsequent loss of employment, results in men experiencing not only the loss of money, but the loss of a sense of achieving in life, catalysed by unemployment (Lucas et al., 2004). This may bias men over women to greater SWB vulnerability regarding the effects of unemployment (Kushman & Lane, 1980). By contrast, while excommunication is common for affected women, it does not occur in every case. For many fortunate women who remain within their family structure, important buffers such as social relationships and money, are moderated by the continued employment of their husbands and therefore remain accessible and salient to women. Accordingly, SWB homeostasis may provide an explanation for the gender differences in SWB reported by people with leprosy.

The second major finding from this study are results indicating that literacy levels and the proximity of the researcher did not impact these data collected within Nepal and India. Both literacy and researcher proximity are known sources of potential bias in cross-cultural research (Hruschka, Munira, Jesmin, Hackman, & Tiokhin, 2018). In response, protocols were developed to minimize the impact from these potential sources of bias, including supplying an indigenous interpreter for participants unable to read. These interpreters were instructed to follow a detailed protocol outlined within Section 4.3.2.3 including, instructions to read questions to participants without explanation or comment. In addition, a validated, accurately translated paper questionnaire for people who could read, ensured a Western researcher was not proximal during the survey's completion. These precautions appear to have eliminated the introduction of bias colloquially referred to by Saeeda (2004) as the impact on data from a “social intruder” (p. 549).

The third major finding stemmed from the prediction, based on SWB homeostasis theory, that people with SWB levels of $\leq$ 50%SM are likely experiencing homeostatic defeat and are engaging cognitive buffers as adaptive mechanisms, which have failed to maintain an individual’s contact with HPMood (Cummins, 2018). Additionally, people with SWB levels between 51 and 69%SM are likely experiencing some challenge to their SWB and engaging cognitive buffers in response to a threat. Finally, those with levels of SWB $\geq$ 70%SM are functioning normally and are under the influence of HPMood with little engagement of cognitive buffers (Cummins & Nistico, 2002). These general observations predict that people in Nepal and India affected by leprosy and members of the $\leq$ 50%SM and 51 and 69%SM groups ought to show increased unique contributions of variance by buffers and decreased levels of HPMood. Results did not support these predictions. In fact, regression models for both groups under emotional duress ($\leq$ 50%SM and 51 and 69%SM), predicted very small amounts of overall variance from buffers within GLS. This is suggestive of poor performing models.

It is hypothesised these poor performing models were the result of cross-cultural semantic differences. For example, the HPMood scale, developed within Australia, asks participants how happy, content and alert they feel. Conflating these three variables has shown to produce a composite affect, referred to as HPMood (Cummins et al., 2018). Anecdotal evidence from India and Nepal suggests the use of the word happy may push the emotional valence of the HPMood scale towards a more high-energy positive affect than intended. For example, upon being asked to define "happy," people usually replied with a statement such as, “it’s the super-excited feeling you would get if you were to win a lot of money.” Additional indigenous research is required to explore the relationships between the HPMood variable and its location within the circumplex model of affect (Yik, Russell, & Steiger, 2011), within Western, Indian and Nepali contexts.

Finally, mixed results were found for the prediction that the unique contribution of variance by cognitive buffers, except for self-esteem, would be removed with the addition of HPMood (Cummins et al., 2018). Self-esteem has been shown to be a robust variable, continuing to contribute some unique variance, even after controlling for pervasive influence from HPMood (Mellor et al., 2008).

Results from India found the addition of HPMood as a covariate eradicated any significant contribution of unique variance from self-esteem for people with and without leprosy. A likely cause for this phenomenon has been unearthed by Cummins et al. (2018) who, examining data using multiple regression analyses from two general population samples of Australian, found that positively-valanced, self-report variables all share variance with HPMood. As a result, when researchers measure and comment on associations between variables such as self-esteem, optimism and perceived control, if they are not first removing the variance of HPMood, these inferences are not valid.

This warning from Cummins et al. (2018) is highly pertinent. There are no extant studies from Nepal or India accounting for the influence of HPMood on the self-esteem variable. This is a significant omission considering the 23,400 studies identified by Google Scholar reporting associations between leprosy and self-esteem. As such, conclusions by Rafferty (2005) such as “rehabilitation enables leprosy patients to regain their self-esteem” (p. 125), may actually reflect the returned influence from HPMood rather than increasing levels of self-esteem. For leprosy affected individuals, HPMood might have been replaced by an enduring negatively valenced emotion associated with leprosy. However, it is plausible that after rehabilitation, their previous experience of being disconnected from HPMood, is now brought back into focus, thus, lifting measured levels of all SWB variables, including self-esteem.

In summary, for people affected by leprosy, stigma results in people becoming socially isolated and unable to engage in meaningful work, subsequently removing access to vital homeostatic resources designed to buffer homeostatic defeat. For men, becoming unemployed is particularly detrimental to their levels of SWB. However, results indicate that these findings ought to be interpreted cautiously. Reasons for caution include some findings that contradict SWB homeostasis theory. For example, with lowering levels of measured SWB, theory predicts increasing engagement of cognitive buffers such as self-esteem, optimism and perceived control. This was not supported. Additionally, doubts were raised about the accuracy of the HPMood variable, as previously described within Western contexts, and a likely variant meaning give to one of its determinants, specifically, the word “happy” within India and Nepal. Finally, results show attempts at quarantining the gathering of these data from cross-cultural bias was successful. The translations were validated as accurate; literacy competencies were found not to be a limiting factor and bias from proximal researchers was eliminated through the study’s data gathering methodology.

Executive Summary and Conclusions

Introduction

Using the theory of subjective wellbeing (SWB) homeostasis as a guiding framework, this thesis explored associations between leprosy and the Subjective Wellbeing (SWB) of people within India and Nepal. Of interest were associations between leprosy and homeostatic mechanisms such as self-esteem, employed to protect SWB from emotional threats.

The initial literature review defines SWB and summarises extant perspectives regarding SWB homeostasis. Potential threats to the maintenance of SWB were discussed with special attention given to leprosy. Finally, the review explored methodologies employed by researchers to quarantine data collected cross-culturally from the infiltration of strong cultural bias.

The methodology of instrument modification and data collection are described in detail. The analytical strategies are then detailed, and the results regarding the influence of leprosy on SWB homeostasis are discussed. Each major section is now summarised.

Subjective Wellbeing

There is agreement amongst researchers that subjective perceptions of an individual's quality of life constitute SWB (Campbell et al., 1976). Driven by a synthesis of cognition and affect, these subjective perceptions comprise global judgments of life satisfaction (Andrews, 1974), influences from domain/criteria-level variables (International Wellbeing Group, 2013) and temporal emotions (Cummins et al., 2018). However, within SWB literature, there is a stubborn ambiguity around measurable definitions for cognition and affect and their proportional contribution to SWB.

Michalos (1985) summarises cognition as thought processing engaged by people when answering questions concerning satisfaction with their lives. Nevertheless, when investigators operationalise cognition, a confusing nomenclature emerges. For example, Michalos (2004) and Davern et al. (2007) define cognition as the dissonance between desired and actual perceptions of life domains within his multiple discrepancy theory (MDT). Alternatively, Kong et al. (2015) operationalise cognition as it is broadly defined by Michalos (1985), as thought processes, and utilise Diener's (1985) Satisfaction With Life Scale (SWLS) as its measure. Kong's (2015) definition highlights the problem. It does not penetrate beyond a general description of the construct. Further, warnings from McKennell and Andrews (1980) that cognition may include multiple dimensions including constructs such as self-esteem highlights the potential inadequacy of any multi-item single construct measure, such as the SWLS, to tap cognition effectively.

