

**Staying Connected:  
Mechanisms Related to the Wellbeing of Older Adults Online**

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### **Statement of Sources**

I declare that this report is my own original work and that contributions of others  
have been duly acknowledged.

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Date

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### **Abstract**

Social connection and the need to belong are central to human motivations in order to maintain optimal health. With the reality of an ageing population, it is vital to identify ways to keep older adults connected and included. This was the first study to examine whether, and to what extent, older adults can derive feelings of social connectedness online. Further, this study investigated the relationship between online-derived social connectedness, belongingness orientation and wellbeing outcomes in older adults. Participants ( $N=241$ ) aged between 55 and 81 completed an online survey which measured social connection: online and offline; the need to belong: growth orientation; and wellbeing outcomes: physical health, loneliness, depression, stress, anxiety, and subjective wellbeing. As hypothesised, older adults gained feelings of social connectedness online, similar to that gained from traditional networks, and to the same extent as younger people. The hypothesised moderated mediation was supported for loneliness and depression, partially supported for stress and subjective wellbeing, but was not supported for anxiety. Results suggest that online social networks may be an alternative platform for older adults to maintain social connection and wellbeing, particularly for those with a growth belongingness orientation. Though causality cannot be inferred from the current design; it is suggested that online social networks may be a fruitful source of social connection for those less able to connect face-to-face.

As the global population rapidly ages, it is necessary for researchers and policy makers to identify ways to support older adults. One concern is how to keep older adults connected (Cornwell, Laumann, & Schumm, 2008). Research on social connection has shown the importance of feeling like one belongs in order to maintain optimal health (Baumeister & Leary, 1995). Previously, traditional face-to-face social networks have provided evidence for a number of interventions to protect against negative wellbeing outcomes (Cattan, White, Bond, & Learmouth, 2005). More recently, the emergence of online social networks, such as Facebook, have been found to show similar benefits (Grieve, Indian, Witteveen, Tolan, & Marrington, 2013). Of note, the number of older adults online is increasing. Specifically, 56% of adults over the age of 65 are using Facebook (Duggan, Ellison, Lampe, Lenhart, & Madden, 2015). As older adults have an increased risk of experiencing loneliness, online social networks have gained interest as a potential alternative for older adults to stay connected (Nimrod, 2014). The aim of this research was to examine for the first time whether, and the extent to which, older adults can derive feelings of social connectedness online, as well as investigating wellbeing outcomes associated with online social connectedness in older adults.

### **A Universal Need to Belong**

The maintenance of meaningful relationships with others has been argued to be a timeless human goal (McClelland, 1987). Both belongingness theory (Baumeister & Leary, 1995) and self-determination theory (Deci & Ryan, 2000) propose that people are motivated to feel connected in order to obtain optimal functioning. Belongingness theory suggests that those with lower levels of belonging suffer higher levels of psychological and physical illness (Baumeister & Leary, 1995). In support of belongingness theory, Mellor, Stokes, Firth, Hayashi, and

Cummins (2008) found those who lacked a sense of belonging, experienced higher levels of loneliness, and in turn reported lower levels of wellbeing. Humans were born to depend on others, thus it is unsurprising that when social connections are diminished, this perceived loneliness can have a detrimental impact on health (Cacioppo & Cacioppo, 2014).

More recently, it has been suggested that different strengths in the need to belong may be evident at the individual level (Lavigne, Vallerand, & Crevier-Braud, 2011). Two belongingness orientations have been suggested to arise from the need to belong: growth orientation and deficit reduction orientation (Lavigne et al., 2011). Individuals with high growth orientation are more likely to experience positive wellbeing outcomes due to more satisfying relationships, because of their sincere interest in others. In contrast, people with higher levels of deficit reduction orientation crave social acceptance, need more reassurance, and consequently experience more levels of loneliness (Lavigne et al., 2011). This suggests that while there may be a universal need to belong and connect with others, the strength and meaning behind this need differs from one person to the next.

The construct of social connectedness stems from belongingness theory, and refers to the feelings of affiliation associated with feeling engaged within a social network (Baumeister & Leary, 1995; Lee, Draper, & Lee, 2001), and can be considered to be a form of bonding social capital (Grieve & Kemp, 2015). Social connection can be measured objectively relative to the number of social ties one has (Goswami, Kobler, Leimeister, & Krmar, 2010), or frequency of contact and participation in activities (Rafnsson, Shankar, & Steptoe, 2015). However, Belongingness theory suggests that it is not just the company of others that satisfies belongingness needs, but the *quality* and *meaning* of the contact that matters

(Baumeister & Leary, 1995). Social connectedness therefore reflects the perceived feelings of meaningful connection with others at an interpersonal level (Lee et al., 2001).

In support of belongingness theory, social connectedness is a key determinant of positive psychological outcomes in a number of contexts. For example, Cockshaw, Shochet, and Obst (2014) found that individuals with higher levels of social connectedness experienced less depression in a workplace setting. Similarly, social connectedness was found to partially mediate the relationship between classroom environment and depressive symptoms for students in years seven and eight at two Australian high schools over three time points (Shochet & Smith, 2014). Other studies show positive relationships between social connectedness and subjective wellbeing (Jose, Ryan, & Pryor, 2012; Yoon, Hacker, Hewitt, Abrams, & Cleary, 2012), post-traumatic growth (Armstrong, Shakespeare-Finch, & Shochet, in press) and self-esteem (Lee & Robbins, 1998).

When social connection is thwarted, actual or perceived isolation may result (Hawthorne, 2006). Feelings of loneliness are inversely related to one's sense of belonging (de Jong Gierveld, Tilburg, & Dykstra, 2006), with loneliness described as the subjective feeling of isolation resulting from a lack of connection and unmet belongingness needs (Aanes, Mittelmark, & Hetland, 2010; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015). With belongingness needs unmet, it is unsurprising, that lonely individuals suffer worse mental health outcomes (Coyle & Dugan, 2012; De Silva, McKenzie, Harpham, & Huttly, 2005; Hagerty & Williams, 1999).

Loneliness is also related to poorer physical health. For example, high levels of loneliness have been associated with a 26% increase in premature mortality,

equivalent with the effects of well-established risk factors of mortality such as obesity and access to health care (Holt-Lunstad et al., 2015). Even when objective measures of social connection (for example marital status) and health behaviours are partialled out, perceived loneliness is associated with increased mortality (Luo, Hawkley, Waite, & Cacioppo, 2012). Loneliness is also associated with weakened immune function (Pressman et al., 2005), higher blood pressure (Hawkley, Thisted, Masi, & Cacioppo, 2010), and cognitive decline (Cacioppo & Hawkley, 2009).

In summary, the fundamental need for belongingness and affiliation is central to human motivations (e.g. Baumeister & Leary, 1995; Cacioppo & Cacioppo, 2014). The social connectedness that arises from meeting belongingness needs is associated with a range of positive outcomes (e.g. Cockshaw et al., 2014; Yoon et al., 2012), and when social connectedness is not experienced, loneliness and associated negative outcomes can emerge (Aanes et al., 2010; Holt-Lunstad et al., 2015).

### **The Importance of Social Connectedness in Older Adulthood**

While a majority of adults are socially connected, as people age, many are faced with drastic changes to their social networks, whereby close ties are hard to replace, and decreased frequency of contact can exacerbate the loss of connections (Cornwell et al., 2008). Although the loss of social connections can happen at any stage of the life course, older adults are more likely than younger adults to experience circumstances that directly challenge their capacity to connect. These include lifestyle changes (for example retirement and bereavement) and mobility constraints (for example, as a result of debilitating arthritis) (Machielse, 2015); declining physical health (Chesley & Johnson, 2014); and increased comorbidities (Chapman & Perry, 2008). Further, due to cultural changes in society, older adults are less able to rely on family or neighbours (Machielse, 2015; Stanley et al., 2010).

Using a qualitative approach, Goll, Charlesworth, Scior, and Stott (2015) explored barriers to social participation in older adults. Participants expressed their concern of no longer being able to physically participate, “I have weakness in my legs and I get extremely tired, so from that point of view it’s sort of difficult in trying to get out” (p.6). Further, geographical distance between family members was considered a barrier to socially connect with one participant stating “My family phone me up sometimes, but they can’t come here, they are very far” (p.7). In addition, participants described a sense of loss of a community that once supported one another, and how they now felt surrounded by neighbours who did not care.

However, by satisfying their need for connection and belonging, older adults can continue to maintain positive levels of wellbeing, and remain active and functional members of society (Fry & Keyes, 2010; Goswami et al., 2010). Social connectedness derived from social networks has been causally associated with a variety of positive effects in older adults (Golden, Conroy, & Lawlor, 2009). For example, Rafnsson et al. (2015) examined the relationship between social network characteristics on subsequent subjective wellbeing over a six year period, finding that close relationships are particularly important when determining life satisfaction for those aged 50 and above. Ashida and Heaney (2008) found that perceived social connectedness was more important than social support in predicting health outcomes in older adults (Mean age 73.1 years). Together, these findings suggest that the maintenance of personal relationships and associated social connection is important for the long term wellbeing of older adults.

### **Staying Connected: The Emergence of Online Social Networks**

Recently, online social networks have emerged as a means to maintain and enhance social ties (boyd [sic] & Ellison, 2008; Goswami et al., 2010). Facebook is

the most commonly used social media site, with more than one billion active monthly users (Facebook Newsroom, 2015). Facebook users can create a profile, share information, and connect with others in their social network (boyd [sic] & Ellison, 2008).

Importantly, it has been established that Facebook users can derive social connectedness from their use of the site (Grieve et al., 2013; Grieve & Kemp, 2015; Park & Lee, 2014; Lin & Utz., 2015). Grieve et al. found that the benefits of traditional face-to-face social connectedness translated online, with Facebook-derived social connectedness related to better subjective well-being, and less depression and anxiety in an adult sample (mean age 25.87 years,  $SD= 9.90$ ). Grieve et al. (see also Indian & Grieve, 2014) further argued for the potential utility of online social networks for people who are unable to connect in person. These isolated populations might include those with diminished accessibility or older adults.

