

Effects of Communication Mode on Connectedness and  
Subjective Well-Being

**By**

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Abstract

The introduction of many new technology-based modes of communication has raised the issue of how new modes of communication impact on individuals' sense of connectedness with their family and friends, and their well-being. Little current research has considered this impact within a theoretical framework which offers an explanation of the underlying processes determining subjective well-being. The homeostatic model of subjective well-being proposes that an individual's life experiences, personality and cognitive buffer factors combine to predict subjective well-being. This study examined how individuals' experiences of communicating with their friends and family are impacted by the communication mode used. Two hypotheses were tested: (1) to investigate the contribution of connectedness to family and friends as salient predictors in an existing model of subjective well-being; (2) to examine the role of age-based differences in use of technology-based communication modes and connectedness to family and friends. A sample of 781 Australian adults, aged between 18-89 years, completed a survey questionnaire which measured participants' experience and satisfaction with use of new technologies and other communication modes, social connectedness with family and friends, homeostatic model predictors and subjective well-being. Hierarchical regression analyses revealed that Connectedness to family and Connectedness to friends were significant predictors of subjective well-being. The younger age group was found to use technology-based modes of communication more frequently compared to other age groups, and to feel equally connected to their family and friends as older age groups who use these modes the least. It was concluded that although there were some age and communication mode differences, the experience of social connectedness makes a more important contribution to an individual's subjective well-being, than the mode of communication.

Although living in a society generally requires that people interact with a range of individuals in their everyday activities, the people who are most likely to provide us with a feeling of belongingness, understanding, and being cared for, are family members and friends.

Therefore, the ways in which people communicate with their family and friends is likely to be central to the quality and amount of social support individuals feel they receive, and may have an impact on how connected they feel socially. With the introduction of many new forms of communication technology, changes in the way people communicate with their family and friends are taking place. This study focused on how the communication modes people use affect individuals' sense of connectedness with their family and friends, and the impact of connectedness on subjective well-being.

Psychologists have studied life satisfaction extensively as a central component of subjective well-being. Subjective measures of well-being use self-rating scales to evaluate an individual's cognitive and affective evaluations of their life, and the experiences that are felt to be of importance to the individual (Diener & Suh, 1997). It has now been established that people are satisfied with their lives within the range of 70-80 percent of the measurement scale maximum score (%SM), and that this range is actively maintained by a homeostatic system (Cummins, 1995).

Research has consistently found that social disconnection, or a lack of supporting relationships, is associated with poor quality of life and diminished health (both psychologically and physically), and that in contrast, having a good social support network leads to higher levels of personal well-being and better health (Antonucci, Fuhrer, & Dartigues; Buys, 2001; Chou, 1999; Cohen & Wills, 1985; Henly, Danziger, & Offer, 2005; Lansford, Antonucci, Akiyama, & Takahashi, 2005; Monroe & Steiner, 1986; Turner, 1981; Winefield, Winefield, & Tiggemann, 1992). It has been proposed that having a supportive network provides a buffer against stress, enhances coping skills (Cohen & Wills, 1985) and leads to a higher level of life satisfaction and self-esteem (Takahashi, Tamura, & Tokoro, 1997). The frequency of interaction or contact with others, particularly friends, has also been found to be positively related to well-being and negatively related to loneliness (Nezlek, Richardson, Green, & Schatten-Jones, 2002).

Much of this previous research has focused on social support and loneliness, and has overlooked the concept of social connectedness, and various ways that this is achieved. Despite the lack of research into this area, over the past decade Lee and his colleagues have conducted investigations on social connectedness (Lee & Robbins, 1995; 1998; 2000; Lee, Draper, & Lee, 2001; Lee, Keough, & Sexton, 2002). People develop a sense of social connectedness through experiences they have through important relationships, such as those with their parents, siblings, extended family, and friends (Lee & Robbins, 1995). Such experiences are likely to occur in all communication settings, including face-to-face interactions, and the newer technology-based interactions.

Technology-based communication is now a very popular mode for communication with families and friends, with 79% of an American sample reporting such use (The Pew Internet and American Life Project, 2004b). Such modes of communication can overcome limitations of distance and be effective when the communication does not involve or require a great deal of emotion or affect (Hampton & Wellman, 2001). There is now widespread availability of computers and other new technologies, which include use of email, instant messenger, webcams, mobile phone and mobile phone SMS (short message service).

The impact of technology-based communication on people's relationships and well-being remains unclear. A review by Baumeister and Leary (1995) concluded that there is consistent, but weak evidence that having a relationship without frequent face-to-face contact can lead to dissatisfaction with feelings of belongingness. The impersonal nature of these modes of communication has been criticized. For example, Walther, Anderson and Park (1994) claimed that a consequence of the use of technology-based communication modes is the filtering out of non-verbal channels which are generally rich in interpersonal information. This leads to less social presence and more impersonal communication (Bargh, 2002). A similar point is made by Bargh and McKenna (2003), who maintained that Internet communication is an impoverished and impersonal form of social exchange which essentially removes the human element of interpersonal communication. Overuse of these modes of communication, in place of traditional face-to-face interactions could lead to social disengagement (Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998; Nie & Erbring, 2000) as individuals replace, instead of supplement, their interactions with family and friends with technology-

based modes of communication. Face-to-face interactions, on the other hand, involve verbal words, eye contact, facial expressions, body language, tone of voice, physical attractiveness and general appearance (Moody, 2001), in addition to hugs, pats on the back, handshakes, cries, embraces, kisses and giggles (Nie, 2001).

The inconsistencies in the literature may be due to the lack of a coherent theoretical framework in which to measure the relationship between connectedness with family and connectedness with friends as predictors of subjective well-being. A more productive approach is likely when measures are tested within a theoretical framework of subjective well-being which allows for the new predictors to be tested alongside known predictors.

The homeostatic model of subjective well-being developed by Cummins and colleagues (Cummins, Gullone, & Lau, 2002; Mellor, Cummins, Karlinski & Storer, 2003) has identified three main psychological factors that interact to predict subjective well-being: personality (extraversion and neuroticism), experiential input (experience of positive and negative environmental input), and cognitive buffer factors (self-esteem, perceived control and optimism) that mediate the effect of environmental and personality influences on subjective well-being. The homeostatic model is illustrated in Figure 1 from Mellor et al (2003).