In contrast to the confusion surrounding cognition, Russell's (1980) circumplex model of affect dominates SWB literature as a widely employed mechanism for conceptualising affect. This circumplex is conceived as a circle with two orthogonal and bi-polar dimensions. The horizontal axis ranges from unpleasantness to pleasantness and on the vertical axis, from low arousal affective feelings such as calmness to those associated with high levels of arousal such as feeling active and alert. Accordingly, any affect can be placed onto the circumplex as a function of its valence and arousal (Posner, Russell, & Peterson, 2005). For example, Russell's (2003) *core affect* is described as an object free, neurophysiological state blending the hedonic and arousal dimensions that are experienced by people as mildly positive feelings. Accordingly, core affect would be located within the activated-pleasant circumplex quadrant.

Less unity exists within discussions regarding affect measurement. Russell (2003) did not provide a measure for his version of affect, but others have. For example, Watson et al. (1988) developed the widely used Positive and Negative Affect Scale (PANAS). However, in response to critiques that the PANAS measures only highly activated states, thereby missing affects from Russell's pleasant-unpleasant affective axis (Barrett & Russell, 1999), alternative measures have been sought. Amongst these measures, is a measure of core affect referred to as Homeostatically Protected Mood (HPMood).

HPMood is described by Davern et al. (2007) as a three-mood composite variable comprising happy, content and alert, representing core affect. Subsequent research has shown HPMood to be present in all self-report variables (Cummins et al., 2018). This seminal finding suggests that a valid measure of core affect has been identified. Further understanding comes from studying HPMood within the theory of SWB homeostasis.

Subjective Wellbeing Homeostasis

HPMood resides at the centre of SWB homeostasis and is the principal constituent of SWB (Cummins et al., 2018). HPMood is a person's genetically fixed, stable, positive, mild background affect that is held at a constant level, analogously to other biological systems controlling physiological states such as core body temperature (Cummins, 2009). The genetic influence is referred to as HPMood's set-point and is fundamental to human functioning by generating motivation for life (Cummins, 2017).

Accordingly, a person's felt level of SWB is mostly, but not entirely, influenced by their HPMood set-point. Each measurement of HPMood consists of both its mood set-point and emotion. The emotional component comprises momentary affective-cognitive interactions between an individual's thoughts and relevant environmental factors (Cummins et al., 2018).

Therefore, when strong emotional contexts, such as those experienced by people affected by leprosy, begin to impact upon HPMood negatively, the homeostatic system responds. The system's goal is to maintain HPMood within its normal operating range (Cummins & Wooden, 2014). Like its initial level, this range is genetically set. As a result, HPMood's optimal range is normally distributed within a population, but for each person, the extent of this range has recently been confirmed to a narrow band of approximately eight percentage points (Capic et al., 2018).

When the homeostatic system encounters a threat, maintaining HPMood within its optimum range involves deploying protective mechanisms referred to as *buffers* (Weinberg, Heath, & Tomyn, 2015). These buffers include internal processes such as adaptation and habituation, self-esteem, optimism and perceived control; and external devices such as money, personal relationships, and achieving in life (Cummins, 2016). The buffers are critical as they maintain HPMood's systemic positive influence upon SWB (Cummins, 2017).

While a person's SWB homeostatic system is robust, it is not impervious (Cummins, 2010). Threats such as those posed by leprosy, moderated by physical disability and stigma, deliver affected people a powerful set of valenced emotional challenges. The effectiveness of the SWB homeostatic management system to defend an individual's set-point is a function of the capacity of available resources to act against such challenges (Cummins, 2010). For leprosy-affected people within India and Nepal, these resources are rapidly depleted. For example, the vernacular understanding that leprosy is the result of divine punishment along with the social exclusion following the abandonment of affected people to 'the divine will,' results in a person's self-esteem, perceived control and hope for the future disappearing.

Against this cultural backdrop, it was expected that examining the deployment of homeostatic buffers against leprosy would yield valid data as the basis for a deeper understanding of SWB homeostasis. However, despite a repository of international SWB comparisons such as The World Happiness Report (Helliwell et al., 2017) and the OECD Better Life Index (OECD, 2014), an increasing literature warns of hazards associated with cross-cultural data collection (Benítez, Padilla, & Van de Vijver, 2019; Hruschka et al., 2018).

Therefore, before employing Western SWB measures such as the Personal Wellbeing Index (International Wellbeing Group, 2013) and the Satisfaction With Life Scale (Diener et al., 1985) within India and Nepal, measures were planned to quarantine data from the influence of strong cultural bias. These measures were based upon an understanding from the literature regarding the source and impact of this bias. Therefore, the origin and influence of cross-cultural bias and the subsequent precautions to quarantine data are now summarised.

Cross-cultural Bias and Precautions to Quarantine Data

To gather data on HPMood and homeostatic buffers, existing self-report instruments were deployed, all of which were developed in Western contexts. However, such cross-cultural use increases exposure to a number of measurement concerns that threaten these data's validity (Cummins, 2015). This problem has been pervasive within SWB literature. Cote and Buckley (1987) reported the extent of this problem for social science. They examined 70 reports for common method variance and found it present in 67 of the papers representing 26.3% of the variance associated with each scale. More recently, Cummins (2018) reiterated an abiding problem posed by cross-cultural data collection, stressing that while HPMood set-points are normally distributed within a population, cultural factors can easily, and usually do, distort how these are reported.

Threats to data from cultural biases include influences from social desirability (Crowne & Marlowe, 1964), acquiescence (John D. Winkler et al., 1982), proxy responding (Sneeuw et al., 2002) and the influence of foreign researchers during collection (Fiske, 1982). The danger of introducing systematic error variance is that it distorts the relationships between data and explanatory constructs such as HPMood and self-esteem (Cummins & Lau, 2010). Accordingly, drawn inferences from these data are likely not valid.

Moreover, within India and Nepal, cross-cultural data collection was found to contain additional risks from scales containing vernacular expressions. For example, created within Australia, the short version of the Depression Anxiety and Stress Scale (DASS-21, Lovibond & Lovibond, 1993) asks people to respond to the statement, "over the past week, I felt down-hearted and blue." Blue has a double meaning within the Australian context. It is both a colour and an idiom for a negative feeling. This was found not to be the case in either India or Nepal. As a result, an accurate translation of the word blue did not capture the intent of the question.

Further, even with an accurate translation, high rates of non-literate people with unknown numeracy proficiencies pose additional threats to data validity. Specifically, uncertainty exists around whether non-literate respondents can convert feelings onto a numeric scale. This is not addressed in the literature. No SWB research was located by the review that included methods for testing scale competency within India or Nepal. This omission further increases the likelihood of undetected bias distorting data.

In response, this thesis developed strategies to limit the infiltration of bias prior to data collection. In addition, an appropriate analytic strategy to expose any infiltration from systemic cultural bias was employed. Precautions included translation strategies, pre-test evaluations for scale comprehension, replacing the numeric scale with a facial scale representing degrees of happiness and a data analytical approach known as Multi-group Means and Covariance Structure modelling completed by a series of Confirmatory Factor Analyses (CFA).