Although the Internet is commonly considered as a purview of the young (e.g. Spies-Shapiro & Margolin, 2014), there is emerging evidence that the Internet provides effective access to social capital in older adults. For the first time since their inception, increasing numbers of older adults are using social media sites (Duggan et al., 2015). More than half (56%) of older adults aged 65 and over use Facebook—up from 45% of older adults using Facebook in 2012 (Duggan et al., 2015). Older internet users report better intergenerational communication (Gatto & Tak, 2008; Nef, Ganea, Muri, & Mosimann, 2013), greater opportunity to stay in touch with distant relatives (Doyle & Goldingay, 2012), and less isolation from the outside world (Ballantyne, Trenwith, Zubrinich, & Corlis, 2010; Smith, 2014; Stanley et al., 2010; Nyman & Isaksson, 2015).

In line with this, a key reason for Internet use in older adults is social inclusion where face-to-face inclusion is not feasible (Doyle & Goldingay, 2012). For example, Doyle and Goldingay (2012) explored older adults' subjective experience of Facebook within a focus group setting. One participant expressed disappointment in not being able to attend a birthday party, and stated that receiving photographs from the event enhanced feelings of participation and connection when it was not possible to be physically present: "they sent me photographs from the party...and it's just wonderful you know..." (p. 45).

Using the Internet can also provide older adults with a greater sense of belonging, improved wellbeing and reduced levels of loneliness and depression. Sum, Matthews, Pourghasem, and Hughes (2009), investigated the relationship between a sense of belonging and general internet use and its associations with wellbeing. Two hundred and twenty two Australian older adults aged 55 or older completed an online survey which showed positive relationships between Internet use and improved psychological and general health. Further, Cotten, Ford, Ford, and Hayle (2012), found that Internet use reduced depression by approximately 20-28% in a very large sample ( $N = 7839$ ) of retired adults over the age of 50.

Specifically in regards to social capital, Morris et al. (2014) conducted a systematic review of articles published between 2000 and 2013. Of the 18 articles identified as evaluating the effect of technology on quantity and quality of social relationships, 14 reported positive effects on aspects such as isolation, loneliness, and support. Enhanced relationships were predominantly derived from chat rooms, support groups, and discussion forums, rather than from other smart technologies, highlighting the utility of interactive online social networks.

In summary, with the emergence of online social networks and the increase in older adults online (Chang, McAllister, & McCaslin, 2015; Zickuhr & Madden, 2012), researchers have suggested the potential utility of online networks to enhance social inclusion in older adults (Goswami et al., 2010; Nimrod, 2014). Due to rapid growth of the older population, it seems reasonable that the number of people experiencing loneliness is likely to increase over time (Ballantyne et al., 2010; Stanley et al., 2010). However, there is preliminary evidence that social network site use may allow older adults to maintain social connection.

### **Quantity, Quality, and Quest: Interpersonal Orientation and Social Connectedness**

The theory of socioemotional selectivity describes a natural, yet adaptive, decline in social network size over the lifespan (Carstensen, Issacowitz, & Charles, 1999). Within this model, individuals regulate their social relationships towards the maintenance of denser social networks which actually enhance their social resources (Lang, 2001). Lubben and Gironde (2006) suggested that older adults turn their focus more towards primary bonds with family, friends and people in their neighbourhood rather than secondary ties such as the workplace and social group activities. Thus although older adults may appear to have fewer network members, they may just be choosing those network members wisely.

While one dimension of loneliness is how connected an older person feels (Stanley et al., 2010), simply increasing the number of social contacts an individual has may not alleviate loneliness (Holt-Lunstad et al., 2015), as one can still feel lonely in a crowd (Lubben & Gironde, 2006). Social interactions must be meaningful to the individual rather than mere contact or support, in order for belongingness needs to be satisfied (Baumeister & Leary, 1995). In line with socioemotional

selectivity theory, it follows that maintaining smaller numbers of close and meaningful relations with family and friends can help to preserve levels of life satisfaction and quality of life in older adulthood (Rafnsson et al., 2015), highlighting the role of perceived social connectedness, rather than size of social network.

Chan (2015) hypothesised an interaction between multimodal connectedness and wellbeing. Multimodal connectedness refers to how many different modes of technology an individual used to stay in touch (i.e. phone, computer, and tablet). Chan predicted that this relationship would be stronger for those who communicate more with their strong social ties. Accordingly, these authors found no direct relationship between the use of multiple modes of technology and wellbeing outcomes. However, when the strength of the ties was taken into account, it was found that the use of multimodal devices moderated the relationship between feelings of connectedness and wellbeing, whereby more frequent communication with strong ties had positive effects on wellbeing and weak tie communication had a negative effect on wellbeing. It was suggested that older adults can use technology to maintain connections which are unbound by location or time; and that individuals can stay connected with their offline close social ties via online avenues, whereby this increased online social connection with strong ties enhances levels of wellbeing (Chan, 2015).

Grieve and Kemp (2015) found that older age, and people with more positive attitudes towards Facebook, higher extraversion and greater emotional stability experienced more online social connectedness. Grieve and Kemp (2015) concluded that Facebook may be a place where adults of all ages can derive feelings of social connectedness. This seems particularly apparent for those who have a genuine

interest in others, have positive views of benefits of online social networking and who enjoy more satisfying relationships with their social ties.

Although Grieve and Kemp (2015) did not identify this, the mechanisms they suggested are consistent with the “seek and ye shall find” hypothesis (Tufekci, 2010). Tufekci describes this as a self-fulfilling prophecy, whereby those who believed online connection could maintain bonds were more likely to benefit. This online self-fulfilling prophecy shows parallels to the relationship between belongingness needs and wellbeing in the offline world. Individuals with higher growth belongingness orientation—those who express a sincere interest in connecting with others, and who view interpersonal interactions as a source of enrichment and discovery—experience more satisfying relationships (Lavigne et al., 2011; Lee et al., 2001).

### **The Current Study**

At a global level, the reality of an ageing population is vital to consider. It is predicted that by 2020 there will be more adults over the age of 65 than there are children under five; and between 2015 and 2050 adults aged over 60 will increase from 900 million to two billion people worldwide (World Health Organisation [WHO], 2015). There is therefore a pressing need to enhance “positive ageing”: the maintenance of wellbeing across both physical and psychosocial domains in later life (Rafnsson et al., 2015). One way to support the inclusion of older adults is by creating affordable strategies to prevent or manage chronic conditions, taking in to consideration physical and mental barriers (WHO, 2015). The Internet shows promise as a means by which psychosocial predictors of positive ageing might be facilitated (e.g. Morris et al., 2014).

Previous research has used qualitative approaches with extremely small sample sizes (e.g. Ballantyne et al., 2010:  $N=6$ ; Doyle & Goldingay, 2012:  $N=5$ ). Despite the rapid emergence of online social networks (Livingstone & Brake, 2010) and increasing adoption of technology by older adults (Chang et al., 2015), to date no research has directly examined the extent to which older adults can derive social connectedness from online social networking sites, and the outcomes that might be associated with this online social connection. This represents a substantial gap in our understanding of which might constitute effective ageing in an electronically connected world.

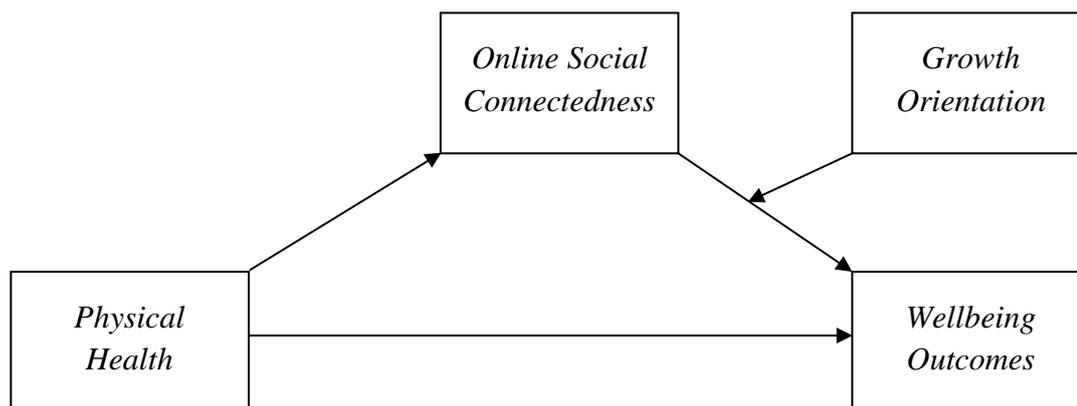
The overarching goal of this research was therefore to identify ways in which older adults can maintain social connectedness within the context of online interpersonal interaction, and to gain insight into how online social connectedness might optimise wellbeing in this population. Definitions of “older adult” vary within the literature. While mindful that the clinical definition of older adult is 65 years or older (Australian Bureau of Statistics, 2012), it was deemed prudent to draw on recent research into technology adoption (e.g. Chan, 2015; Nef et al., 2012), in order to more effectively ground the current study within the most relevant literature. It is also important to note that many older adults live happy, connected lives, contrary to stereotypes of ageing (Plikuhn, Niehaus, & Reeves, 2014). The current study addresses the mechanisms associated with wellbeing of older adults online in general, rather than only in those who are lonely.

To address the broad goal of this research, this study had three novel aims. The first aim was to identify whether older adults can derive social connectedness from Facebook in a similar way to their younger counterparts. The second aim was to examine the extent to which social connectedness can be experienced within the

older age group. The final aim was to explore the mechanisms by which positive outcomes might be elicited by Facebook use.

As research using younger samples indicates that online social networking sites can facilitate perceptions of social connectedness that are related to, but distinct from offline social connectedness (e.g. Grieve et al., 2013), and as older adults are increasingly using the social networking site Facebook (Duggan et al., 2015), it was firstly hypothesised that online and offline social connectedness would emerge as distinct, but related, constructs, in older adults. Further, it was predicted that older adults would report similar levels of Facebook-derived social connectedness as has been seen in younger samples.