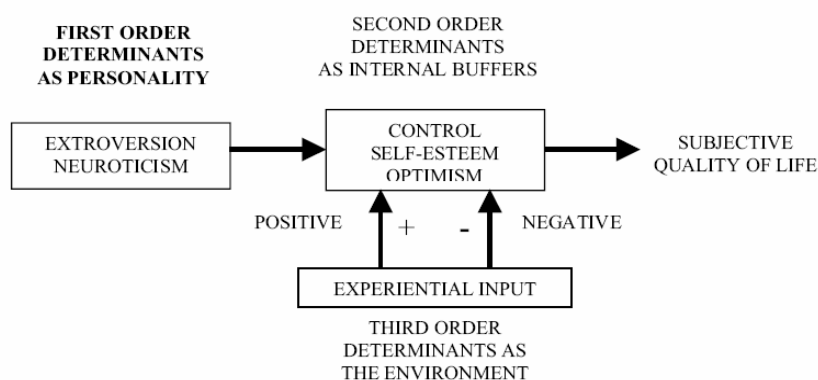


Figure 1. A model for subjective quality of life homeostasis

In this model, the different experiences of individuals' communication based on the different modes could be incorporated as part of the individual's experiential input. The experiences could be positive or negative, and invoke different responses from the cognitive buffer factors.

Subjective well-being has been measured by Cummins and colleagues with a Personal Well-being scale (Cummins, Eckersley, Pallant, Van Vugt, and Misajon, 2003) based on the individual's satisfaction level in seven salient domains: standard of living, health, personal relationships, life achievements, feelings of safety, feeling connected with community, and future security. The theoretical model thus allows a more systematic test of the impact of different types of communication on individuals' well-being, taking into account the individuals' wide range of other experiences, personality and cognitive factors, and satisfaction in a range of personal life domains. By focusing on individuals' perceptions of connectedness to their family and friends, it will likely lead to a more comprehensive understanding of the relationship between communication type and subjective well-being. The present study was designed with the purpose of clarifying the inconsistencies evident in the more descriptive studies reported in the literature regarding technology-based communication and the relationship between communication type and subjective well-being.

This study also considered the influence of age on the relationship of communication mode used, social connectedness, satisfaction level, and subjective well-being. The age-based hypothesis is based on previous studies reporting use of technology-based communication primarily using younger age groups (for example, Gross, Juvonen, & Gable, 2002; Pew Internet and American Life Project, 2001; Pew Internet and American Life Project, 2004a). Research is lacking that investigates whether these younger age groups are in fact using technology-based modes of communication more frequently, in comparison to other age groups, and if this might have an impact on their subjective well-being, given that there is a divergence in the research as to whether this might be a positive or a negative influence on well-being.

Two hypotheses were tested. Firstly, based on the hypothesis that the experience of feeling positively connected with family and friends contributes to subjective well-being, it was predicted that there will be a positive relationship between connectedness with family and friends and subjective well-being. By adding this measure of social connectedness with family and friends as third order determinants (environmental input) into the homeostatic model, it will predictably add to the understanding of the factors that influence life satisfaction. This hypothesis was tested using a hierarchical regression analysis.

Secondly, the relationship between frequency of technology-based and face-to-face communication with family and friends and subjective well-being for each of three age groups was examined ([18-35], [36-55], [56-89] years of age). A negative relationship was predicted between frequency of use of technology-based modes of communication and age. This hypothesis was tested with a one-way analysis of variance, and post-hoc Bonferroni pair-wise comparisons for age group differences.

### Method

#### *Participants*

The participants for this project were taken from a database of Australian adults who had previously participated in an Australian Unity Well-being project and had indicated that they were willing to remain on the database for participation in future projects. 1732 participants were sent a questionnaire, 808 of which were returned completed, giving a response rate of 46.7%. Data from 27 of these participants in total were removed from the sample. Nineteen had missing values on the Personal Well-being (PWB) scale. The remaining eight were removed due to their PWB scores being the maximum score reported for all items. Routinely such cases are removed as they are considered to provide unreliable data. This left a sample size of 781 with the age of the participants ranging from 18 to 89 years ( $M = 53.32$  years,  $SD = 15.21$ ), comprising 468 females and 301 males, for those participants whose age and gender were known.

#### *Measures*

A survey questionnaire was developed that included demographic questions, measures of the use of new technologies and communication modes, factors in the homeostatic model of subjective well-being, and social connectedness. The full survey is provided in Appendix A. Details of the measures used in this study are provided below.

### ***Homeostatic Model of Subjective Well-being Factors***

***Subjective well-being.*** The 7-item Personal Well-being (PWB) scale, developed by Cummins et al. (2001) for the Australian Unity Well-being project, was used as a measure of subjective well-being, together with the global life-satisfaction item, “How satisfied are you with your life as a whole?” Scores on these items were on an 11-point end-defined scale, ranging from “Very Dissatisfied” to “Very Satisfied”. Cronbach’s alpha reliability coefficient reported by Cummins and his colleagues (2001) for the PWB scale was .82. In the present study the Cronbach’s alpha coefficient for the PWB scale was .86.

***Determinant Factors.*** Measures of the three types of determinant factors (see Figure 1) were included: Personality, Internal (Cognitive) buffers, and Experiential Input.

***Personality.*** Measures of extraversion and neuroticism were based on four items from Gosling, Rentfrow and Swann’s (2003) Ten Item Personality Inventory (TIPI), a short inventory for measuring the Big Five personality dimensions. Gosling and colleagues (2003) found coefficient alphas of .68 and .73 respectively for extraversion and emotional stability. The emotional stability scale scores were used as a measure of neuroticism. Consistent with these results, the present study found Cronbach’s coefficient alphas of .65 for extraversion and .69 for neuroticism.

***Cognitive Buffers.*** Perceived control, self-esteem and optimism were measured.

***Perceived Control.*** The measure of perceived control used a nine-item scale developed by Hollway (2003) based on measures of primary, secondary and relinquished control. The items are prefaced with “When bad things happen to you how do you cope with them? How much do you agree that when something bad happens...”. Examples of items of each control type are - primary control: “I look for different ways to improve the situation”; secondary control: “I remind myself something good may come of it”; and relinquished control: “I spend time by myself”. Participants indicated their agreement on an 11-point end-defined scale ranging from “Strongly Disagree” to “Strongly Agree”. The three control types were collapsed to form one combined variable by reverse scaling the relinquished control items and adding the scale together to reach a final perceived control score. The coefficient alpha in the present study was .65.