Findings from a pilot study conducted within India demonstrated the depth of cultural influence. Three surprising examples suffice. First, while indigenous participants affirmed the accuracy of the translated questionnaire, they were unable to answer one question designed to test scale competency. The question asked, “If you were completely happy, which face would you select to represent this feeling?” The correct response was the facial emoticon situated in the place normally occupied by the number 10, on a 0 (“no happiness at all”) to 10 (completely happy”) numeric scale. Further, the translation for “completely happy” was located immediately above the correct face. However, at this point, all participants paused and did not respond. When asked why, the reply was, “I cannot answer this question because I am not feeling completely happy.” For Indian participants, this was an example of a counterfactual (Mandel, Catellani, & Hilton, 2005). Respondents insisted they were not completely happy and therefore were unable to respond. Further, when the question was reframed as, “Imagine your friend felt completely happy, which face would they select.” Without exception, all respondents chose the correct face. In response, the question was modified to reflect this understanding before data were collected from leprosy-affected people and the control group.

Second, the facial scale was not interpreted as intended. The facial scale was employed to identify acquiescence and as a replacement for a numeric scale. Participants explained the problem. They noted that each smiling face better represented a separate emotion and not degrees of happiness as intended. For example, a representative from the group identified a face representing someone feeling happy but pointed to the adjacent face and indicated this face represents someone feeling “gracious.” In response, the group affirmed that within India, respondents, including non-literate people, would have no trouble using the original numeric scale. Further discussions with Nepali colleagues affirmed these conclusions. As a result, the facial scale was removed and replaced with a 0 to 10 end-defined numeric.

Finally, vernacular statements from the DASS-21 such as “over the past week I felt downhearted and blue” and “over the past week I felt that I was rather touchy” were unable to be understood by respondents within India and Nepal. In response, the translation was modified to reflect an indigenous representation of each statement’s content. Finally, within India, the Satisfaction With Life Scale’s (SWLS, Diener et al., 1985) question, “If I could live my life over, I would change almost nothing” and the Rosenberg’s Self-esteem Scale (RSES, Rosenberg, 1965) question, “I feel that I am a person of worth, at least on an equal plane with others” posed significant problems for many respondents. Feedback from indigenous researchers suggest the doctrine of reincarnation held by many within India confused the question from the SWLS, and a robust caste system distorted any questions asking respondents to compare themselves with others, as is the case within the RSES.

In response to results from the pilot study, modifications were made to the questionnaire and data gathered. However, as a final precaution against the introduction of bias, data were initially analysed using Confirmatory Factor Analysis (CFA). This analytic strategy tests if data collected from India and Nepal are invariant across Australian, Indian and Nepali contexts. If invariance can be demonstrated, associations between scale items and latent factors are independent of someone's group membership. As such, cross-cultural comparisons can be validly made. This analytic strategy is now briefly summarised, and results are discussed.

Analytic Methods

To confirm that factor models for instruments used within India and Nepal were consistent with their collected data, a three-part study was undertaken using Confirmatory Factor Analysis (CFA). Part A produced what is referred to within the thesis as a *standard sample.* The standard sample is the confirmed factorial structure using Australian data and acts as a reference model for cross-cultural comparisons. Surprisingly, a number of the Western scales required modifications before a good fit was achieved. For example, the Personal Wellbeing Index (PWI, International Wellbeing Group, 2013), created and used as a measure of SWB within Australia since 2001, required the removal of three items. These items were satisfaction with health, personal relationships and connectedness to community. One of these, personal relationships is integrally related to the theory of SWB homeostasis (Cummins, 2018).

The theory of SWB homeostasis identifies three resources, referred to as the “golden triangle of happiness,” that are “more relevant to subjective well-being than the others. These are feelings of satisfaction with income, personal relationships, and achieving in life” (Cummins, 2018, p. 12). Therefore, the necessary removal of the personal relationship item from the PWI was unexpected. However, the explanation for its required removal highlights a major difference between the analytic strategies deployed over the past 18 years to identify the golden triangle of homeostatic resources, and CFA.

SWB is a latent variable (LSWB, Weinberg, Seton, & Cameron, 2018). Accordingly, it cannot be directly observed. However, it is measurable. For example, using a scale such as the PWI (International Wellbeing Group, 2013), a CFA identifies observed variables sharing common variance. Combining these as a single factor is theorised to represent the LSWB factor. By contrast, prior research by The International Wellbeing Group recommends the measurable variable, Global Life Satisfaction (GLS) as a proxy for LSWB (International Wellbeing Group, 2013). Using multiple regression (MR), the PWI domains are regressed against GLS to identify the variant contributions of each life domain to GLS. This technique consistently places personal relationships within three PWI domains, most strongly linked to GLS (Cummins, 2018). However, using CFA and LSWB, analyses reveal the personal relationships domain as the second smallest contributor to SWB, after security, using Australian, Indian and Nepali data.

The implication is that the PWI's relationship domain functions differently depending on whether GLS or LSWB are employed by researchers. If this is the case, inferences from MR using GLS, such as the contribution of unique variance from various PWI domains, cannot be validly inferred to LSWB, as they were recently by Weinberg et al. (2018) and previously by the International Wellbeing Group (International Wellbeing Group, 2013). This has important implications for SWB nomenclature. While prior findings using GLS and MR are valid, they are not salient to LSWB. Going forward, research investigating and drawing inferences regarding LSWB and its determinants requires employing analytic strategies such as CFA.

After modifying scales to produce a set of standard samples, Part B attempted to confirm these within the Indian and Nepali groups, separately. Despite efforts to limit the infiltration of cultural bias, as has been detailed, invariance could not be confirmed for either the PWI, depression or optimism. Accordingly, these scales could not be included in further cross-cultural comparisons. The single exception was the depression subscale of the DASS-21 within Nepal.

The failure of instruments to show measurement invariance is a major finding from this study. It is particularly notable since the efforts undertaken to quarantine data from cultural influences were ineffective in preventing cultural variance. This finding has significant implications for the validity of much extant cross-cultural SWB literature. Very few of these contain analytic strategies to test invariance. In their absence, there seems a high probability that reported cross-cultural findings may be invalid.

As a result of the inability to demonstrate measurement invariance, within-country comparisons between people with and without leprosy constitute the final study. Results are now summarised and discussed.

Within Country Comparisons

Findings from the final study support the hypothesis that leprosy is an overpowering threat to the SWB of affected people. Under the influence of strong negatively valenced emotions associated with stigma and disability, people with leprosy are likely experiencing homeostatic defeat. For these individuals, their normal level of HPMood has become experientially obscured. This was confirmed by affected people returning lower levels of HPMood and higher levels of depression severity than people with no leprosy or other disability. Further, men appeared less resilient to leprosy than women. Accordingly, focussing on gender-specific reluctance to seek medical treatment for leprosy may support the unique contexts of men.

Addressing stigma is attracting a growing number of educational resources (Global Partnership for Zero Leprosy, 2019; Rafferty, 2005). For example, teams from leprosy hospitals engage local schools and community groups with early detection and educational programs directed against stigma (Subedi & Engelbrektsson, 2018). However, these community programs exclude most men.

Because men in rural Nepal and India spend long hours farming, the majority of participants in community-based programs are women and children (Engelbrektsson & Subedi, 2018; World Health Organisation, 2019). As a result, the majority of men do not receive direct educational interventions designed to minimise stigma. For these men, the normal response to early signs of leprosy is concealment (Raju et al., 2014). Hiding these early indicators affords the disease an unhindered progression until associated disability becomes unavoidable. Increasing the availability of programs targeting men within India and Nepal would be a beneficial extension to extant community measures.