As older adults can sometimes experience barriers to participation in face-to-face networks which limits their opportunity to connect (Goll et al., 2015), and in line with the suggestion that the online environment may be an alternative avenue to gain social connection for people less able to connect offline (e.g. Grieve et al., 2013; Indian & Grieve, 2014); it was hypothesised that individuals with low physical health would find connectedness online. As online social connectedness is associated with better psychological wellbeing (e.g. Grieve et al., 2013), it was anticipated that online social connectedness will in turn predict better psychological wellbeing outcomes, specifically greater subjective well-being, as well as lower levels of depression, anxiety and stress. However, because levels of growth belongingness orientation can influence the relationship between social relationships and psychosocial outcomes (Lavigne et al., 2011; Lee et al., 2001), it was predicted that online social connectedness would only mediate the physical health—psychological wellbeing relations for those with high levels of growth orientation. This final hypothesis thus reflects a moderated mediation model, as conceptualised in Figure 1.



*Figure 1.* Hypothesised Relationship Between Physical Health, Online Social Connectedness, and Wellbeing Outcomes, as a Function of Growth Orientation

## Method

### Participants

Participants for the factor analysis were 280 Facebook users (Male = 55, Female = 225), aged between 55 and 81 ( $M = 61.28$ ,  $SD = 5.01$ ). Due to incomplete data, for all subsequent analyses, participants were 241 Facebook users (81.7% female) aged between 55 and 81 ( $M = 61.21$ ,  $SD = 5.01$ ). Participants were recruited via a Facebook event, shared posts and word of mouth. The only inclusion criteria were that participants be aged 55 or over and members of Facebook.

### Design and Analytic Approach

A cross-sectional design was employed. An Exploratory Factor Analysis (EFA) was conducted to test the first hypothesis, in order to examine whether online social connectedness and offline social connectedness would emerge as distinct constructs. Factor analysis aims to reduce a large number of variables into a smaller set of meaningful factors by identifying underlying latent variables (Williams, Brown, & Onsmann, 2010). Maximum Likelihood was a suitable factor extraction

method, as it allows for greatest generalisability (deWinter & Dodou, 2012). As it was expected that online and offline social connectedness would correlate, oblique rotation to allow for this was deemed most appropriate (Fabrigar, Wegener, MacCallum, & Stragan, 1999).

To address the second set of hypotheses, bivariate correlations and a conditional process analysis model from Hayes (2013) PROCESS were used. Hayes' model integrates both mediation and moderation, linking the indirect effect to values of a moderator, and produces a formal test of the conditional indirect effect, known as the index of moderated mediation (Hayes, 2015). To generate bootstrap confidence intervals for the moderated mediation, 10,000 bootstraps of the original data was used to generate a representation of the population, which indicates the significance of the conditional indirect effect. The model tests the conditional indirect effect of  $X$  on  $Y$ , through  $M$ , as a linear function of  $V$ . For all moderated mediation models in the current study, the predictor variable ( $X$ ) was physical health; the outcome variables ( $Y$ ) were loneliness, depression, anxiety, stress, and subjective wellbeing; the mediator variable ( $M$ ) was online social connectedness; and the moderator variable ( $V$ ) was growth orientation. The conceptual model is presented in Figure 2. The statistical model is presented in Figure 3.

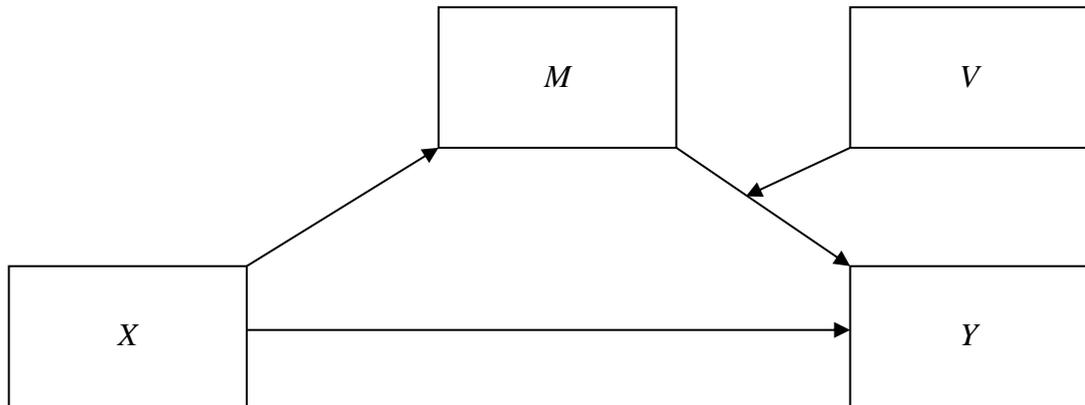


Figure 2. Conceptual Model 14 of PROCESS (Hayes, 2013)

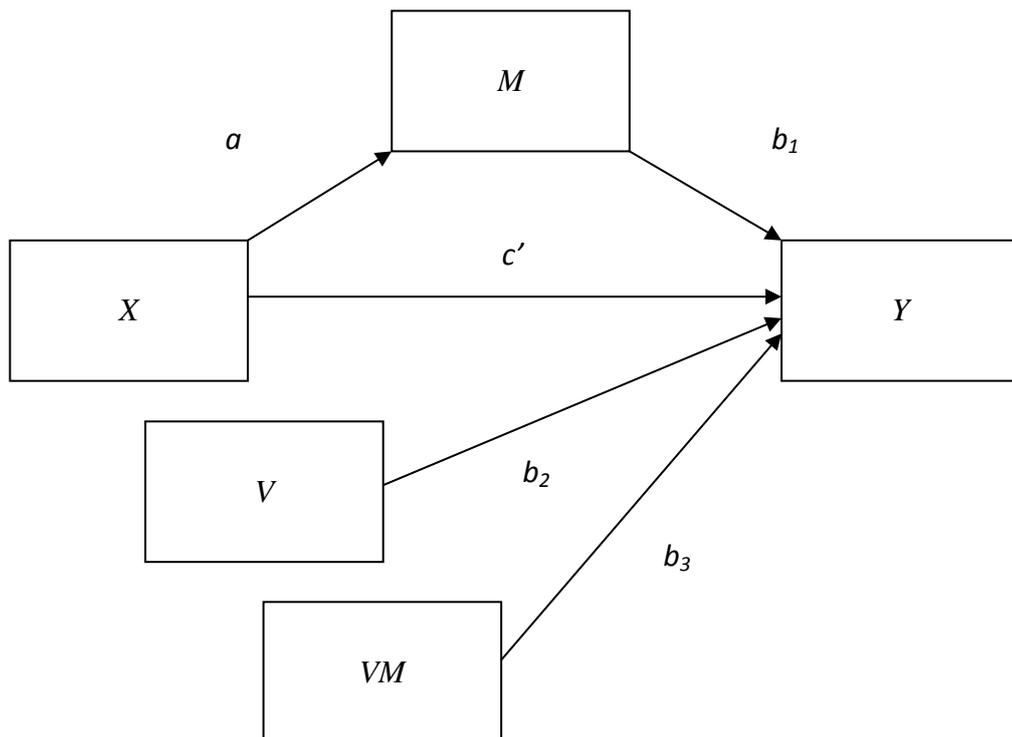


Figure 3. The Statistical PROCESS Model 14 (Hayes, 2013)

**A-priori power analysis.** According to Comrey and Lee (2013), 200 and 300 cases for EFA are ‘fair’ and ‘good’, respectively. Gorsuch (1983) argues that a 5:1 participant to item ratio is adequate for EFA. The current sample therefore meets or exceeds requirements. Sample size also exceeded recommendations for moderated mediation analysis via bootstrapping (Preacher, Rucker, & Hayes, 2007).

## **Materials**

All measures are presented in Appendix A. Demographic data included questions regarding Facebook use, sex, occupational status, living arrangements, and any experiences of diagnosed brain injury/disease, mental or physical illness.

**Online Social Connectedness.** Online social connectedness was measured using the revised 13-item Facebook connectedness scale (Grieve et al., 2013) adapted from Lee et al.’s (2001) 20-item Social Connectedness Scale-revised. This scale measures how socially connected people feel on Facebook. Participants rated their agreement on a 6-point Likert scale ranging from 1 = *strongly disagree* to 6 = *strongly agree*. Four items are negatively worded and therefore reversed scored, so when the scale is summed, higher scores indicate higher levels of online social connectedness. A sample positive item is *I feel close to people on Facebook*. A sample negative item is *I feel disconnected from the Facebook world around me*. Internal reliability for this scale is very good, with a Cronbach’s alpha coefficient of .85 (Grieve et al., 2013).

**Offline Social Connectedness.** The Social Connectedness Scale-revised (Lee et al., 2001) was used to measure social connectedness in an offline, face-to-face environment. The scale measures an individual’s perceived connection in a traditional offline social environment, using 20 self-report items (10 positive perceptions and 10 negative perceptions). A sample positive perception item is *I am*

*able to connect with other people*. A sample negative perception item is *I feel disconnected from the world around me*. Negative perception items are reverse scored, thus higher total scores indicated higher levels of offline social connectedness. Participants respond on a six point Likert scale ranging from 1 = *strongly disagree* to 6 = *strongly agree*. Internal reliability for this scale is excellent, with a Cronbach's alpha coefficient of .92 (Lee et al., 2001).

**Physical Health.** Self-reported physical health was measured using the 6 item physical component summary (PCS) of the 12-item short form health survey (Ware, Kosinski, & Keller, 1996). The PCS measures physical functioning, limitations to daily activities due to physical health problems, bodily pain, and an individual's general overall perception of their health. Response scales vary across items. Participants report the extent to which health is affecting their functioning, for example *Accomplished less than you would like*. Two items are reverse scored so that higher scores indicate better health. Ware et al. report equivalence with the longer SF-36, and the physical component summary has good internal reliability, and excellent test-retest reliability.

**The Need to Belong.** Growth orientation was assessed using the 5-item growth orientation subscale from the Belongingness Orientation Scale (Lavigne et al., 2011). A sample item is *My interpersonal relationships are important to me because I have a sincere interest in others*. Participants were asked to rate their agreement (where 1 = *strongly disagree* and 5 = *strongly agree*), with higher scores indicating higher levels of growth orientation. Cronbach's alpha scores for the Growth Orientation subscale ranging from .77 and .83, which indicates good reliability, and good convergent and discriminant validity (Lavigne et al., 2011).