*Self-esteem.* The Rosenberg Self-Esteem Scale (SES) (Rosenberg, 1979) was used as a measure of self-esteem and one of the three cognitive buffer factors. This is a ten-item scale which asks participants to indicate their level of agreement on an 11-point End-defined scale ranging from “Strongly Disagree” to “Strongly Agree”, to questions such as “I wish I could have more respect for myself”. Reported reliabilities for the SES scale are high with Cronbach’s alphas ranging from .72 to .90, using a 5-point end-defined scale. In the current study, the alpha coefficient was .89.

*Optimism.* The Life Orientation Test-Revised (LOT-R) (Carver & Scheier, 2003) scale was used to measure optimism, which is defined as “generalized expectations of good versus bad outcomes in life”. The scale normally consists of six items; however the three positively worded items were used in the present study as a measure of optimism. The items included questions such as “Overall, I expect more good things to happen to me than bad”. Participants are asked to indicate their level of agreeability on an 11-point end-defined scale ranging from “Strongly Disagree” to “Strongly Agree”. The alpha coefficient in the present study was .85.

*Experiential Input.* Experiential input is the third order environmental determinant in the homeostatic model of subjective well-being, and can be negative or positive (Mellor et al., 2003). Measures of life events, connectedness to family and feelings of connectedness to friends were used as measures of environmental experience.

*Life Events.* Participants were asked “Has anything happened to you recently causing you to feel happier or sadder than normal?” Participants indicated “Yes, happier”, “Yes, sadder”, or “No”. Responses on this question were used as a categorical measure of Life Events, with Happier = 3, No Event = 2, and Sadder = 1.

*Connectedness to family and friends.* Connectedness was measured using two items in the ‘Telecommunications and the Internet’ section of the questionnaire. One question measured how connected participants feel to their friends, and another question measured how connected they feel to their family. Both questions used an 11-point end-defined scale, ranging from 0 (Not Connected) to 10 (Strongly Connected).

### *Procedure*

Although the current study was part of a larger study, separate ethics approval was obtained from the Deakin University Ethics Committee (see page i). Following this approval, the questionnaires were posted to participants enclosed with a plain language statement (see Appendix C) and a letter to the participant describing the purpose of the project, their rights with regards to participation and confidentiality, and contact details should they have further questions or concerns. Appendix B provides a copy of the letter. Completed questionnaires were returned by reply paid mail.

## Results

### *Preliminary Data Analysis*

Of the independent variables, the cognitive buffer factors (perceived control, self-esteem, and optimism) were all strongly negatively skewed; the personality factor ‘neuroticism’ was strongly positively skewed and ‘extraversion’ had a normal distribution; the experiential input factor ‘life event’ had a normal distribution and the experiential factors ‘connectedness to family’ and ‘connectedness to friends’ were strongly negatively skewed. The dependent variable Subjective Well-Being, measured by the PWB scale, was strongly negatively skewed. Each of the variables, therefore, violated the assumption of normality. However these distributions were not unexpected as they were in accordance with past research and theory. Further, Pallant (2001) advises normality issues are seldom critical for analyses using large samples, as was the case here.

All data was screened for outliers by inspection of the ‘Extreme Values Table’. Outliers were considered to be any value that was outside of a response between the values of zero to ten (which were the given options according to the 11-point end-defined scale used). A total of seven data entry errors were detected. These were all double entries (e.g. 88 rather than 8) of a plausible response and were modified to reflect a correct response. Two outlying values in the PWB scale were detected by examining box plots and histograms for each of the variables, however these values were not deleted as they did not appear to affect the direction or level of significance of the results tested. Missing data were analyzed through SPSS 12.0 MISSING

VALUES ANALYSIS. There was no pattern to the missing data. Expectation maximization was conducted for all missing data, excluding the variable Life Events as this was a dichotomous variable for which data could not be imputed. Those cases with missing data on the Life Events variable ( $N = 18$ ) were excluded from the main regression ( $N = 771$ ), however they were used for the purpose of finding correlations between variables. The means and standard deviations for each scale were not altered by expectation maximization. Evidence of data screening can be seen in Appendix D.

*Hypothesis 1: Connectedness with family and friends and subjective well-being.*

A hierarchical multiple regression using SPSS Regression was conducted with Personal Well-being as the dependent variable, and the homeostatic model factors with the addition of 'Connectedness to family' and 'Connectedness to friends' as the independent variables.

Multicollinearity was assessed by checking tolerances and Variance Inflation Factors. No multicollinearity was found. Multivariate outliers were assessed by examining Cook's D and mahalanobis distance. The maximum mahalanobis distance was greater than the chi square critical value, and a total of ten outliers were identified. The analyses were run with and without these cases, and it was found that these outliers did not alter the results so were not excluded from the analyses. An analysis of the residuals revealed that there were no violations of normality or homoscedasticity. Evidence of assumption testing can be seen in Appendix D.

The connectedness variables were entered in Model 1 of the regression along with the Life Event variables. These three variables represented experiential input. In Model 2 the personality variables (extraversion and neuroticism) were entered, followed by the cognitive buffer factors (self-esteem, perceived control, and optimism) in Model 3. The dependent measure of subjective well-being was scores on the personal well-being (PWB) scale. Table 1 presents a summary of the regression results.

Table 1

*Regression for Connectedness and Homeostatic Model Factors on Subjective Well-being (PWB)*

Variables	<u>N</u>	<u>M</u>	SD	r	$\beta$	sr <sup>2</sup>	R <sup>2</sup>	$\Delta R^2$
<u>Model 1</u>								
Life Event					.16***	.03	.25	.25***
Connectedness to family					.23***	.04		
Connectedness to friends					.28***	.06		
<u>Model 2</u>								
Life Event					.12***	.01	.34	.09***
Connectedness to family					.18***	.02		
Connectedness to friends					.19***	.02		
Extraversion					.11***	.01		
Neuroticism					-.29***	.07		
<u>Model 3</u>								
Life Event	763	2.02	0.76	.25	.10***	.01	.45	.11***
Connectedness to family	781	81.11	20.43	.40	.10**	.01		
Connectedness to friends	781	69.11	22.80	.42	.12***	.01		
Extraversion	781	53.84	24.54	.28	.00			
Neuroticism	781	30.73	21.67	-.43	-.03			
Self-esteem	781	74.72	17.45	.60	.36***	.05		
Optimism	781	67.72	18.73	.53	.18***	.02		
Perceived Control	781	67.54	12.14	.40	.01			
Personal Well-being (DV)								

Model 1: Unique variability = .13; shared variability = .12; Model 2: Unique variability = .13; shared variability = .21; Model 3: Unique variability = .10; shared variability = .35; \*\*\* $p < .001$ , \*\* $p < .01$ .  $p < .001$  for all bi-variate correlations of variables with personal well-being.