The second finding was that literacy levels and the proximity of the researcher did not introduce measurement error into these data. Both illiteracy and researcher proximity are known sources of potential bias via social desirability (Li, Niu, & Li, 2011), as when additional commentary around the meaning of questions is offered by researchers. Under these influences, the risk of introducing bias increases significantly. This heightened risk is catalysed by the conflation of social desirability and the likely modification to the construct's intended meaning (Flaherty et al., 1988).

The current study took measures to avoid this. For example, researchers supplied an indigenous interpreter for non-literate participants with instructions to read survey questions without explanation or comment. Further, supplying a paper copy of the survey and a pen allowed literate respondents to complete the questionnaire alone.

Results indicated no significant difference between the non-literate and literate groups suggestive that data were effectively quarantined from impacts from proximal researchers.

Measures taken to avoid impacts from researcher proximity were absent within all the reviewed literature. To be fair, many studies employed indigenous researchers; however, none accounted for their influence during interactions with respondents during data collection (see, for example, Adhikari et al., 2014; Gautam et al., 2007). In fact, the majority of studies allowed researchers interviewing non-literate people affected by leprosy to provide extended commentary on SWB questions (Adhikari et al., 2014). Clearly, there are associated inconveniences with collecting data from a participant who is unable to understand a particular question. However, this ought not to provoke researchers to provide extended explanations of the construct nor an approximated response on behalf of participants. Without precautionary responses, the data used in forming these published perspectives almost certainly contains bias.

Finally, based on SWB homeostasis theory, people with SWB levels of ≤ 50%SM were expected to be engaging cognitive buffers as adaptive mechanisms to maintain their contact with HPMood (Cummins, 2018). If this were the case, results ought to show increased unique contributions of variance by the homeostatic buffers and decreased levels from HPMood. However, regression models for people under emotional duress from leprosy predicted minimal amounts of variance from buffers within GLS. It was concluded that these results are suggestive of poor performing models likely due to semantic differences.

These semantic differences emerged as a result of conversations during my earlier visit to India and Nepal. When asked what people thought happy meant they generally replied with a statement such as, “it’s the super-excited feeling you would get if you were to win a lot of money." Thus, the word happy, as understood within India and Nepal, may have a disproportional impact on the composite HPMood construct by pushing it more towards a higher-energy positive affect than the mildly positive mood it is designed to tap (Bittar, 2009). If so, there are major implications when SWB homeostasis theory is applied to data collected from cross-cultural contexts and examined with multiple regression using HPMood, homeostatic buffers such as self-esteem, and GLS.

In sum, regression models using HPMood and cross-cultural data are likely impacted by cultural bias. Accordingly, the valence and levels of activation that have been imputed to the HPMood variable within an Australian context require prior confirmation within India and Nepal. Caution is required before including HPMood within future multiple regression models that subsequently draw inferences about the associations between leprosy and an individual's SWB homeostatic system.

Conclusions

The literature review of SWB research undertaken within India and Nepal revealed that potential sources of introduced bias from Western measures are generally overlooked. Most studies include good translations of measurement scales; however, precautions to quarantine data such as testing scale competency and identifying and subsequently excluding acquiescent responders, are absent. Further, analytic techniques such as Confirmatory Factor Analysis (CFA) to test for measurement invariance are usually not employed, and when they are, methods such as co-varying error variance on some items, result in a confusing array of non-repeatable, albeit it, 'good-fitting' factorial models. Occasionally, scales such as the Personal Wellbeing Index are employed after they are initially confirmed using CFA, with item deletion. However, the choice of items for deletion is driven by Multiple Regression Analysis using the Global Life Satisfaction variable as an inadequate proxy for a latent SWB variable.

In response, this thesis undertook a range of precautionary methods to quarantine data from the introduction of strong cross-cultural influences. Additionally, CFA was used, with item deletion determined from CFA results, to test whether the precautions produced measurement invariance between the factorial models and their data. Apart from bias from the presence of researchers during data collection, these measures were not successful. Accordingly, between country comparisons could not be undertaken.

Within-country comparisons between people with and without leprosy identified the disease as an overwhelming threat to a person's SWB homeostasis. However, uncertainty around the validity of the HPMood variable within India and Nepal highlights both the need for a cautionary interpretation of results and further research to verify the construct. Other limitations to the examination of within-country comparisons included the demographic variable, salary. Money is an important protective buffer within SWB homeostasis (Cummins, 2018), and both the group affected by leprosy and the control group's incomes were under the poverty line of approximately U.S. $2 per day (The World Bank, 2015). This meant the associations related to money as a resource could not be examined. Finally, within each country there exists manifold cultures. For example, Nepal has 126 castes that speak around 126 different languages (Indigenous Voice, 2019). Accordingly, results from the convenience samples cannot represent the national population of either Nepal or India. Therefore, generalising the findings of this thesis to these national contexts is unjustified.

Leprosy is a curable, non-fatal disease. However, psychological harm, mediated by stigma and disability, often results in premature death (Engelbrektsson & Subedi, 2018). Therefore, exploring and addressing negative associations between leprosy and people's quality of life requires continual monitoring of its objective determinants such as the availability of treatment protocols. However, examining whether individuals are employing objective measures to protect their SWB requires researchers to engage methods that are free of strong cross-cultural influences. This pervasive influence must be a considered factor for all future investigations exploring the associations between leprosy and people's SWB homeostasis.

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Appendix A

RSES

Table 57: RSES compensating for the χ2 statistic's oversensitivity to sample size from eight samples, each n = 106, drawn from the 23rd Australian Wellbeing Unity Index survey (N = 1796).

χ^2						
Raw	**Transformed**	**Raw Mean**	**Transformed Mean**	**Re-converted Mean**	**d*f***	**p-*Value***
11.83	**2.47**	**11.27**	**2.40**	**11.04**	**5**	**0.05**
16.84	**2.82**					
10.12	**2.31**					
11.25	**2.42**					
10.12	**2.31**					
12.26	**2.50**					
8.33	**2.12**					
9.42	**2.24**					

Notes. Indicators of a good fitting model to data are: A non-significant (p < .05) χ^2 Hu and Bentler (1999).

CFA item ranking

Table 58: CFA item ranking and goodness-of-fit statistics of the RSES from the 23rd Australian Wellbeing Unity Index survey (N = 1796)

Instrument	Item	Rank	Standardised regression weight
RSES	1. On the whole, I am satisfied with myself.	4	0.81
	2. I feel that I have a number of good qualities.	3	0.88
	3. I am able to do things as well as most other people.	5	0.77
	4. I feel I am a person of worth, at least on an equal plane with others.	1	0.93
	5. I take a positive attitude towards myself.	2	0.89

Revised RSES

Table 59: Analysis compensating for the χ2 statistic's oversensitivity to sample size from eight samples, each n = 106, drawn using the Revised RSES from the 23rd Australian Wellbeing Unity Index survey (N = 1796), with item 3 removed

Raw χ^2	Transformed χ^2	Raw χ^2 Mean	Transformed χ^2 Mean	Re-converted Mean	d*f*	p-*value*
9.90	**2.29**	**9.25**	**2.21**	**9.18**	**2**	**0.01**
10.25	**2.32**					
7.95	**2.07**					
8.59	**2.15**					
9.63	**2.26**					
11.30	**2.42**					
8.15	**2.09**					
8.22	**2.10**					

Note. Indicators of a good fitting model to data are: A non-significant (p < .05) χ^2 Hu and Bentler (1999).