**Loneliness.** Loneliness was assessed with the commonly used UCLA Loneliness Scale (Russell, Peplau, & Ferguson, 1978). Participants rated how often they felt regarding 20-items, rated on a four-point Likert scale ranging from 0 = *I never feel this way* to 3 = *I often feel this way*. All items are negatively worded, so when summed, higher scores indicate a greater degree of perceived loneliness. Sample items include *I feel completely alone* and *I feel as if nobody really understands me*. Cronbach's alpha for the UCLA Loneliness scale is .96 (Russell et al., 1978), indicating excellent internal reliability.

**Mental Health.** The Depression, Anxiety and Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995) was used to measure mental health. Participants rated how much the 21 statements applied to them in the past four weeks on a four point Likert scale, ranging from 0 = *did not apply to me at all* to 3 = *applied to me most of the time*. Higher scores indicate higher levels of psychological distress. Sample items include: *I couldn't seem to experience any positive feeling at all* (depression); *I was worried about situations in which I might make a fool of myself* (anxiety); and, *I found it difficult to relax* (stress). Internal consistency for the depression, anxiety, and stress subscales range from good to excellent, with Cronbach's alpha coefficients of .91, .81, and .89, respectively (Lovibond & Lovibond, 1995).

**Subjective Wellbeing.** To measure subjective wellbeing, The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) was utilised. This scale is designed to measure global cognitive judgements of an individual's life satisfaction as a whole (Pavot & Diener, 1993). Participants rated their agreement to 5 positively framed items, for example, *In most ways my life is close to ideal*, on a 7-point Likert scale, ranging from 1 = *strongly disagree* to 7 = *strongly agree*. Higher

scores indicated a higher satisfaction with life. Pavot and Diener (1993) identified sound reliability scores in a number of studies ranging from .79 to .89.

### **Procedure**

After receiving ethics approval (see Appendix B1) from the Tasmanian Social Sciences Human Research Committee (HREC: H0015105), the survey was advertised on Facebook. Interested participants were invited to follow the online link which took them to a secure online data collection service (LimeSurvey). On page one, an information sheet informed participants about the research project (see Appendix B2). Page two of the survey asked participants to give their informed consent by clicking *yes* or *no* (refer to Appendix B3). Once consent was obtained, participants completed the survey items, which took approximately 30 to 40 minutes. Upon completion, participants were directed to a second link to ensure anonymity of the survey responses. Participants were asked to enter their personal information in order to be sent a \$20.00 gift-card (a choice of six, for example, Coles-Myer, JB Hi-fi), to thank them for their time.

## **Results**

### **Assumptions**

*Factor analysis.* All relevant assumptions were tested. Each participant contributed only once, ensuring independence of observations. On inspection of the correlation matrix, one bivariate correlation was evident at the .8 level ( $r = .801$ ), however, tolerance and variance inflation factors indicated that multicollinearity was not considered to be an issue (Menard, 2002). Visual inspection of the scatterplots confirmed linear and heteroscedastic relationships among variables.

Shapiro-Wilk tests of normality were significant, indicating that not every variable was perfectly normally distributed. However, this test can be sensitive to

trivial departures from normality (Allen & Bennett, 2012). Closer inspection of the histograms, boxplots, and normality plots, revealed that the Facebook-connectedness items were relatively normally distributed; however, there was some evidence of non-normality for the item *I am able to connect to others*, showing severe outliers. A log transformation was performed and the data was rerun (Field, 2013), with the pattern remaining largely unchanged. Therefore all subsequent analyses include the untransformed data, as factor analysis is quite robust to violations of the normality assumption (Allen & Bennett, 2012).

***Moderated mediation.*** When testing conditional indirect effects the relevant assumptions are linearity and independence of observations (Preacher et al., 2007). These assumptions were met: participants took part only once, and scatterplots confirmed linear relationships.

#### **Sample characteristics ( $N = 241$ ).**

Overall, 2.5% of the sample reported experience with a diagnosed brain injury/illness, including epilepsy, stroke, and malignant hypertension. Of those who reported experience with a diagnosed mental illness (14.5%), the most common reported was depression, followed by anxiety, and PTSD. Almost half the sample reported a current diagnosed physical illness (46.1%), whereby arthritis was the most commonly reported followed by hypertension and diabetes. A majority of the sample lived with at least one other person (85.1%), and almost half were fully retired (44.4%).

As the sample was predominantly female, chi-square tests of independence were conducted on all demographic variables to identify any systematic differences in the sample as a function of sex. There were no systematic differences among males and females who reported a diagnosed brain injury/illness,  $\chi^2(1, N = 241) =$

.010,  $p = .92$ , or physical illness,  $\chi^2(1, N = 241) = .57, p = .449$ , or any systematic differences in relation to occupational status,  $\chi^2(3, N = 241) = 2.90, p = .407$ , or living arrangements,  $\chi^2(5, N = 241) = 8.70, p = .121$ . However, the proportion of older adults with a diagnosed mental illness differed significantly by sex,  $\chi^2(1, N = 241) = 4.32, p = .038$ , with more females ( $n = 33$ ) than males ( $n = 2$ ) reporting a diagnosed mental illness. This aligns with the fact that females are more likely than males to experience and report symptoms (WHO, 2015).

Participants reported a mean 161 Facebook friends ( $SD = 231.75$ ), and spent 126 minutes per day logged in to Facebook ( $SD = 279.73$ ). These Facebook use data confirm that on average, participants were using Facebook at levels that should allow Facebook social connectedness to be perceived.

### **Factor Analysis**

To examine whether online social connectedness would emerge as a distinct construct to traditional face-to-face offline social connectedness, an Exploratory Factor Analysis (Maximum Likelihood with Oblique Rotation) was conducted on the 33 connectedness items (Grieve et al., 2013; Lee et al., 2001). A ‘marvellous’ Kaiser-Meyer-Olkin (KMO) value of .92 exceeded the recommended minimum value of .6 (Hutcheson & Sofroniou, 1999), suggesting the likelihood that the factor analysis would yield distinct and reliable factors. Bartlett’s Test of Sphericity was significant  $\chi^2(351, N = 280) = 4470.66, p < .001$ , confirming the presence of significant correlations between some variables (Zygmunt & Smith, 2014). The correlation matrix revealed that every item had a correlation with at least one other above .3 (Tabachnick & Fidell, 2007). All partial correlations were reasonably close to zero. Overall, no issues of multicollinearity or singularity (no  $r > .85$ , Allen & Bennett, 2012) were evident within the correlation matrix. Multiple correlations

within the anti-image matrices were all between .858 and .955, exceeding the recommendation of .5 (Field, 2013), showing appropriate sampling adequacy.

Six factors were initially identified with eigenvalues greater than 1, accounting for 56.2% of the total variance. However, the scree plot reasonably suggested extraction of two to six factors. All potential solutions were attempted however, the pattern matrices were uninterpretable. Across all solutions, six items were consistently problematic: either continuously loading on to their own factor, similarly loading on to two separate factors, or failing to load at all. These items<sup>1</sup> were removed and the analysis was then rerun on the remaining 27 items.

Four factors had eigenvalues greater than 1, consistent with the scree plot which also suggested a four factor solution. Three and five factor solutions were run for completeness; however, these were uninterpretable. Therefore, it was decided that four factors accounting for 54.02% of the total variance would be retained. An oblique rotation (Direct Oblimin) with a minimum loading inclusion criterion of .32 (in line with Tabachnick & Fidell, 2007) was employed. The factor correlation matrix showed correlations up to  $r = .64$ , suggesting that oblique rotation was justified (Schmitt, 2011). Please refer to Table 1 for the full pattern matrix following oblique rotation.

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<sup>1</sup> *I am in tune with the Facebook world*"; *I fit in well in new Facebook situations*"; *I find myself actively involved in people's lives*"; *My friends feel like family*"; *Even among my friends there is no sense of brother/sisterhood*"; and *I feel understood by the people I know*"

Table 1

*Factor Loadings Following Oblique Rotation*

Item	Factor Loadings			
	Factor 1	Factor 2	Factor 3	Factor 4
I don't feel related to most people*	.932			
I feel distant from people*	.891			
I feel like an outsider*	.872			
I feel disconnected from the world around me*	.770			
I see myself as a loner*	.692			
I catch myself losing a sense of connectedness with society*	.551			
Even around people I know I don't feel that I really belong*	.551			
I don't feel I participate with anyone or any group*	.501			
I feel understood by the people I know when I'm on Facebook		.932		
I am able to relate to my Facebook friends		.789		
I see Facebook friends as friendly and approachable		.724		
My Facebook friends feel like family		.686		
I feel close to people on Facebook		.629		
I find myself actively involved in Facebook friend's lives		.420		
I am able to connect with other people on Facebook		.377		
I fit in well in new situations			.750	
I feel comfortable in the presence of strangers			.684	
I see people as friendly and approachable			.558	
I am able to connect with other people			.550	
I feel close to people			.523	

I am in tune with the world	.435
I have little sense of togetherness with my peers*	.429
I am able to relate to my friends	.382
I feel disconnected from the Facebook world around me*	.560
I have little sense of togetherness with my Facebook friends*	.540
I don't feel related to most people on my Facebook*	.531
Even among my Facebook friends, there is no sense of brother/sisterhood*	.531

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*Note.* Items marked \* are reverse scored.

Factor one comprised eight items, with the highest factor loading item *I don't feel related to most people*. This factor was labelled Offline Social Disconnectedness as all items reflect perceived disconnectedness in a traditional face-to-face environment. The second factor included seven items with the highest loading item *I feel understood by the people I know when I'm on Facebook*. The second factor was labelled Online Social Connectedness due to all items reflecting the way people perceive interactions in an online social environment, specifically Facebook.

Factor Three also comprised eight items with the highest factor loading evident the item *I fit in well in new situations*, followed by *I feel comfortable in the presence of strangers*. This factor was labelled Offline Social Connectedness as items reflect perceived connection in a face-to-face environment. Finally, Factor Four encompassed four items with the highest factor loading evident for the item; *I feel disconnected from the Facebook world around me*. This factor was labelled Online Social Disconnectedness as items reflect feeling disconnected in the Facebook environment.

While all factor loadings were at an interpretable level (Tabachnick & Fidell, 2007) as two factors were comprised entirely of reversed items, it is possible that these were method factors. Mindful that method factors reflect potential systematic measurement error and can substantially attenuate correlations between the factor and other variables (Podsakoff, MacKenzie, Lee, & Podaskoff, 2003), a cautious approach to their inclusion was warranted. Therefore, as the focus of the current study was social connectedness (rather than disconnectedness), it was decided to only use the Online and Offline Social Connectedness scales for all subsequent analyses.