The table displays the means and standard deviations, correlation with the dependent variable ( $r$ ), the standardized regression coefficients ( $\beta$ ), the semi-partial correlations (sr<sup>2</sup>), R Square (R<sup>2</sup>), and R Square change ( $\Delta R^2$ ), and the significance levels.  $r$  was significantly different from zero in each model. The semi-partial coefficients (sr<sup>2</sup>) indicate the amount of unique variance accounted for by specific variables.

In Model 1, with the experiential input factors in the equation (life events, connectedness to family, connectedness to friends),  $R^2 = .25$ ,  $p < .001$ ,  $F(3, 759) = 84.25$ ,  $p < .001$ . All three variables contributed a total of 13% unique variance (3% Life Event; 4% Connectedness to family; 6% Connectedness to friends) and 12% shared variance. In Model 2, with the

personality factors entered into the equation,  $R^2 = .34$ ,  $p < .001$  ( $\Delta R^2 = .25$ ),  $F(3, 762) = 76.14$ ,  $p < .001$ . The shared variance was 21%, with the unique contribution of the experiential factors reduced to 5% (1% Life Event; 2% Connectedness to family; 2% Connectedness to friends) and the personality factors adding 8% unique variance (1% Extraversion; 7% Neuroticism), suggesting some mediation of the experiential input by the personality factors, particularly level of neuroticism which was negatively related to subjective well-being. In Model 3, with the cognitive buffer factors entered, an additional 11% of variance in subjective well-being was explained,  $R^2 = .45$ ,  $p < .001$  ( $\Delta R^2 = .11$ ),  $F(8, 754) = 76.77$ ,  $p < .001$ , with 35% of the variance being shared variance, and 10% being unique variance (1% Life Event; 1% Connectedness to family; 1% Connectedness to friends; 5% Self-esteem; 2% Optimism). These findings suggest that the cognitive buffer factors mediated the effect of the personality factors, and to a small degree connectedness to family and friends, but also had a moderating effect by adding significantly to the prediction of subjective well-being.

Hypothesis 1 gains support from these findings, by the demonstration that the experience of feeling positively connected with friends and relations is significantly related to subjective well-being, and appears to integrate in expected ways as an additional experiential input together with the homeostatic model predictors. The results are consistent with social connectedness being an important experiential determinant of subjective well-being.

#### *Hypothesis 2: Age-related effects in the use of technology-based modes of communication*

Frequency of hours per week for use of face-to-face communication and technology-based communication is presented in Table 2 for three age groups, together with descriptive statistics for connectedness to friends and family, and personal well-being. Table 2 shows the results of one-way analysis of variance using SPSS ONEWAY, which were conducted for each variable with Age Group as the independent variable, and post-hoc Bonferroni pair-wise comparisons of group differences.

Table 2

*Age-Group Effects for Communication Mode, Connectedness and Subjective Well-being (PWB)*

Measure	Group 1		Group 2		Group 3		Contrast <sup>a</sup>
	M	SD	M	SD	M	SD	
Face-to-face Communication	3.29	1.41	2.65	1.49	2.45	1.35	<u>G 1</u> > <u>G 2</u> & <u>G 3</u>
Technology Communication	1.75	0.93	1.42	0.76	1.42	0.74	<u>G 1</u> > <u>G 2</u> & <u>G 3</u>
Connectedness to Friends	70.62	22.40	64.86	25.51	72.68	20.66	<u>G 2</u> < <u>G 3</u>
Connectedness to Family	79.59	21.55	77.68	20.84	84.47	19.42	<u>G 2</u> < <u>G 3</u>
Personal Well-Being	71.02	15.22	70.74	15.06	74.72	14.24	<u>G 2</u> < <u>G 3</u>

<sup>a</sup>Pairwise comparisons for Group contrasts with  $p < .05$ ; Group 1 = 18-35 years; Group 2 = 36-55 years; Group 3 = 56-89 years.  $N = 95$  (Group 1); 315 (Group 2); 344 (Group 3). Technology Communication = mean of summed responses for use of technology; Face-to-face Communication = mean summed responses for face-to-face communication, where 1 = 0-5hrs, 2 = 5-10hrs, 3 = 15-20hrs, 4 =  $\geq$  20hrs of use per week.

Significant age group differences were found for all variables. The group difference of face-to-face communication,  $F(2, 752) = 13.75$ ,  $p < .001$  was due to more frequent engagement in face-to-face communication reported by participants in the younger group than by participants in either of the two older age groups. A similar group difference was evident for technology communication,  $F(2, 751) = 4.61$ ,  $p < .001$ . Younger participants in this sample indicated that they spent more hours per week using technology-based modes of communication, than did participants in the older age groups.

The group differences for Connectedness and Personal Well-being demonstrated higher scores for participants in the older group than for the middle group, with  $F(2, 752) = 13.75$ ,  $p < .001$  (Connectedness to Friends);  $F(2, 752) = 13.75$ ,  $p < .001$  (Connectedness to Family); and  $F(2, 752) = 13.75$ ,  $p < .001$  (Personal Well-being). Thus participants in the older group had higher levels of social connectedness and personal well-being than did participants in the 36 to 55 years age group. Scores on these measures for participants in the younger age group did not differ from those for participants in either of the older groups.

To determine the relative contributions of age group, communication mode use, and social connectedness to the prediction of subjective well-being, a hierarchical regression was

conducted with Age group entered in Model 1, and the other variables added in Model 2. The results are presented in Table 3.

Table 3

*Hierarchical Regression Results for Age Group, Communication Mode Use, and Connectedness on Subjective Well-being (PWB)*

Variables	N	M	SD	r	$\beta$	sr <sup>2</sup>	R <sup>2</sup>	$\Delta R^2$
<u>Model 1</u>							.01**	.01**
Age	767				.12**	.01		
<u>Model 2</u>							.23***	.22***
Age	767	2.33	0.69	.12***	.06			
Face-to-face Communication	769	2.64	1.44	.14***	.05			
Technology Communication	768	1.45	0.77	-.01	-.09**	.01		
Connectedness to family	781	81.11	20.43	.40***	.24***	.04		
Connectedness to Friends	781	69.11	22.80	.42***	.30***	.07		
Personal Well-being (DV)	781	72.62	14.83					

Model 1: Unique variability = .12; Model 2: Unique variability = .12; shared variability = .11; \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ .

It can be seen that although age group was significantly and positively related to subjective well-being in Model 1 (contributing 1% variance), when the communication use and connectedness variables were added in Model 2, the age effect no longer contributed unique variance. Instead the connectedness variables contributed 11% unique variance to the total of 23% of variance explained. Hours spent communicating using technology had a small (1%) but negative effect on subjective well-being.

These results demonstrate there are age-related differences in communication mode use and connectedness, but the important predictor of subjective well-being among these predictors is the experience of social connectedness. These results provide new empirical evidence of the relationship between age group, communication mode use, social connectedness with subjective well-being.

### Discussion

The aims of this study were to determine if feelings of connectedness to family and connectedness to friends would be significant predictors of subjective well-being, entered as environmental input in an existing model of quality of life homeostasis; and to determine age-based differences in relation to the frequency and type of communication mode used to communicate with family and friends, with the specific prediction that use of technology-based modes of communication would be negatively related to age. The findings were consistent with the predictions. Connectedness to family and connectedness to friends were found to be significant predictors of subjective well-being, and the oldest age group used technology-based modes of communication the least, and the youngest age group used these modes the most. It would seem that there is not just one single communication mode for all age groups that is best suited for feeling connected to family and friends in relation to subjective well-being. Some other interesting findings are also discussed.

#### *Hypothesis 1: Connectedness with family and friends and subjective well-being.*

The hypothesis that there would be a positive relationship between connectedness with family and friends and subjective well-being was supported. Adding measures of connectedness to family and friends into the existing homeostatic model of subjective well-being added to the understanding of the factors that influence life satisfaction, by explaining an extra 9% of unique variance. Thus, it is determined that social connectedness is an important experiential determinant of subjective well-being.

How individuals feel about their connections with those close to them may increase or decrease their levels of life satisfaction. Subjective well-being failure is proposed to occur when a sufficiently adverse environmental factor overcomes the homeostatic system (Chambers, Cummins, Mellor, Firth & Stokes, 2005). Thus, individuals who feel very disconnected to family and/or friends may be at risk of homeostatic failure. Other environmental factors that have been studied and determined to have an impact on subjective well-being include life events (as considered in the present study), volunteerism, and stress (Chambers et al., 2005). However, life events is a very broad construct and may encompass a range of positive and negative events that may have an impact on quality of life. More research



is required that looks at the effects of specific environmental impact, such as the effects of sudden disconnection, loss, or rejection, from family or friends, including romantic partners.

*Hypothesis 2: Age-related effects in the use of technology-based modes of communication*

The second hypothesis, which predicted a negative relationship between frequency of use of technology-based modes of communication and age, was supported. Significant group differences revealed that the younger participants in this sample spent more hours per week using technology-based modes of communication than the older participants. Interestingly, the younger participants were also spending the most amount of time per week in person with their family and friends, indicating that they are not replacing, but instead supplementing their face-to-face interactions with technology-based modes of communication. Further, this age group also reported approximately equal levels of overall life satisfaction as the oldest (56-89) age group.

This result provides support for the use of technology-based modes of communication as a means of increasing social interaction, but it does not necessarily increase social connectivity as has been suggested in previous studies (Kraut et al., 1998). This is evidenced by the results of this study that the older participants used all modes of communication the least of all age groups, however reported higher levels of well-being and connectedness overall, and significantly more so than the middle age group (36-55 years), who use a moderate amount of communication both face-to-face and via the use of technology.

One possible explanation for the finding that the youngest age group (18-35 years) spent more time interacting with family and friends is simply that they have more time to do so. It is not uncharacteristic for individuals in this age group to be living at home with their parents while they save, study, travel, and spend time socializing with friends at a time in their lives when they may not have the same level of responsibility (e.g. full-time jobs, children, mortgage, bills) as individuals in the older age groups, and therefore have more time for socializing. Further, these younger individuals have grown up in a generation riddled with new technology, and are perhaps more likely to embrace various forms of technology-based communication, such as mobile text messaging, email, webcams and instant messenger.

### *Additional Findings*

An interesting finding was that connectedness to friends (8%) predicted more unique variance in subjective well-being than connectedness to family (4%). Although this was not a significant difference, or a direct hypothesis of the current study, this finding lends support to the previous studies which found that contact with friends in particular is positively related to well-being (Larson, Mannell, & Zuzaneck, 1986; Nezlek et al., 2002). It is evident that, for some people, family members are more important than friends, however, other individuals report feeling more connected to their friends than their family members. There are many reasons why this may be; for example, often interactions with family members involve more routine, mundane tasks, compared to the fun leisure activities which are characteristic of friendships. This is an area of study which requires more research.

Another interesting finding was that the middle age group (36-55 years) was significantly less connected to their family and friends than the older age group. This may be due to the increased level of responsibility for this age group, as previously mentioned. This also requires further research to more closely examine the reasons for this finding.

### *Implications*

The finding that the older participants use technology-based modes of communication the least and have almost the same levels of connectedness to family and friends and levels of subjective well-being as the younger participants, indicates that there is not only one universal communication mode which is best suited for all age groups. Rather, the feeling of connectedness is subjective and therefore may depend on the modes that individuals are comfortable with using. It is clear that individuals in the younger age group are the most comfortable using technology-based modes of communication. In light of the finding that connectedness to family and friends is an important predictor of well-being, developing community strategies that encourage individuals to increase their interactions with their family and friends, or to seek out activities in which they may make friends, may help to increase levels of social connectedness and subjective well-being.

### *Limitations and Future Directions*

A limitation of the current study is the imbalance of younger versus older participants. Future studies may benefit from focusing on and increasing the sample size for the younger age groups in an effort to get a clearer idea of other, specific types of technology-based communication used amongst those individuals and how it affects their lives. New types of technology-based communication are being released onto the market at an incredible rate, each new form being an improvement of the one before it. Examples include SMS Mac, an online form of communication which offers typed messages to be sent for free to mobile phones; 'Communicators', a new mobile phone with email and Internet capabilities; and Skype, an online service offering free phone calls over the Internet. Future research could incorporate these new technology-based communication modes.

### *Conclusion*

The results of this study contribute knowledge to the areas of subjective well-being and social connectedness. These results add to the existing homeostatic model of subjective well-being by recognizing the contribution of feelings of connectedness to family and friends as being an integral, environmental factor that predicts subjective well-being. The results also provide new empirical evidence of the relationship between age group, communication mode use, social connectedness with subjective well-being. Further, there is currently limited research in the field of social connectedness, as distinct from social support and loneliness, and the current study has demonstrated how this construct fits into well-being research, when taking frequency of contact and different modes of communication into consideration. It was concluded that although there were some age and communication mode differences, the experience of social connectedness makes a more important contribution to an individual's subjective well-being, than the mode of communication.