CFA Item Ranking

Table 60: CFA item ranking and goodness-of-fit statistics of the RSES from the 23rd Australian Wellbeing Unity Index survey (N = 1796)

Instrument	Item	Rank	Standardised regression weight
RSES	1. On the whole, I am satisfied with myself.	4	0.81
	2. I feel that I have a number of good qualities.	3	0.88
	3. I am able to do things as well as most other people.	5	0.77
	4. I feel I am a person of worth, at least on an equal plane with others.	1	0.93
	5. I take a positive attitude towards myself.	2	0.89

Goodness-of-fit statistic		**90% CI[d]**	
		Lower	Upper
RMSEA[a]	.121	.104	.138
CFI[b]	.719		
SRMR[c]	.048		

Notes. [a]Root Mean Square Error of Approximation. [b]Comparative Fit Index. [c]Standardised Root Mean Square Residual. [d]AMOS reports 90% confidence intervals around the RMSEA statistic as a measure of precision. Indicators of a good fitting model to data, recommended by Hu and Bentler (1999), are CFI ≥ .95; RMSEA < .06; SRMR < .05.

4-item RSES

Table 61: CFA item ranking of the 4-item RSES and goodness-of-fit statistics from the 23rd Australian Wellbeing Unity Index survey (N = 1796), with item three removed

Instrument	Item	Rank	Standardised regression weight
RSES	1. On the whole, I am satisfied with myself.	4	0.82
	2. I feel that I have a number of good qualities.	3	0.88
	4. I feel I am a person of worth, at least on an equal plane with others.	1	0.92
	5. I take a positive attitude towards myself.	2	0.89

PCS

Table 62: CFA item ranking and goodness-of-fit statistics of the DASS-7D from the Indian sample (N = 155)

Instrument	Item	Rank	Standardised regression weight
PCS	1. I am in control of my life.	5	0.43
	2. I can change the important things in my life.	3	0.63
	3. I feel I have control over the things that happen to me.	2	0.67
	4. I feel I can solve the problems I have.	1	0.68
	5. Nothing is stopping me doing the things I want to do.	4	0.48

Goodness-of-fit statistic		90% CI[d]	
		Lower	Upper
RMSEA[a]	.048	.00	.13
CFI[b]	.923		
SRMR[c]	.078		

Notes: [a]Root Mean Square Error of Approximation. [b]Comparative Fit Index. [c]Standardised Root Mean Square Residual. [d]AMOS reports 90% confidence intervals around the RMSEA statistic as a measure of precision. Indicators of a good fitting model to data, recommended by Hu and Bentler (1999), are CFI ≥ .95; RMSEA<.06; SRMR<.05.

DASS-7D

Table 62: Analysis of DASS-7D compensating for the $\chi 2$ statistic's oversensitivity to sample size from eight samples, each n = 106, drawn from the 23rd Australian Wellbeing Unity Index survey (N = 1796)

χ^2						
Raw	Transformed	Raw Mean	Transformed Mean	Re-converted Mean	d*f*	p-*Value*
4.91	3.21	19.88	2.95	19.22	14	0.15
12.92	3.01					
6.33	2.40					
8.56	3.23					
10.56	2.97					
11.62	3.10					
7.08	2.63					
14.48	3.05					

Notes. Indicators of a good fitting model to data are: A non-significant ($p < .05$) χ^2 Hu and Bentler (1999).

Table 63: CFA item ranking and goodness-of-fit statistics of the DASS-7D from the 23rd Australian Wellbeing Unity Index survey (N = 1796)

Instrument	**Item**	**Rank**	**Standardised regression weight**
DASS-7D	1. I couldn't seem to experience any positive feels at all.	5	0.76
	2. I found it difficult to work up the initiative to do things.	6	0.72
	3. I felt I had nothing to look forward to.	2	0.80
	4. I felt down-hearted and blue.	3	0.78
	5. I was unable to become enthusiastic about anything.	1	0.85
	6. I felt I was not worth much as a person.	5	0.76
	7. I felt that life was meaningless.	4	0.77

Goodness-of-fit statistic		**90% CI[d]**	
		Lower	Upper
RMSEA[a]	.052	.041	.063
CFI[b]	.840		
SRMR[c]	.040		

Notes: [a]Root Mean Square Error of Approximation. [b]Comparative Fit Index. [c]Standardised Root Mean Square Residual. [d]AMOS reports 90% confidence intervals around the RMSEA statistic as a measure of precision. Indicators of a good fitting model to data, recommended by Hu and Bentler (1999), are CFI ≥ .95; RMSEA < .06; SRMR < .05.

Appendix B

Indian Questionnaire

परिचय
Introduction

इन प्रश्नों का उदेश्य जीवन संतुष्टि के विभिन्न पहलुओं की जाँच करना है।
The intention of these questions is to investigate different aspects of life satisfaction.

कृपया उत्तर देने से पूर्व हर प्रश्न को ध्यान से पढिए।
Please read each question carefully before responding.

कृपया हर प्रश्न का उत्तर दिजिए।
Please answer every question.

क्या यह दोनों चेहरे खुश दिखते हैं?
(Do both these faces look happy?)

हाँ (Yes) ☐
नहीं (No) ☐

क्या यह चेहरा एक खुश चेहरा है?
(Is this face a happy face?)

☐ हाँ (Yes)

☐ नहीं (No)

अगले 3 प्रश्नों के लिए: यदि शून्य के बराबर होता है तो संतुष्ट नहीं है और दस के बराबर होता है तो पूरी तरह से संतुष्ट है।
(For the next 3 questions: If **zero** equals no satisfaction at all and **10** equals completely satisfied…)

१: अगर आप पूरी तरह से संतुष्ट है तो वांछित संख्या पर गोला बनाएं।
(Please circle the number you would choose if you felt completely satisfied.)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

२: अगर आप पूरी तरह से असंतुष्ट है तो वांछित संख्या पर गोला बनाएं।
(Please circle the number you would choose if you felt no satisfaction at all.)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

३:	अगर आप लगभग संतुष्ट है तो कौन सी सांख्य पर गोला बनाएंगे?
(If you felt almost completely satisfied what number would you circle?)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

४:	अगर आप थोड़ा बहुत संतुष्ट है तो कौन सी सांख्य पर गोला बनाएंगे?
(If you felt just a little bit satisfied what number would you circle?)

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

अपने जीवन के बारे मे सोचकर, कृपया १ से १० के बीच में एक अंक पर गोल करें जो निम्नलिखित वाक्यों के बारे मे आप कैसा महसूस करते हैं ये बताता है।
(Thinking about your own life, please circle a number between 0 and 10 that describes how you feel about the following statements.)

बिल्कुल संतुष्ट नहीं
Not satisfied at all

पूर्णतः संतुष्ट
Completely Satisfied

आप अपने जीवन से कितने संतुष्ट हैं ?
1: How satisfied are you with your life as a whole?

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

अपने जीवन के बारे मे सोचकर, कृपया १ से १० के बीच में एक अंक पर गोल करें जो निम्नलिखित वाक्यों के बारे मे आप कैसा महसूस करते हैं ये बताता है।
Thinking about your own life, please circle a number between 0 and 10 that describes how you feel about the following statements.