### **Descriptive Statistics and Bivariate Correlations**

Descriptive statistics are presented in Table 2. Mean scores and standard deviations for the variables included in the current study were similar to those seen in prior research (e.g. Crawford et al., 2011; Grieve et al., 2013; Lavigne et al., 2011; Lee et al., 2001; Povet & Diener, 1993; Rafnsson et al., 2015; Russel et al., 1978). Internal consistencies for all measures (see also Table 1), showed good to excellent Cronbach's  $\alpha$  values. Of note, both the online 7-item social connectedness scale and the 8-item offline social connectedness scale, showed mean item responses similar to those seen previously (Grieve et al., 2013; Lee et al., 2001), of 4.1 and 4.6 (*slightly agree/agree*), respectively.

Table 2

*Descriptive Statistics and Internal Reliabilities for All Measures*

	Mean ( <i>SD</i> )	Cronbach's $\alpha$
Online Social Connectedness	28.54 (5.71)	.89
Offline Social Connectedness	36.54 (5.84)	.86
Depression	2.21 (3.06)	.88
Anxiety	1.35 (2.08)	.75
Stress	3.24 (2.92)	.82
Subjective Wellbeing	24.05 (6.77)	.90
Physical Health	15.41 (3.66)	.87
Growth Orientation	19.59 (3.35)	.91
Loneliness	34.28 (12.61)	.96

Bivariate Pearson's product-moment correlation coefficients ( $r$ ) were calculated (please see Table 3). As expected, offline and online connectedness were significantly related with  $r = .20$ , reflecting a small to medium effect (Cohen, 1992). Offline social connectedness significantly correlated in the expected direction with all other variables, showing medium to large effect sizes.

Online social connectedness showed significant associations with physical health, and growth orientation, with small to medium effect sizes (Cohen, 1992). Consistent with predictions, lower levels of physical health predicted higher levels of online social connectedness and higher levels of growth orientation predicted higher online social connectedness. However, there were no significant relationships between online social connectedness and loneliness, depression, anxiety, stress, or subjective wellbeing, with extremely small effect sizes evident: only .04% to .25% of variance was explained by online social connectedness. These findings suggest that

the nature of online social connectedness is more complex in older populations, compared to previous online social connection research that has used younger samples (e.g. Grieve et al., 2013; Grieve & Kemp, 2015).

Table 3

*Bivariate Correlations*

	Online SC	Offline SC	Depression	Anxiety	Stress	SWB	Physical Health	Growth Orientation	Loneliness
Online SC	-								
Offline SC	.20**	-							
Depression	-.02	-.51***	-						
Anxiety	.02	-.32***	.56***	-					
Stress	.03	-.33***	.60***	.67***	-				
SWB	-.05	.52***	-.61***	-.40***	-.43***	-			
Physical Health	-.24***	.19**	-.40***	-.37***	-.30***	.41***	-		
Growth Or	.23***	.60***	-.35***	-.14*	-.19**	.22**	.07	-	
Loneliness	-.03	-.60***	.57***	.40***	.44***	-.56***	-.24***	-.36***	-

*Note.* Online SC= Online Social Connectedness; Offline SC= Offline Social Connectedness; SWB= Subjective Wellbeing;

Growth Or= Growth orientation. \*denotes  $p < .05$ , \*\*denotes  $p < .01$ , \*\*\*denotes  $p < .001$ .

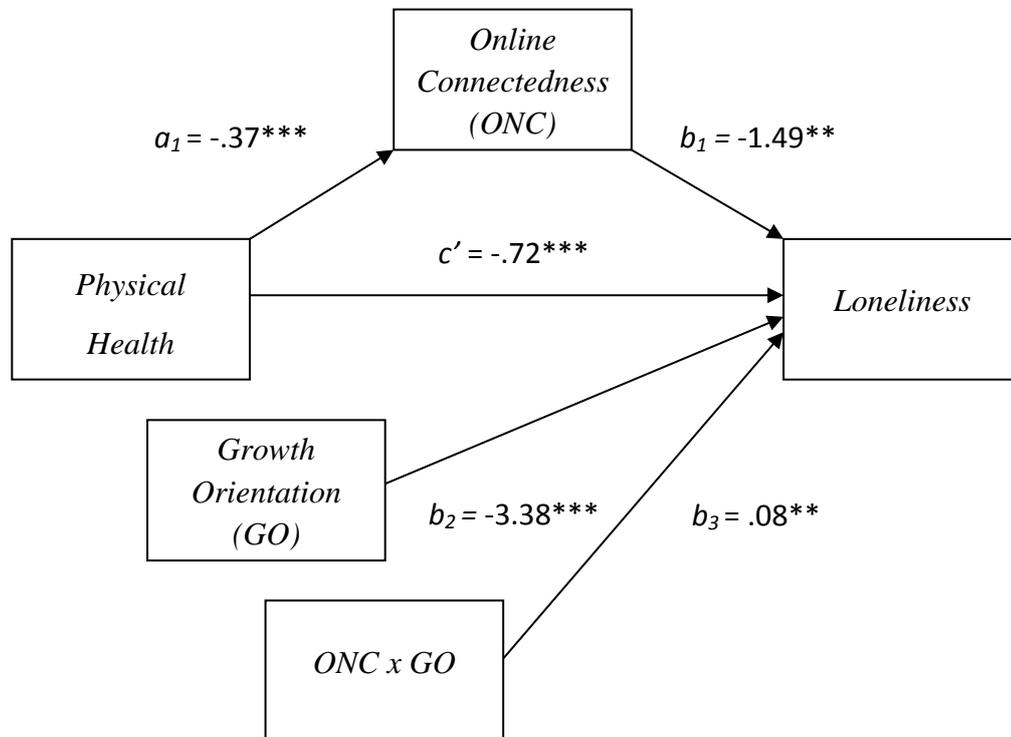
### Moderated Mediation Analyses

Separate tests examining whether online social connectedness mediated the relationship between physical health and outcome variables (loneliness, depression, stress, anxiety, and subjective wellbeing), as a function of growth belongingness orientation were conducted using Model 14 of PROCESS (Hayes, 2013).

Note that, for all models, physical health significantly predicted online social connectedness (i.e. all  $a$  pathways;  $p = .0002$ , 95% CI [-.560, -.174]).

**Loneliness.** Figure 4 shows the conditional indirect effect of physical health on loneliness through online social connectedness, as a function of growth orientation. Both online social connectedness ( $b_1$  pathway;  $p = .009$ , 95% CI [-2.62, -.370]), and growth orientation ( $b_2$  pathway;  $p < .001$ , 95% CI [-4.97, -1.79]), significantly predicted loneliness. There was also a significant interaction effect of online social connectedness and growth orientation, on loneliness ( $b_3$  pathway;  $p = .007$ , 95% CI [.021, .137]). Conditional indirect effects showed that at high levels of growth orientation, online social connectedness was negatively and significantly related to loneliness, as the bootstrapped 95% confidence intervals did not contain zero, -.117, 95% CI [-.306, -.013]. However, at mean and low levels of growth orientation, online social connectedness was not significantly related to loneliness, as the bootstrapped 95% confidence intervals both contained zero. The direct effect of physical health on loneliness was also significant ( $c'$  pathway;  $p = .006$ , 95% CI [-1.13, -.311]). The hypothesised conditional indirect effect of physical health on loneliness through online social connectedness as a function of growth orientation was significant,  $a_1b_3 = -.03$ ,  $SE = .02$ , 95% CI [-.07, -.004]. This moderated mediation effect suggests that individuals with lower levels of physical health, experience increased levels of online social connectedness, which consequently

results in reduced loneliness, but only for those with high levels of growth orientation.



*Figure 4.* The conditional indirect effect of physical health on loneliness through online social connectedness as a function of growth orientation

\*\*\*  $p < .001$

\*\*  $p < .05$

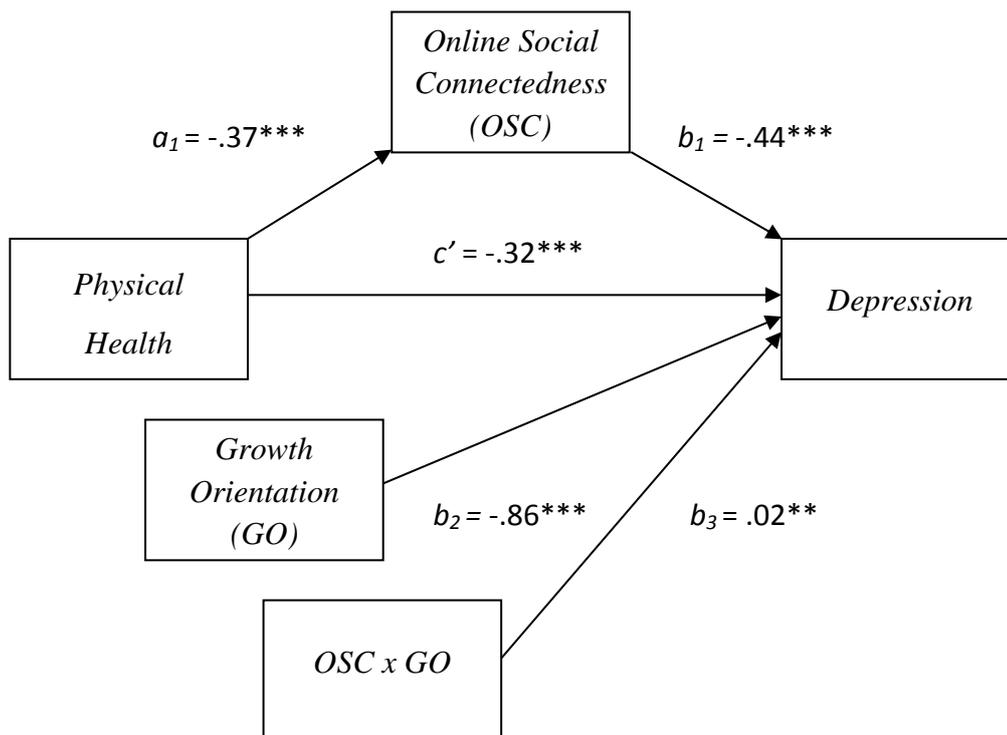


Figure 5. The conditional indirect effect of physical health on depression through online social connectedness as a function of growth orientation

\*\*\*  $p < .001$

\*\*  $p < .05$

**Depression.** The same model was run with depression as the  $Y$  variable (please see Figure 5). Both online social connectedness ( $b_1$  pathway;  $p = .0008$ , 95% CI [-.694, -.183]), and growth orientation ( $b_2$  pathway;  $p < .001$ , 95% CI [-1.23, -.502]), were significantly related to depression. A significant interaction effect of online social connectedness and growth orientation on depression ( $b_3$  pathway;  $p = .001$ , 95% CI [.009, .035]), was found. Conditional indirect effects showed that at high levels of growth orientation, online social connectedness was negatively and significantly related to depression, -.02, 95% CI [-.059, -.004]. However, there were no significant interaction effects found at low and mean levels

of growth orientation. The direct effect of physical health on depression was also significant ( $c'$  pathway;  $p < .001$ , 95% CI [-.412, -.225]). The hypothesised conditional indirect effect of physical health on depression through online social connectedness as a function of growth orientation was significant,  $a_1b_3 = -.01$ ,  $SE = .004$ , 95% CI [-.017, -.002]. This suggests that individuals with lower levels of physical health, experience increased levels of online social connectedness, which results in decreased depression, particularly for those with high levels of growth orientation.