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Appendix A: Questionnaire & Demographics









### Age and Gender Demographics

#### Gender Frequencies

<b>Gender</b>	<b>N</b>	<b>%</b>
Male	301	37
Female	468	58
Unknown	39	5
<b>Total</b>	<b>808</b>	<b>100</b>

#### Age Frequencies

<b>Age (yrs)</b>	<b>N</b>	<b>%</b>
18-35	97	12
36-55	318	39
56-89	352	44
Unknown	41	5
<b>Total</b>	<b>808</b>	<b>100</b>

Appendix B: Letter to participants



Appendix C: Plain Language Statement





Appendix D: Data screening & Assumption testing

## Missing Variables Analysis

### Univariate Statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes(a)	
				Count	Percent	Low	High
LIFEVENT	763	2.0236	.75952	18	2.3	0	0
CONNECTED_FRIENDS	775			6	.8		
CONNECTED_FAMILY	776			5	.6		
PWB	781			0	.0		
LIFESAT	780			1	.1		
PERCON	761			20	2.6		
SESTEEM	751			30	3.8		
SOPTIM	776			5	.6		
SEXTRAV	771			10	1.3		
SNEUROT	772			9	1.2		

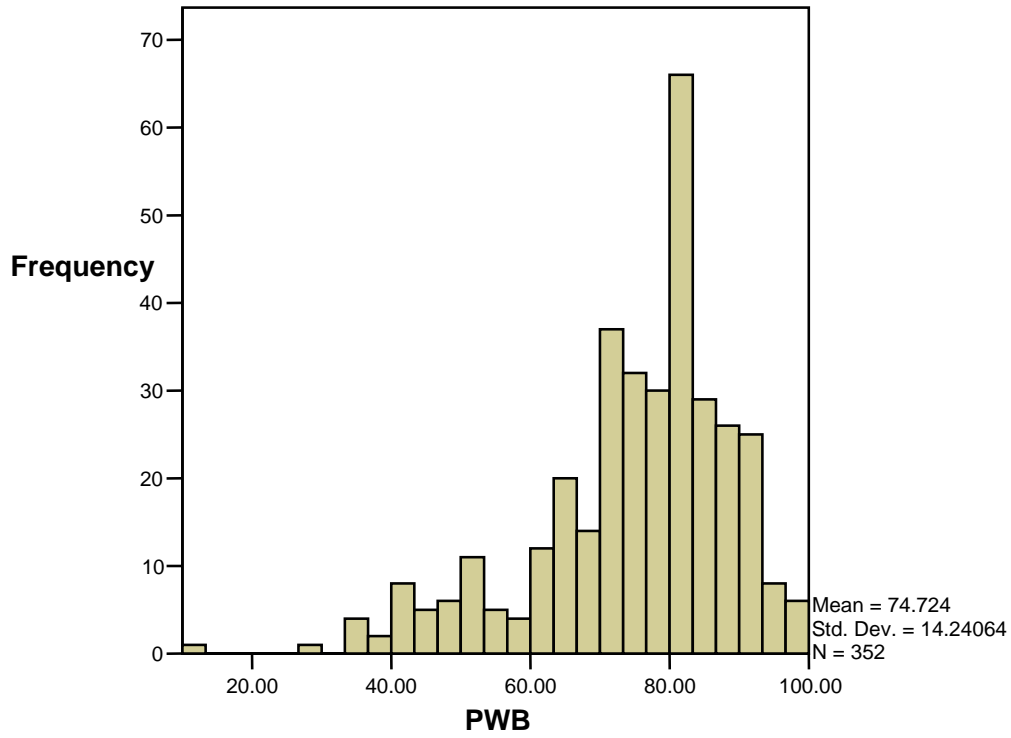


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359	3	15.8								S		
615	5	26.3								S		
581	5	26.3									S	
34	6	31.6							S		S	
397	5	26.3									S	S
709	5	26.3										S
749	5	26.3										S
751	5	26.3										S
534	6	31.6								S		S
101	6	31.6								S		S
70	8	42.1					S		S	S		S
340	9	47.4				S	S		S	S		S
475	8	42.1				S	S			S		S
673	3	15.8										S
724	1	5.3					S					
698	2	10.5					S		S			
203	2	10.5					S		S			
439	2	10.5					S		S			
76	2	10.5				S			S			
490	2	10.5			S	S						
593	1	5.3			S	S						
274	2	10.5		S	S							
753	4	21.1		S								
776	9	47.4		S	S							S
249	6	31.6		S	S							
579	7	36.8								S		
712	8	42.1						S		S		
235	4	21.1					S		S			
426	6	31.6				S	S		S		S	
370	10	52.6		S	S							S

S = system missing value

**Histogram**



Two outliers detected in Personal Well-Being data

## Scale reliabilities

### Personal Well-Being

#### Reliability Statistics

Cronbach's Alpha	N of Items
.861	7

### Extraversion

#### Reliability Statistics

Cronbach's Alpha	N of Items
.649	2

### Neuroticism

#### Reliability Statistics

Cronbach's Alpha	N of Items
.690	2

### Perceived Control

#### Reliability Statistics

Cronbach's Alpha	N of Items
.649	9

### Self-esteem

#### Reliability Statistics

Cronbach's Alpha	N of Items
.894	10

### Optimism

#### Reliability Statistics

Cronbach's Alpha	N of Items
.850	3

Test for Multicollinearity

	Collinearity Statistics		
	Tolerance	VIF	Minimum Tolerance
Extraversion Scale SM	.859	1.165	.658
Neuroticism Scale SM	.875	1.143	.703
Optimism Scale SM	.808	1.237	.689
Rosenberg Self-esteem Scale SM	.773	1.294	.679
Perceived Control	.822	1.216	.694
Optimism Scale SM	.640	1.563	.640
Rosenberg Self-esteem Scale SM	.497	2.014	.497
Perceived Control	.745	1.342	.638

a Predictors in the Model: (Constant), Life Event, Connectedness to Friends, Connectedness to Family

b Predictors in the Model: (Constant), Life Event, Connectedness to Friends, Connectedness to Family, Neuroticism Scale SM, Extraversion Scale SM

c Dependent Variable: Personal Well-Being

Test for multivariate outliers – Mahalanobis distance

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
Mahalanobis Distance	712	.8	40.4	7.989	5.4961
Valid N (listwise)	712				

Mahalanobis distance > Critical chi-square value (26.125), df = 8, significance level .001