	बिल्कुल नहीं Not at all										अत्यंत Extremely
आप कितना योग्य महसूस करते हैं ? 2: How worthwhile do you feel?	०	१	२	३	४	५	६	७	८	९	१०
आप भविष्य को लेकर कितने आशावान हैं ? 3: How optimistic about the future do you feel?	०	१	२	३	४	५	६	७	८	९	१०
आपका अपने जीवन पर कितना नियंत्रण है एसा लगता है ? 4: How much control do you feel you have over your life as a whole?	०	१	२	३	४	५	६	७	८	९	१०

अपने जीवन के बारे में साधारणतः सोचकर...
Thinking about your life in general…

	बिल्कुल नहीं Not at all										अत्यंत Extremely
आप साधारणतः कितना खुश महसूस करते हैं ? 5: How happy do you generally feel?	०	१	२	३	४	५	६	७	८	९	१०
आप साधारणतः कितना सचेत महसूस करते हैं ? 6: How alert do you generally feel?	०	१	२	३	४	५	६	७	८	९	१०
आप साधारणतः कितना संतुष्ट महसूस करते हैं ? 7: How content do you generally feel?	०	१	२	३	४	५	६	७	८	९	१०

आप निम्नलिखित से कितने संतुष्ट हैं
How satisfied are you with the following?

	बिल्कुल संतुष्ट नहीं Not satisfied at all									पूर्णतः संतुष्ट Completely Satisfied
आपका जीवनस्तर 8: Your standard of living	०	१	२	३	४	५	६	७	८	९	१०
आपकी सेहत 9: Your health	०	१	२	३	४	५	६	७	८	९	१०
आप जीवन में जो हासिल कर रहे हैं 10: What you are achieving in life	०	१	२	३	४	५	६	७	८	९	१०
आपके निजी संबंधों से 11: Your personal relationships	०	१	२	३	४	५	६	७	८	९	१०
आप कितने सुरक्षित हैं 12: How safe you feel	०	१	२	३	४	५	६	७	८	९	१०
अपने समुदाय का हिस्सा हैं 13: Feeling part of your community	०	१	२	३	४	५	६	७	८	९	१०

आपके भविष्य की सुरक्षा 14: Your future security	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
आपका धर्म 15: Your religion	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

कृपया उस अंक पर गोल करें जो दर्शाता हो की आप निम्नलिखित से कितने सहमत या असहमत हैं
Please circle the number that explains how much you agree or disagree with the following.

	बिल्कुल सहमत नहीं Do not agree at all	पूर्णतः सहमत Completely Agree
मुझे लगता है मेरा महत्व है, मैं दुसरों के समान हुँ 16: I feel I am a person of worth, at least on an equal plane with others	० १ २ ३ ४ ५ ६ ७ ८ ९ १०	
मुझे लगता है मुझमें बहुत सारे अच्छे गुण हैं 17: I feel I have a number of good qualities	० १ २ ३ ४ ५ ६ ७ ८ ९ १०	
मैं दुसरों की तरह काम अच्छी तरह कर सकता हुँ / मैं दुसरों की तरह काम अच्छी तरह कर सकती हुँ 18: I am able to do things as well as most other people	० १ २ ३ ४ ५ ६ ७ ८ ९ १०	

मैं अपने प्रति सकारात्मक मनोभाव रखता हुँ / मैं अपने प्रति सकारात्मक मनोभाव रखती हुँ 19: I take a positive attitude towards myself	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
कुल मिलाकर मैं अपने आप से संतुष्ट हुँ 20: On the whole, I am satisfied with myself	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

कृपया उस अंक पर गोल करें जो दर्शाता हो की आप निम्नलिखित से कितने सहमत या असहमत हैं
Please circle the number that explains how much you agree or disagree with the following.

	बिल्कुल सहमत नहीं Do not agree at all	पूर्णतः सहमत Completely Agree

अनिश्चित समयों मैं आशावादी रहता हुँ / अनिश्चित समयों में मैं आशावादी रहती हुँ 21: In uncertain times, I usually expect the best	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
मैं भविष्य को लेकर हमेशा आशावादी रहता हुँ / मैं भविष्य को लेकर हमेशा आशावादी रहती हुँ 22: I'm always optimistic about my future	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

सम्सतः मैं अपने साथ बुरे से ज्यादा अच्छी घटना होने की उम्मीद रखता हुँ / सम्सतः मैं अपने साथ बुरे से ज्यादा अच्छी घटना होने की उम्मीद रखती हुँ
23: Overall, I expect more good things to happen to me than bad

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

कृपया उस अंक पर गोल करें जो दर्शाता हो की आप निम्नलिखित से कितने सहमत या असहमत हैं
Please circle the number that explains how much you agree or disagree with the following.

बिल्कुल सहमत नहीं
Do not agree at all

पूर्णतः सहमत
Completely Agree

अपने जीवन पर मेरा नियंत्रण है
24: I am in control of my life

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

अपने जीवन के महत्वपूर्ण बातों को मैं बदल सकता हुँ / अपने जीवन के महत्वपूर्ण बातों को मैं बदल सकती हुँ
25: I can change the important things in my life

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

मुझे लगता है की मेरे साथ होनेवाली घटनाओं पर मेरा नियंत्रण है ० १ २ ३ ४ ५ ६ ७ ८ ९ १०
26: I feel I have control over the things that happen to me

मुझे लगता है की मैं अपनी समस्याओं का समाधान कर सकता हुँ / ० १ २ ३ ४ ५ ६ ७ ८ ९ १०
मुझे लगता है की मैं अपनी समस्याओं का समाधान कर सकती हुँ
27: I feel I can solve the problems I have

जो मुझे करना है वह करने से कुछ भी रोक नहीं सकता ० १ २ ३ ४ ५ ६ ७ ८ ९ १०
28: Nothing is stopping me doing the things I want to do

कृपया उस अंक पर गोल करें जो दर्शाता हो की आप निम्नलिखित से कितने सहमत या असहमत हैं

Please circle the number that explains how much you agree or disagree with the following.

पिछले हफ्ते में...	बिल्कुल सहमत नहीं	पूर्णतः सहमत
Over the last week…	Do not agree at all	Completely agree

मुझे कोई भी सकारात्मक भावनाओं की अनुभूति नहीं हुई ० १ २ ३ ४ ५ ६ ७ ८ ९ १०
29: I couldn't seem to experience any positive feels at all

मुझे काम करने के लिए आत्मबल जुटाना मुश्किल लग रहा था 30: I found it difficult to work up the initiative to do things	०	१	२	३	४	५	६	७	८	९	१०
मैं निराश महसूस कर रहा था / मैं निराश महसूस कर रही थी 31: I felt I had nothing to look forward to	०	१	२	३	४	५	६	७	८	९	१०
मैं उदास महसूस कर रहा था / मैं उदास महसूस कर रही थी 32: I felt down-hearted and blue	०	१	२	३	४	५	६	७	८	९	१०
मैं किसी भी बात पर उत्साहित नहीं था / मैं किसी भी बात पर उत्साहित नहीं थी 33: I was unable to become enthusiastic about anything	०	१	२	३	४	५	६	७	८	९	१०