**Anxiety.** Figure 6 shows the same model with anxiety as the  $Y$  variable. Both online social connectedness, ( $b_1$  pathway;  $p = .033$ , 95% CI [-.395, -.016]) and growth orientation ( $b_2$  pathway;  $p = .017$ , 95% CI [-.597, -.060]), were significantly related to anxiety. There was a significant interaction effect of online social connectedness and growth orientation on anxiety ( $b_3$  pathway;  $p = .043$ , 95% CI [.0003, .020]). However, no significant conditional indirect effects at levels of growth orientation were found. The direct effect of physical health on anxiety was significant ( $c'$  pathway;  $p < .001$ , 95% CI [-.279, -.141]). There was no significant conditional indirect effect of physical health on anxiety through online social connectedness as a function of growth orientation,  $a_1b_3 = -.004$ ,  $SE = .003$ , 95% CI [-.012, .001].

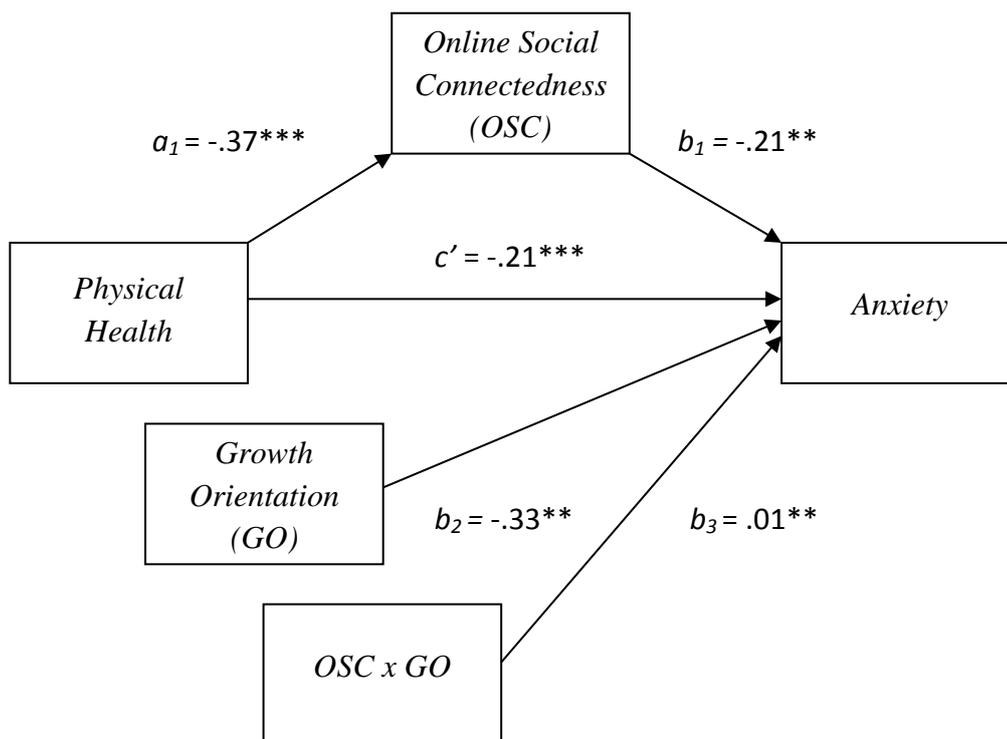


Figure 6. The conditional indirect effect of physical health on anxiety through online social connectedness as a function of growth orientation

\*\*\*  $p < .001$

\*\*  $p < .05$

**Stress.** The same model was run with stress as the  $Y$  variable (please refer to Figure 7). Online social connectedness was not significantly related to stress ( $b_1$  pathway;  $p = .083$ , 95% CI [-.511, .031]). However, the relationship between growth orientation and stress, was significant ( $b_2$  pathway;  $p = .014$ , 95% CI [-.865, -.097]). The interaction effect of online social connectedness and growth orientation on stress was not significant at the traditional alpha level of .05, ( $b_3$  pathway;  $p = .075$ , 95% CI [-.001, .027]), as the bootstrapped 95% confidence intervals contained zero. Therefore, no significant interaction effects at low, mean or high levels of growth orientation were found, as all bootstrapped 95% confidence intervals contained zero.

The direct effect of physical health on stress was significant ( $c'$  pathway;  $p < .001$ , 95% CI [-.327, -.128]). However, the hypothesised conditional indirect effect of physical health on stress through online social connectedness as a function of growth orientation was significant,  $a_1b_3 = -.005$ ,  $SE = .003$ , 95% CI [-.014, -.001]. Although it is unclear at what level of growth orientation this interaction effect occurs, the index of moderated mediation suggests that low physical health, predicts increased online social connectedness, which in turn predicts reduced stress, conditional of growth orientation.

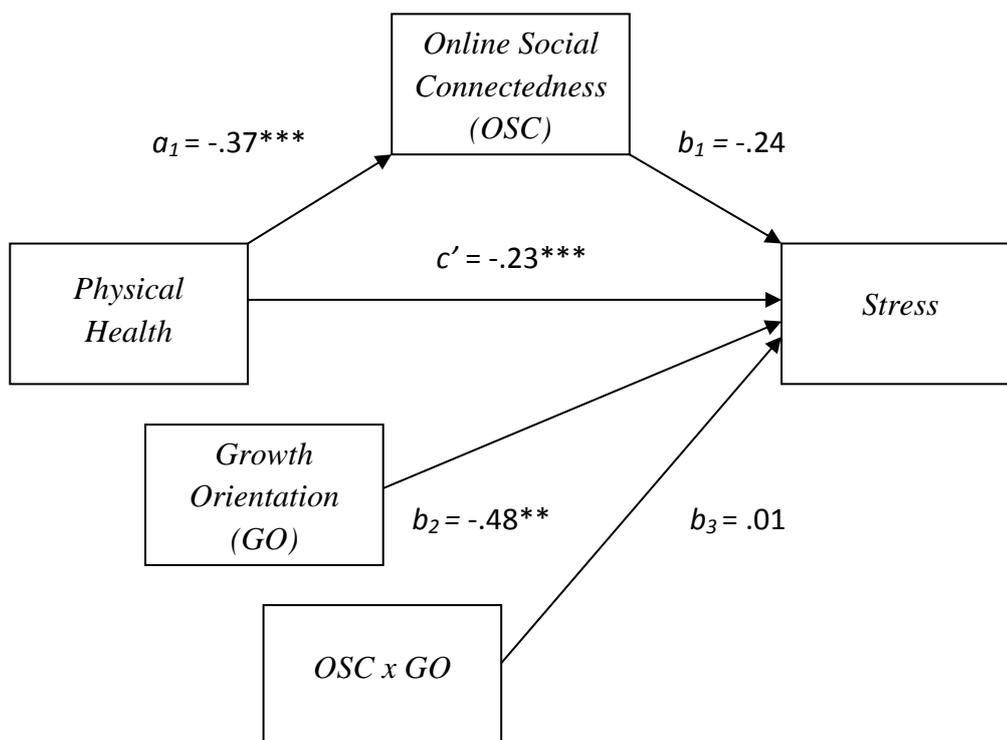
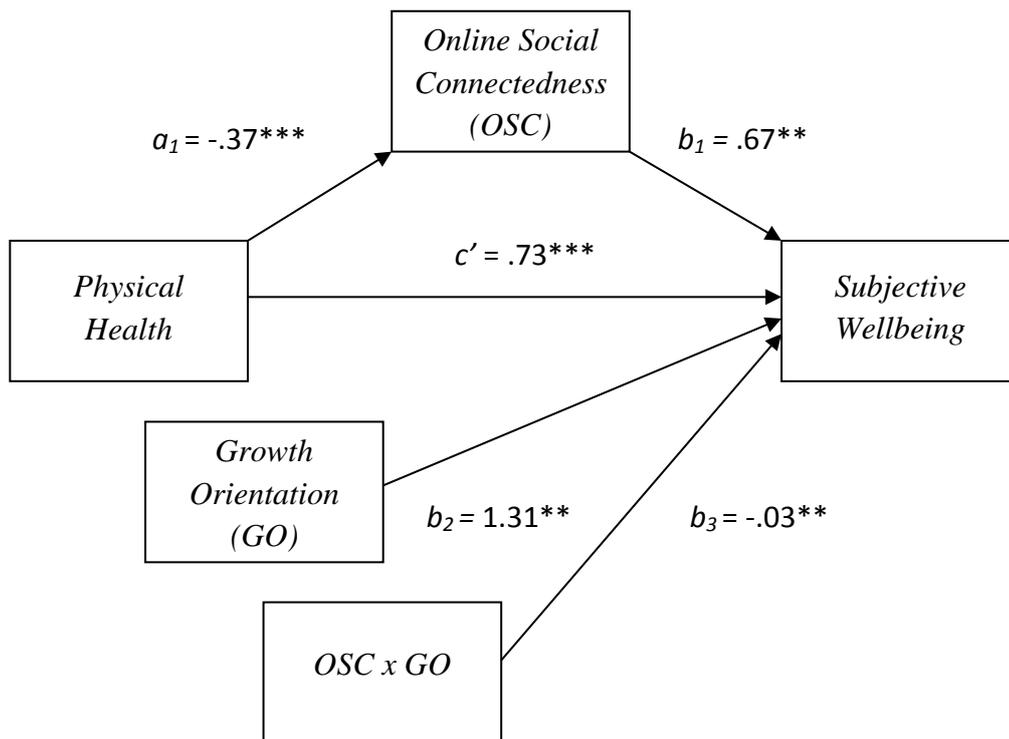