Appendix E: Statistical output



*Hypothesis 1: Connectedness with family and friends and subjective well-being.*

## Regression

### Descriptive Statistics

	Mean	Std. Deviation	N
Personal Well-Being	72.6212	14.82672	781
Connectedness to Friends	69.11	22.802	781
Connectedness to Family	81.11	20.430	781
Life Event	2.0236	.75952	763
Extraversion Scale SM	53.8378	24.53872	781
Neuroticism Scale SM	30.7267	21.66831	781
Rosenberg Self-esteem Scale SM	74.7236	17.45314	781
Optimism Scale SM	67.7173	18.73231	781
Perceived Control	67.5403	12.13849	781

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.500(a)	.250	.247	12.86719	.250	84.254	3	759	.000
2	.578(b)	.335	.330	12.13417	.085	48.236	2	757	.000
3	.670(c)	.449	.443	11.06507	.114	52.116	3	754	.000

a Predictors: (Constant), Life Event, Connectedness to Friends, Connectedness to Family

b Predictors: (Constant), Life Event, Connectedness to Friends, Connectedness to Family, Neuroticism Scale SM, Extraversion Scale SM

c Predictors: (Constant), Life Event, Connectedness to Friends, Connectedness to Family, Neuroticism Scale SM, Extraversion Scale SM, Perceived Control, Optimism Scale SM, Rosenberg Self-esteem Scale SM

### ANOVA(d)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41848.287	3	13949.429	84.254	.000(a)
	Residual	125663.502	759	165.565		
	Total	167511.789	762			
2	Regression	56052.581	5	11210.516	76.139	.000(b)
	Residual	111459.208	757	147.238		
	Total	167511.789	762			
3	Regression	75195.261	8	9399.408	76.770	.000(c)
	Residual	92316.528	754	122.436		
	Total	167511.789	762			

a Predictors: (Constant), Life Event, Connectedness to Friends, Connectedness to Family

b Predictors: (Constant), Life Event, Connectedness to Friends, Connectedness to Family, Neuroticism Scale SM, Extraversion Scale SM

c Predictors: (Constant), Life Event, Connectedness to Friends, Connectedness to Family, Neuroticism Scale SM, Extraversion Scale SM, Perceived Control, Optimism Scale SM, Rosenberg Self-esteem Scale SM

d Dependent Variable: Personal Well-Being

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Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients		Correlations			
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	40.232	2.164		18.590	.000			
	Connectedness to Friends	.181	.024	.278	7.586	.000	.421	.265	.239
	Connectedness to Family	.166	.027	.229	6.212	.000	.403	.220	.195
	Life Event	3.166	.627	.162	5.048	.000	.251	.180	.159
	Extraversion Scale SM								
	Neuroticism Scale SM								
	Rosenberg Self-esteem Scale SM								
	Optimism Scale SM								
	Perceived Control								
	2	(Constant)	51.280	2.536		20.221	.000		
Connectedness to Friends		.123	.024	.190	5.161	.000	.421	.184	.153
Connectedness to Family		.129	.026	.177	5.021	.000	.403	.180	.149
Life Event		2.406	.597	.123	4.029	.000	.251	.145	.119
Extraversion Scale SM		.065	.019	.107	3.343	.001	.275	.121	.099
Neuroticism Scale SM		-.195	.022	-.285	-8.966	.000	-.432	-.310	-.266
Rosenberg Self-esteem Scale SM									
Optimism Scale SM									
Perceived Control									
3		(Constant)	24.165	3.437		7.031	.000		
	Connectedness to Friends	.079	.022	.121	3.567	.000	.421	.129	.096
	Connectedness to Family	.075	.024	.103	3.114	.002	.403	.113	.084
	Life Event	2.016	.547	.103	3.689	.000	.251	.133	.100
	Extraversion Scale SM	.000	.018	.000	-.011	.991	.275	.000	.000
	Neuroticism Scale SM	-.020	.024	-.029	-.820	.413	-.432	-.030	-.022
	Rosenberg Self-esteem Scale SM	.304	.036	.358	8.477	.000	.608	.295	.229
	Optimism Scale SM	.142	.030	.179	4.794	.000	.528	.172	.130
	Perceived Control	.017	.041	.014	.410	.682	.407	.015	.011

a Dependent Variable: Personal Well-Being

*Hypothesis 2: Age-related effects in the use of technology-based modes of communication*

**One-way**

**Descriptives**

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Hours per week using technology to communicate with family and friends	1	95	.75	.934	.096	.56	.94	0	4
	2	315	.42	.762	.043	.33	.50	0	4
	3	344	.41	.739	.040	.33	.49	0	3
	Total	754	.46	.782	.028	.40	.51	0	4
Hours per week in direct contact (face-to-face) with family and friends	1	97	2.30	1.408	.143	2.02	2.58	0	4
	2	315	1.63	1.486	.084	1.46	1.79	0	4
	3	343	1.45	1.347	.073	1.30	1.59	0	4
	Total	755	1.63	1.438	.052	1.53	1.73	0	4

**ANOVA**

		Sum of Squares	df	Mean Square	F	Sig.
Hours per week using technology to communicate with family and friends	Between Groups	9.215	2	4.607	7.658	.001
	Within Groups	451.841	751	.602		
	Total	461.056	753			
Hours per week in direct contact (face-to-face) with family and friends	Between Groups	55.020	2	27.510	13.747	.000
	Within Groups	1504.879	752	2.001		
	Total	1559.899	754			

**Post Hoc Tests**

**Multiple Comparisons**

Scheffe

Dependent Variable	(I) Three Age Groups	(J) Three Age Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Hours per week using technology to communicate with family and friends	1	2	.331(*)	.091	.001	.11	.55
		3	.335(*)	.090	.001	.11	.56
	3	2	-.003	.060	.999	-.15	.15
Hours per week in direct contact (face-to-face) with family and friends	1	2	.674(*)	.164	.000	.27	1.08
		3	.853(*)	.163	.000	.45	1.25
	3	3	.179	.110	.268	-.09	.45

\* The mean difference is significant at the .05 level.