पिछले हफ्ते में... Over the last week…	बिल्कुल सहमत नहीं Do not agree at all										पूर्णतः सहमत Completely agree
मुझे इन्सान के तौर पर अपना कोई महत्व नहीं लग रहा था / मुझे व्यक्तिगत तौर पर अपना कोई महत्व नहीं लग रही थी 34: I felt I was not worth much as a person	०	१	२	३	४	५	६	७	८	९	१०
मुझे जीवन अर्थहीन लग रहा था 35: I felt that life was meaningless	०	१	२	३	४	५	६	७	८	९	१०

उम्र
36: Age (Tick the appropriate box)

१८-२५
18-25

२५-३५
25-35

३५-४५
35-45

४५-५५
45-55

५५-६५
55-65

६५-७५
65-75

75+
७५ से उपर

लिंग	पुरूष	महिला
37: Gender (Circle)	M	F
क्या आप विवाहित हैं ?	हाँ	नहीं
38: Are you married (Circle)	Y	N

अविवाहित	हाँ	नहीं
Single	Y	N
तलाकशुदा	हाँ	नहीं
Divorced	Y	N
क्या आप व्यवसायी हैं ?	हाँ	नहीं
39: Are you employed? (Circle)	Y	N
पूर्णकालिक	हाँ	नहीं
Full-time	Y	N
अंशकालिक	हाँ	नहीं
Part-time	Y	N

आपकी आय (उचित जगह अंकित करें)
40: Income per year (Tick the appropriate box)

- ०-१०००० 0-10,000 ☐
- १०-३०००० 10-30,000 ☐
- ३०-५०००० 30-50,000 ☐
- ५०-७०००० 50-70,000 ☐
- ७०-९०००० 70-90,000 ☐
- ९०,००० से उपर 90,000+ ☐

सहयोग के लिए धन्यवाद
(Thank you for your participation)

Nepali Questionnaire with Faces Removed

तपाईं १८ वर्षको उमेर भन्दा बढी हूनूहून्छ भने हरेक प्रश्नको जवाफ गर्नुहोस्।
(Please answer every question.)

पूर्ण रुपले सन्तुष्टि महसुस भएमा एउटा नम्बरमा घेरा लगाउँनुहोस।

1 Please circle the number a person would choose if they felt completely satisfied.

पूर्ण सन्तुष्ट छैन Not satisfied at all										पूर्ण सन्तुष्ट Completely Satisfied
०	१	२	३	४	५	६	७	८	९	१०

लगभग पूर्ण सन्तुष्ट महसुस भएमा एउटा नम्बरमा घेरा लगाउँनुहोस।

2 Please circle the number a person would choose if they felt almost completely satisfied.

पूर्ण सन्तुष्ट छैन Not satisfied at all										पूर्ण सन्तुष्ट Completely Satisfied
०	१	२	३	४	५	६	७	८	९	१०

अफनो जीवन को बारे मा सोच्नु र तल का वाक्यहरुमा ० देखी १० सम्म जहाँ उचित गोलो लगाउने।
(Thinking about your own life, please circle a number between 0 and 10 that describes how you feel about the following statements.)

	पूर्ण सन्तुष्ट छैन Not satisfied at all										पूर्ण सन्तुष्ट Completely Satisfied
आफ्नो जीवन संग तपाईं कतीको सन्तुष्ट हूनूहन्छ? 3. How satisfied are you with your life as a whole?	०	१	२	३	४	५	६	७	८	९	१०

	हुँदै हैन Not at all										पूर्ण रुपले Extremely
कति योग्य महसुस लाग्छ? 4. How worthwhile do you feel?	०	१	२	३	४	५	६	७	८	९	१०

हुँदै हैन
Not at all

पूर्ण रुपले
Extremely

भविष्यको बारेमा कति खुसी महसुस लाग्छ?
5: How optimistic about the future do you feel?

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

हुँदै हैन
Not at all

पूर्ण रुपले
Extremely

आफ्नो जीवनमा आफ्नै कति नियन्त्रण छ जस्तै लाग्छ?
6: How much control do you feel you have over your life as a whole?

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

हुँदै हैन
Not at all

पूर्ण रुपले
Extremely

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

साधारणतया तपाई कतिको खुसी अनुभव गर्नु हुन्छ?
7: How happy do you generally feel?

हुँदै हैन
Not at all

पूर्ण रुपले
Extremely

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

साधारणतया तपाई कतिको फुर्तिलो अनुभव गर्नु हुन्छरु
8: How alert do you generally feel?

हुँदै हैन
Not at all

पूर्ण रुपले
Extremely

साधारणतया तपाई कतिको सन्तुष्टि अनुभव गर्नु हुन्छरु
9: How content do you generally feel?

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

अफनो जीवन को बारे मा सोच्नु र तल का वाक्यहरुमा ० देखी १० सम्म जहाँ उचित गोलो लगाउने।
Thinking about your own life please circle a number between 0 and 10 that explains how you feel about the following statements.

निम्न संग तपाईं कतिको सन्तुष्ट हूनूहन्छ?
How satisfied are you with the following...

पूर्ण सन्तुष्ट छैन
Not satisfied at all

पूर्ण सन्तुष्ट
Completely Satisfied

आफ्नो रहन स्थिति
10: Your standard of living

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

आफ्नो स्वास्थ्य 11: Your health	०	१	२	३	४	५	६	७	८	९	१०
जीवनमा हासिल गरेको कुराहरू 12: What you are achieving in life	०	१	२	३	४	५	६	७	८	९	१०
तपाईंको व्यक्तिगत सम्बन्धहरू 13: Your personal relationships	०	१	२	३	४	५	६	७	८	९	१०
कती सुरक्षित महसुस गर्नुहुन्छ? 14: How safe you feel	०	१	२	३	४	५	६	७	८	९	१०
आफ्नो समुदायमा भाग लिएको महसुस 15: Feeling part of your community	०	१	२	३	४	५	६	७	८	९	१०
तपाईंको सुरक्षा 16: Your future security	०	१	२	३	४	५	६	७	८	९	१०
तपाईंको धर्म 17: Your religion	०	१	२	३	४	५	६	७	८	९	१०

आफ्नो सहमति वा असहमति देखाउन निम्नलिखित संख्या जहाँ उचित गोलो लगाउने
Please circle the number that indicates how much you agree or disagree with the following.

	पूर्णतया असहमत Do not agree at all										पूर्णतया सहमत Completely Agree
मेरो जिवन धेरैकुरामा मेरो आशाको नजिक छ। 18: In most ways my life is close to my ideal	०	१	२	३	४	५	६	७	८	९	१०
मेरो जिवनको अवस्था उत्तम छ। 19: The conditions of my life are excellent	०	१	२	३	४	५	६	७	८	९	१०
म मेरो जिवनसंग सन्तुष्ट छु। 20: I am satisfied with life	०	१	२	३	४	५	६	७	८	९	१०
अहिले सम्म मैले चाहेको सबै महत्वपुर्ण चिज मेरो जिन्दगीमा पाएको छु। 21: So far, I have gotten the important things I want in life	०	१	२	३	४	५	६	७	८	९	१०

यदि मेरो जिन्दगी फेरि जिउन पाएमा, म केहि पनि परीवर्तन गर्ने छैन । 22: If I could live my life over, I would change almost nothing	०	१	२	३	४	५	६	७	८	९	१०
	पूर्णतया असहमत Do not agree at all										पूर्णतया सहमत Completely Agree
मलाई लाग्छ म पनि अरु जत्तिकै महत्वपुण छु। 23: I feel I am a person of worth, at least on an equal plane with others	०	१	२	३	४	५	६	७	८	९	१०
मलाई लाग्छ म संग पनि राम्रा गुणहरु छन । 24: I feel I have a number of good qualities	०	१	२	३	४	५	६	७	८	९	१०
म पनि अरु मन्छे जस्तै सबै काम गर्न सक्छु । 25: I am able to do things as well as most other people	०	१	२	३	४	५	६	७	८	९	१०
म आफु प्रति सकारात्मक बिचार राख्छु । 26: I take a positive attitude towards myself	०	१	२	३	४	५	६	७	८	९	१०