Figure 7. The conditional indirect effect of physical health on stress through online social connectedness as a function of growth orientation

\*\*\*  $p < .001$

\*\*  $p < .05$

**Subjective Wellbeing.** Figure 8 shows the same model with subjective wellbeing as the outcome variable. Both online social connectedness ( $b_1$  pathway;  $p = .028$ , 95% CI [.072, 1.26]), and growth orientation ( $b_2$  pathway;  $p = .003$ , 95% CI [.466, 2.15]), were significantly related to subjective wellbeing. There was also a significant interaction effect of online social connectedness and growth orientation on subjective wellbeing ( $b_3$  pathway;  $p = .025$ , 95% CI [-.065, -.004]). However, there were no significant differences between low, mean and high conditional indirect effects of growth orientation, as all bootstrapped 95% confidence intervals contained zero. The direct effect of physical health on subjective wellbeing was also significant ( $c'$  pathway;  $p < .001$ , 95% CI [.510, .945]). The hypothesised conditional indirect effect of physical health on subjective wellbeing through online social connectedness as a function of growth orientation was significant, as the bootstrapped 95% confidence intervals did not contain zero,  $a_1b_3 = .01$ ,  $SE = .01$ , 95% CI [.002, .040]. This moderated mediation effect indicates that low physical health, predicts increased online social connectedness, which in turn predicts increased subjective wellbeing, conditional of growth orientation. However, individual differences at levels of growth orientation add no unique information beyond this, suggesting that growth orientation in general predicts better wellbeing.



*Figure 8.* The conditional indirect effect of physical health on subjective wellbeing through online social connectedness as a function of growth orientation

\*\*\*  $p < .001$

\*\*  $p < .05$

## Discussion

### Overview: Main Findings

The first aim of the current study was to identify whether older adults can gain social connectedness online, similar to that experienced in traditional face-to-face networks. As hypothesised, online and offline social connectedness emerged as distinct, yet related, constructs. Surprisingly, online and offline social disconnectedness emerged as separate factors to online and offline social connectedness, resulting in a four factor solution.

The second aim was to examine the extent to which older adults can gain social connectedness online. Older adults in this sample gained feelings of online-derived connection similar to, and were even more emotionally connected to Facebook than, their younger counterparts, supporting the second hypothesis.

The final aim of the current study was to investigate the mechanisms underlying the interplay between online social connectedness and wellbeing outcomes in older adults. It was predicted that online social connectedness would mediate the relationship between physical health and wellbeing outcomes, conditional of high levels of growth orientation. It was expected that the conditional interaction effect would occur at the second stage of the moderated mediation: between online social connectedness and wellbeing outcomes ( $b_1$  pathway). This hypothesis was supported for loneliness and depression, partially supported for subjective wellbeing and stress, but was not supported for anxiety. Specifically, with loneliness and depression as outcomes variables, low physical health predicted increased online social connectedness, which in turn predicted decreased loneliness and depression, only for those with high levels of growth orientation. When either subjective wellbeing or stress was the outcome variable, low physical health

predicted increased online social connectedness, which resulted in increased subjective wellbeing and decreased stress. However, these effects occurred as an overall condition of growth orientation, whereby no differences were found between low, mean and high levels of growth orientation. There was no significant conditional indirect effect found for anxiety. While both online social connectedness and growth orientation predicted anxiety, no significant interaction effect was found.

### **Distinct but Related: Online and Offline Social Connectedness**

This was the first study to directly test whether older adults can gain feelings of social connectedness from an online environment, revealing that older adults can derive feelings of social connectedness online, similar to that gained in traditional social networks. This finding is consistent with and extends previous research (Grieve et al., 2013) showing distinct online and offline connectedness in a sample of younger adults. That older adults can also experience online social connectedness corroborates the proposition that online social networks (specifically Facebook) may be an alternative platform for individuals who may be less able to connect face-to-face (Grieve et al., 2013; Indian & Grieve, 2014).

Facebook was initially created with the aim of keeping college students connected (Ellison et al., 2007), and social networking sites (SNSs) are generally considered to be the milieu of the young (e.g. Spies-Shapiro & Margolin, 2014). The current findings therefore represent a substantial step forward by placing both belongingness theory (Baumeister & Leary, 1995) and socioemotional selectivity theory (Carstensen et al., 1999) squarely within non-traditional social networks. Social media (specifically the SNS Facebook) can be a source of social capital in older adults.

The current data indicate that Facebook offers those facing health barriers to offline connection the opportunity to stay connected. Holt et al. (2015) identified this as particularly important for older adults under the age of 65, which represents the majority of the current sample. Given the ageing population (WHO, 2015), the increased risk of social isolation with age (e.g. Cornwell et al., 2008) and the need to maintain physical and psychosocial wellbeing in later life (Rafnsson et al., 2015), the current findings supporting the potential utility of social media to buffer social isolation for older adults is noteworthy.

The current study also provides additional insight into the nature of social connectedness in the online environment. Items measuring disconnectedness (negatively worded items) loaded on to separate factors to those measuring positive aspects of social connection. One possible explanation is that these results reflect method factor effects (Podsakoff et al., 2003). Another possible interpretation is that social disconnectedness items are measuring a different underlying construct to feelings of social connection. For example, Stanley et al. (2010) argued that feeling disconnected is a result of unmet belongingness needs. If so, perhaps the social disconnectedness items are measuring loneliness rather than low levels of perceived social connection per se. Still, it is unclear as to why this disconnection emerged separately as a function of online or offline context. In a younger sample, Grieve et al. (2013) found that items measuring disconnection cut across online and offline contexts. Perhaps for older adults, although social capital can be obtained online, there is a stronger separation between the online and offline world, and consequently social relationships are more readily delineated between media.

### **Social Connection, Belongingness Orientation, and Wellbeing**

In examining the mechanisms by which online social connectedness might relate to health and wellbeing, moderated mediation effects were evident. Overall, those with lower physical health experienced higher online social connectedness which in turn significantly predicted less loneliness, depression, and stress, and greater subjective wellbeing for those with high growth belongingness orientations. This suggests that individuals with a genuine interest in connecting with others are more likely to obtain the positive wellbeing outcomes that are associated with online social connection.

As such, the current findings uphold Tufekci's (2010) "seek and ye shall find" hypothesis, where those who believe in the benefits of online social interaction are more likely to benefit from that interaction. These findings also align with existing research focussed on offline relationships. Those who view interpersonal interactions as an opportunity for connection and personal growth tend to experience more satisfying relationships (Lavigne et al., 2011; Lee et al., 2001). Toepoel (2013) found that participation in offline leisure activities was related to how many close contacts a person had to assist them to get involved, suggesting that those already socially connected were more likely to actively participate than those with fewer social ties. Similarly, Rafnsson et al. (2015) found the role of close relationships and frequency of contact in later life may be particularly important when determining life satisfaction in older adults.

Previous research into online relationships has found a similar predictive pattern to the ones seen in the current study. For example, Chan (2015) identified that being connected via multiple modes of technology was not predictive of wellbeing alone. However, when tie strength was added to the model, those who had

a stronger connection with their social ties experienced enhanced levels of wellbeing, compared to those with weak tie communication, who experienced more negative outcomes.

More generally, the finding that individuals with a genuine interest to connect with others benefit from online-derived social connectedness can be likened to the *social enhancement hypothesis* of Internet use. This hypothesis (also known as the “rich get richer” hypothesis) suggests that those with more sociable traits such as extraversion, openness to experience, and high self-esteem offline are more likely to benefit from online social interaction (Zywica & Danowski, 2008). For these individuals, social media affords the opportunity for the social capital experienced offline (possessing sociable traits enhances social acceptance, and therefore greater levels of social connection) to be further enriched by extending social relationships into the online world. In the current study, those with higher growth orientation (those who express interest in others) gained the greatest benefits from online social connectedness. If the social enhancement hypothesis applies here, perhaps these individuals are using the online world as an additional means by which to maintain and strengthen an existing offline social network.

In contrast to predictions, the current study found no conditional indirect effect for anxiety. A possible explanation for this comes from Lee and Robbins (1998) who found that high social connectedness was negatively related to trait anxiety, whereas high levels of social connectedness had no effect on state anxiety. It is therefore plausible that the current study captured participants’ levels of state anxiety rather than a more pervasive trait anxiety. For example, the anxiety subscale included in the DASS-21 measures somatic symptoms of anxiety (Gostler et al., 2008) such as *I was aware of dryness of my mouth*, which may more strongly reflect

state anxiety. As such, a measure allowing specific capture of trait anxiety (for example, the State-Trait Anxiety Inventory, Spielberger, 1989) might show different results.

An alternative explanation could stem from the fact that the current sample reported scores in the 'normal' anxiety range. Teachman (2006) identified a curvilinear relationship between age and negative affect, specifically anxiety, neuroticism and depression. Negative affect decreased at age 35, increasing again at age 77. As the current sample consisted of younger older adults, it is possible that anxiety is not a challenge the majority of this age group currently face.

### **Limitations and Future Directions**

One possible limitation of the current study is the sole use of self-report measures. Certain response sets, such as social desirability and acquiescent response styles can limit credibility (Paulhus & Vazire, 2011). Future research might control for this using behavioural methods, for example, by examining participants' actual Facebook posts (Lin & Utz, 2015), however it should be noted that self-report and actual Facebook use tend to be strongly correlated (Junco, 2013).