**One-way**

**Descriptives**

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Hrs spent in person communicating	1	97	3.2990	1.40805	.14297	3.0152	3.5828	1.00	5.00
	2	315	2.6254	1.48645	.08375	2.4606	2.7902	1.00	5.00
	3	343	2.4461	1.34724	.07274	2.3030	2.5891	1.00	5.00
	Total	755	2.6305	1.43834	.05235	2.5277	2.7332	1.00	5.00
Hrs spent using technology to communicate	1	95	1.7474	.93363	.09579	1.5572	1.9376	1.00	5.00
	2	315	1.4159	.76241	.04296	1.3314	1.5004	1.00	5.00
	3	344	1.4128	.73913	.03985	1.3344	1.4912	1.00	4.00
	Total	754	1.4562	.78249	.02850	1.4003	1.5122	1.00	5.00
Connectedness to Friends	1	97	70.62	22.399	2.274	66.10	75.13	0	100
	2	318	64.86	24.508	1.374	62.15	67.56	0	100
	3	352	72.68	20.661	1.101	70.51	74.84	0	100
	Total	767	69.18	22.819	.824	67.56	70.79	0	100
Connectedness to Family	1	97	79.59	21.550	2.188	75.24	83.93	0	100
	2	318	77.68	20.842	1.169	75.38	79.98	0	100
	3	352	84.47	19.420	1.035	82.44	86.51	0	100
	Total	767	81.04	20.522	.741	79.59	82.50	0	100
Personal Well-Being	1	97	71.0162	15.21803	1.54516	67.9491	74.0833	11.43	95.71
	2	318	70.7367	15.06257	.84467	69.0749	72.3986	20.00	97.14
	3	352	74.7240	14.24064	.75903	73.2312	76.2168	11.43	98.57
	Total	767	72.6020	14.82141	.53517	71.5514	73.6525	11.43	98.57

**ANOVA**

		Sum of Squares	df	Mean Square	F	Sig.
Hrs spent in person communicating	Between Groups	55.020	2	27.510	13.747	.000
	Within Groups	1504.879	752	2.001		
	Total	1559.899	754			
Hrs spent using technology to communicate	Between Groups	9.215	2	4.607	7.658	.001
	Within Groups	451.841	751	.602		
	Total	461.056	753			
Connectedness to Friends	Between Groups	10443.363	2	5221.681	10.271	.000
	Within Groups	388410.882	764	508.391		
	Total	398854.244	766			
Connectedness to Family	Between Groups	7941.214	2	3970.607	9.641	.000
	Within Groups	314654.206	764	411.851		
	Total	322595.420	766			
Personal Well-Being	Between Groups	2935.361	2	1467.680	6.782	.001
	Within Groups	165335.107	764	216.407		
	Total	168270.468	766			

## Post Hoc Tests

### Multiple Comparisons

Dependent Variable		(I) Three Age Groups	(J) Three Age Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Hrs spent in person communicating	Bonferroni	1	1					
			2	.67357(*)	.16427	.000	.2794	1.0677
			3	.85290(*)	.16268	.000	.4626	1.2432
		2	1	-.67357(*)	.16427	.000	-1.0677	-.2794
			3	.17933	.11040	.314	-.0855	.4442
			3	-.85290(*)	.16268	.000	-1.2432	-.4626
Hrs spent using technology to communicate	Bonferroni	1	1					
			2	.33150(*)	.09079	.001	.1137	.5493
			3	.33458(*)	.08990	.001	.1189	.5503
		2	1	-.33150(*)	.09079	.001	-.5493	-.1137
			3	.00308	.06049	1.000	-.1421	.1482
			3	-.33458(*)	.08990	.001	-.5503	-.1189
Connectedness to Friends	Bonferroni	1	1					
			2	5.760	2.615	.084	-.52	12.03
			3	-2.059	2.586	1.000	-8.26	4.14
		2	1	-5.760	2.615	.084	-12.03	.52
			3	-7.818(*)	1.744	.000	-12.00	-3.63
			3	2.059	2.586	1.000	-4.14	8.26
Connectedness to Family	Bonferroni	1	1					
			2	1.905	2.354	1.000	-3.74	7.55
			3	-4.887	2.327	.108	-10.47	.70
		2	1	-1.905	2.354	1.000	-7.55	3.74
			3	-6.792(*)	1.570	.000	-10.56	-3.02
			3	4.887	2.327	.108	-.70	10.47
Personal Well-Being	Bonferroni	1	1					
			2	.27945	1.70632	1.000	-3.8145	4.3734
			3	-3.70783	1.68695	.085	-7.7553	.3396
		2	1	-.27945	1.70632	1.000	-4.3734	3.8145
			3	-3.98728(*)	1.13812	.001	-6.7179	-1.2566
			3	3.70783	1.68695	.085	-.3396	7.7553
			2	3.98728(*)	1.13812	.001	1.2566	6.7179
			3					
			3					

\* The mean difference is significant at the .05 level.

## Regression

### Descriptive Statistics

	Mean	Std. Deviation	N
Personal Well-Being	72.6212	14.82672	781
Three Age Groups	2.33	.690	767
Hrs spent using technology to communicate	1.4505	.77789	768
Hrs spent in person communicating	2.6385	1.44225	769
Connectedness to Friends	69.11	22.802	781
Connectedness to Family	81.11	20.430	781

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.115(a)	.013	.012	14.73804	.013	10.090	1	752	.002
2	.486(b)	.236	.231	13.00228	.223	54.545	4	748	.000

a Predictors: (Constant), Three Age Groups

b Predictors: (Constant), Three Age Groups, Connectedness to Friends, Hrs spent using technology to communicate, Hrs spent in person communicating, Connectedness to Family

### ANOVA(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2191.550	1	2191.550	10.090	.002(a)
	Residual	163341.753	752	217.210		
	Total	165533.304	753			
2	Regression	39076.892	5	7815.378	46.229	.000(b)
	Residual	126456.411	748	169.059		
	Total	165533.304	753			

a Predictors: (Constant), Three Age Groups

b Predictors: (Constant), Three Age Groups, Connectedness to Friends, Hrs spent using technology to communicate, Hrs spent in person communicating, Connectedness to Family

c Dependent Variable: Personal Well-Being

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Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	66.851	1.894		35.289	.000			
	Three Age Groups	2.474	.779	.115	3.176	.002	.115	.115	.115
	Hrs spent using technology to communicate								
	Hrs spent in person communicating								
2	(Constant)	43.407	2.621		16.560	.000			
	Three Age Groups	1.229	.713	.057	1.724	.085	.115	.063	.055
	Hrs spent using technology to communicate	-1.667	.630	-.087	-2.645	.008	-.011	-.096	-.085
	Hrs spent in person communicating	.486	.354	.047	1.373	.170	.141	.050	.044
	Connectedness to Friends	.195	.024	.299	7.953	.000	.421	.279	.254
	Connectedness to Family	.173	.028	.238	6.228	.000	.403	.222	.199

a. Dependent Variable: Personal Well-Being