समपुर्णमा म आफु प्रति सन्तुष्ट छु।
27: On the whole, I am satisfied with myself

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

अनिश्चित समयमा,
म सामान्यतया राम्रो आशा राख्छु।
28: In uncertain times, I usually expect the best

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

म मेरो भविष्यको बारेमा सधैं खुसी छु।
29: I'm always optimistic about my future

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

पूर्णतया असहमत
Do not agree at all

पूर्णतया सहमत
Completely Agree

कुल मिलाएर, म खराब भन्दा बढी राम्रो कुराको आशा राख्छु।

० १ २ ३ ४ ५ ६ ७ ८ ९ १०

30: Overall, I expect more good things to happen to me than bad

मेरो जीवन मेरो नियन्त्रणमा छ। 31: I am in control of my life	०	१	२	३	४	५	६	७	८	९	१०
मेरो जीवनका महत्त्वपूर्ण कुराहरू परिवर्तन गर्न सक्छु। 32: I can change the important things in my life	०	१	२	३	४	५	६	७	८	९	१०
मलाई लाग्छ मलाई जे हुन्छ त्यो म नियन्त्रण गर्न सक्छु। 33: I feel I have control over the things that happen to me	०	१	२	३	४	५	६	७	८	९	१०
मलाई लाग्छ म समस्याहरूको समाधान गर्न सक्छु। 34: I feel I can solve the problems I have	०	१	२	३	४	५	६	७	८	९	१०
म जे गर्न चाहन्छु, कुनै कुराले मलाई रोक्न सक्दैन। 35: Nothing is stopping me doing the things I want to do	०	१	२	३	४	५	६	७	८	९	१०

आफ्नो सहमति वा असहमति देखाउन निम्नलिखित संख्यामा जहाँ उचित गोलो लगाउने ।
Please circle the number that explains how much you agree or disagree with the following.

पछिल्लो हप्तामा:
Over the last week…

	पूर्णतया असहमत Do not agree at all										पूर्णतया सहमत Completely Agree
मलाई आराम गर्न गाह्रो भयो। 36: I have found it hard to wind down	०	१	२	३	४	५	६	७	८	९	१०
मेरो मुख सुकेको अनुभव भयो। 37: I was aware of dryness in my mouth	०	१	२	३	४	५	६	७	८	९	१०
मलाई कुनै सकारात्मक भावनाको अनुभव नै भएन। 38: I couldn't seem to experience any positive feels at all	०	१	२	३	४	५	६	७	८	९	१०
मलाई सास फेर्न गार्हो भयो (छिटो छिटो सास बढ्यो)। 39: I experienced breathing difficulty	०	१	२	३	४	५	६	७	८	९	१०
मलाई काम सुरु गर्न अति गार्हो लाग्छ। 40: I found it difficult to work up the initiative to do things	०	१	२	३	४	५	६	७	८	९	१०

विभिन्न परिस्थितिमा म अति बदी प्रतिकिया देखाउछु। ० १ २ ३ ४ ५ ६ ७ ८ ९ १०

41: I tended to over-react to situations

पछिल्लो हप्तामा:

Over the last week...

पूर्णतया असहमत
Do not agree at all

पूर्णतया सहमत
Completely Agree

म थर थर कामेको अनुभव गरे
(उदहारण को निम्ति हात काम्नु)। ० १ २ ३ ४ ५ ६ ७ ८ ९ १०

42: I experienced trembling in the hands

मैले थाहा पाए कि मैले धेरै मात्रामा तंत्रिका ऊर्जा को प्रयोग गरेको थिए। ० १ २ ३ ४ ५ ६ ७ ८ ९ १०

43: I found I was using a lot of nervous energy

म हतोत्साहित भयर आफै मुर्ख जस्तो देखिन्छुकी भन्ने डर लाग्छ। ० १ २ ३ ४ ५ ६ ७ ८ ९ १०

44: I was worried about situations in which
I might panic and make a fool of myself

मेरो भबिष्य नभएको जस्तो लाग्छ। ० १ २ ३ ४ ५ ६ ७ ८ ९ १०

45: I felt I had nothing to look forward to

आफै चिट चिट (भद्किएको) भयको अनुभव हुन्छ। 46: I found myself getting agitated	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
आराम गर्न दुख महसुस हुन्छ। 47: I found it difficult to relax	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
पछिल्लो हप्तामा: Over the last week…	पूर्णतया असहमत Do not agree at all ... पूर्णतया सहमत Completely agree
मैले निराश महसुस गरे। 48: I felt down-hearted and blue	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
म काम गरिरहेको अबस्थामा कुनै कुरो बीच मा आयो भने सहन सक्दिन। 49: I was intolerant of anything that kept me from getting on with what I was doing	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

म झन्डै हतोत्साहित भयको अनुभव गरे। 50: I felt I was close to panic	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
केहि कुराले पनि मलाई उत्साहित गर्दैन। 51: I was unable to become enthusiastic about anything	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
मेरो कुनै अस्तीतो छ जस्तो लाग्दैन। 52: I felt I was not worth much as a person	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
म छिटो रिसाउने, रूने महसुस गर्नथाले। 53: I felt I was rather touchy	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

पछिल्लो हप्तामा:
Over the last week…

पूर्णतया असहमत Do not agree at all										पूर्णतया सहमत Completely agree

कडा कामै नगर्दा पनि मुटुको ढुकढुकी बढेको अनुभव भयो। 54: I was aware of the action of my heart in the absence of physical exertion	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

बिना कारण डरको अनुभव भयो। 55: I felt scared without any good reason	० १ २ ३ ४ ५ ६ ७ ८ ९ १०
जीवन अर्थ बिह्नि भयको महसुस भयो। 56: I felt that life was meaningless	० १ २ ३ ४ ५ ६ ७ ८ ९ १०

उमेर
57: Age (Tick the appropriate box)

१८-२५
18-25 ☐

२५-३५
25-35 ☐

३५-४५
35-45 ☐

४५-५५
45-55 ☐

५५-६५
55-65 ☐

६५-७५
65-75 ☐

७५ से उपर
75+ ☐

लिंग (गोलो लगाउने) पुरुष महिला
59: Gender (Circle) M F

तपाई विवाहित हुनुहुन्छ? हो हैन
60: Are you married (Circle) Y N

अविवाहित हो हैन
61: Single Y N

तलाकशुदा हो हैन
62: Divorced Y N

तपाईं जागिरे हुनुहुन्छ?	हो	हैन
63: Are you employed? (Circle)	Y	N
पुरै समय	हो	हैन
64: Full-time	Y	N
आंशिक समय	हो	हैन
65: Part-time	Y	N

प्रति महिनाको आय (रुपैया)

66: Income per year (Tick the appropriate box)

०-१०००० ☐
0-10,000

१०-३०००० ☐
10-30,000

३०-५०००० ☐
30-50,000

५०-७०००० ☐
50-70,000

७०-९०००० ☐
70-90,000

९०,००० ☐
90,000