Another possible limitation is that due to sampling methods, individuals in the current study are already connected. Gosling and Mason (2015) note that while the Internet can be advantageous for collecting a diverse and widespread representation of the population, certain groups may not be reached. It may be beneficial for future researchers to advertise through more traditional means, with the aim of gaining a better representation of those who may be older and less connected. Nonetheless, descriptive statistics were similar to those seen in prior research (e.g. Lee et al., 2001), suggesting that the current sample was reasonably representative.

It was beyond the scope of this study to examine the mechanisms which enable older adults to engage online. Some older adults experience barriers to participating online such as lack of accessibility or computer training (Chang, 2015), or a dearth of interest (Gatto & Tak, 2008). It is possible that the current study may not adequately include individuals experiencing these barriers. Further, those born before 1977 can be described as ‘digital immigrants’, in comparison to ‘digital natives’ who find technology second nature (Chesley & Johnson, 2014). However, as older adults are bringing computer skills from work to retirement and into old age, these barriers are lessening, and they will definitely not exist in the future (Gatto & Tak, 2008).

This study focussed on the sole online social network (Facebook). It is possible that the relationships found here between online social connectedness and wellbeing outcomes can be derived on other media sites, such as Twitter. Further, males and females are not represented evenly in the current sample (81.7% female). It is suggested that females spend more time connecting with their social ties and experience higher levels of psychological distress (Kawachi & Berkman, 2001). As a consequence, the current findings should not be overgeneralised.

Finally, the use of a cross-sectional design is an obvious limitation. One reason for this is the potential issue of age-cohort effects (Hofer, Sliwinski, & Flaherty, 2002). However, and perhaps more importantly, it is not possible to infer causation from the current results. It is feasible that alternative models might explain the relationship between online-derived connectedness and wellbeing outcomes. While the current results are grounded in theory (Baumeister & Leary, 1995) and previous longitudinal research (e.g. Shochet & Smith, 2014), it is possible that there are bidirectional associations. For example, are high levels of online social

connectedness predictive of reduced loneliness, or are those less lonely more likely to go online? Only 7% of cyberpsychology research has employed a longitudinal design (Zhang & Leung, 2014). Future research should assess the impact of online-derived connectedness on the wellbeing of older adults longitudinally, perhaps using a cross-lagged methodology similar to that used by Shochet and Smith (2014).

### **Implications**

A central finding was that older adults can indeed derive feelings of social connectedness online, similar to that gained in traditional networks and to the same extent as their younger counterparts. In terms of theory, this extends the current understanding and knowledge of who can benefit from online social connection, and the mechanisms by which social connectedness can influence wellbeing.

Specifically, this was the first research to find evidence for the “seek and ye shall find” hypothesis (Tufekci, 2010) in an older population, as well as providing evidence that belongingness needs (Baumeister & Leary, 1995) can be met online for this group. Rather than Facebook being for the young, it appears that older adults can also benefit from connecting online.

From a practical perspective, these findings confirm suggestions by Grieve et al. (2013) and Indian and Grieve (2014) that Facebook may be an alternative platform to stay connected for those less able, such as individuals experiencing physical illness or lack of mobility. A further possible implication is that the ability to gain feelings of connectedness online may be particularly beneficial during significant changes or transitions in one’s life. For example, in the current study, people with low physical health gained increased levels of online-derived connectedness, resulting in positive wellbeing outcomes. These findings may generalise to other events which directly challenge older adults’ ability to connect,

such as transitioning from work to retirement, from home to long term care, lengthy hospital stays, or to keep in touch with loved ones who move away. In addition, online derived connectedness may be beneficial for healthy older adults who are travelling in their retirement who wish to stay in touch with family and friends back at home. As such Internet use may be the key to allow older adults to stay connected during significant life altering events, whereby loneliness can be particularly salient (Chesley & Johnson, 2014; Lancee & Radl, 2012; Stanley et al., 2010).

The second major finding was that individuals with a growth belongingness orientation, who enjoy more satisfying relationships with others, are most likely to gain online-derived connectedness and in turn positive wellbeing. This has clear implications for older adults who are faced with challenges to connect face-to-face but who seek to maintain close connection with their social ties in order to satisfy their belongingness needs. The opportunity to connect online will be a fruitful source of connection for these individuals, whereby staying connected will allow for the maintenance of optimal psychological health.

While some older adults may experience barriers to online social connection (Chang, 2015), an increasingly number of older adults are online (Zickuhr & Madden, 2012) and using SNSs (Duggan et al., 2015). In the future, barriers to connect online will most likely be non-existent. The current findings have implications for older adults seeking to stay connected with their close social ties now, and in the future. It would be of importance to further examine belongingness orientations and their impact on online social connection, as those high in deficit reduction orientation may have unmet belongingness needs, and less satisfying relationships – impacting on their wellbeing (Lavigne et al., 2011; Lee et al., 2001; Pillow, Malone, & Hale, 2015). To reach this group, it may not be as easy as

removing barriers to social participation. Anxieties and maladaptive cognitions (such as craving acceptance and reassurance), may need to be reduced to assist those with unmet belongingness needs to gain the connection they desire (Masi, Chen, Hawkey, & Cacioppo, 2011).

### **Conclusion**

This was the first study to directly and quantitatively examine if older adults can gain feelings of social connectedness online, to what extent this occurs, and how online-derived connectedness relates to the wellbeing of older adults. It can be concluded that while SNSs were originally created for the young (Ellison et al., 2007), older adults can also gain social connectedness online, and, moreover, to the same extent as their younger counterparts. In addition, those high in growth belongingness orientation appear to gain the most benefits, and subsequently experience less loneliness, depression and stress, and increased satisfaction with life. To finish, connections matter. The current findings provide evidence for an alternative avenue for older adults to stay connected in a rapidly ageing and increasingly online world.

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## Appendix A1

### Demographic Questions

**Please answer the following questions as they apply to you:**

Age: \_\_\_\_\_

Gender: \_\_\_\_\_

How many people do you live with? \_\_\_\_\_

Who do you live with (e.g. partner, children, etc.)? \_\_\_\_\_

Do you have a diagnosed brain injury/illness (e.g. dementia)? \_\_\_\_\_

Do you have a diagnosed mental illness (e.g. depression)? \_\_\_\_\_

Do you have a diagnosed physical illness (e.g. arthritis)? \_\_\_\_\_

Are you retired? \_\_\_\_\_

## Appendix A2

### Facebook Social Connectedness Scale (Grieve et al., 2013)

**Directions:** Please rate how much you agree or disagree with the following statements from 1 = *strongly disagree*; 2 = *disagree*; 3 = *slightly disagree*; 4 = *slightly agree*; 5 = *agree*; to 6 = *strongly agree*.

1. I am in tune with the Facebook world<sup>^</sup>
2. Even among my Facebook friends, there is no sense of brother/sisterhood\*<sup>-</sup>
3. I fit in well in new Facebook situations<sup>^</sup>
4. I feel close to people on Facebook<sup>+</sup>
5. I feel disconnected from the Facebook world around me\*<sup>-</sup>
6. I see Facebook friends as friendly and approachable<sup>+</sup>
7. I feel understood by the people I know when I'm on Facebook<sup>+</sup>
8. I am able to relate to my Facebook friends<sup>+</sup>
9. I have little sense of togetherness with my Facebook friends\*<sup>-</sup>
10. I find myself actively involved in Facebook friend's lives<sup>+</sup>
11. I am able to connect with other people on Facebook<sup>+</sup>
12. I don't feel related to most people on my Facebook\*<sup>-</sup>
13. My Facebook friends feel like family<sup>+</sup>

*Note.* Items marked \* are reverse scored. Items marked + include items which loaded on to the 7-item online connectedness scale used in the current study. Items marked – are items which loaded on to the 4-item online disconnectedness scale in the current study. Items marked <sup>^</sup> were removed from the analysis. Total score is derived by

summing individual items, with higher scores indicating higher online social connectedness.

### Appendix A3

The Social Connectedness Scale-revised (Lee et al., 2001)

**Directions:** Please rate how much you agree or disagree with the following statements from 1 = *strongly disagree*; 2 = *disagree*; 3 = *mildly disagree*; 4 = *mildly agree*; 5 = *agree*; to 6 = *strongly agree*.

1. I feel distant from people\* -
2. I don't feel related to most people\* -
3. I feel like an outsider\* -
4. I see myself as a loner\* -
5. I feel disconnected from the world around me\* -
6. I don't feel I participate with anyone or any group\* -
7. I feel close to people +
8. Even around people I know, I don't feel that I really belong\* -
9. I am able to relate to my peers +
10. I catch myself losing a sense of connectedness with society\* -
11. I am able to connect with other people +
12. I feel understood by the people I know ^
13. I see people as friendly and approachable +
14. I fit in well in new situations +
15. I have little sense of togetherness with my peers\* +
16. My friends feel like family ^
17. I find myself actively involved in people's lives ^
18. Even among my friends, there is no sense of brother/sisterhood\* ^

19. I am in tune with the world +

20. I feel comfortable in the presence of strangers +

*Note.* Items marked \* are reverse scored. Items marked + include items which loaded on to the 8-item offline connectedness scale used in the current study. Items marked – are items which loaded on to the 8-item offline disconnectedness scale in the current study. Items marked ^ were removed from the analysis. Total score is derived by summing individual items, with higher scores indicating a greater sense of offline social connectedness.

### Appendix A4

Depression, Anxiety and Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995)

**Directions:** Please rate how much these statements applied to you in the past 4 weeks on a scale from 0 = *did not apply to me at all*, 1 = *applied to me some of the time*, 2 = *applied to me a good part of the time*; to 3 = *applied to me most of the time*.

1. I found it hard to wind down\*
2. I was aware of dryness of my mouth^
3. I couldn't seem to experience any positive feeling at all+
4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)^
5. I found it difficult to work up the initiative to do things+
6. I tended to over-react to situations\*
7. I experienced trembling (e.g., in the hands)^
8. I felt that I was using a lot of nervous energy\*
9. I was worried about situations in which I might panic and make a fool of myself^
10. I felt that I had nothing to look forward to+
11. I found myself getting agitated\*
12. I found it difficult to relax\*
13. I felt down-hearted and blue+
14. I was intolerant of anything that kept me from getting on with what I was doing\*
15. I felt I was close to panic^
16. I was unable to become enthusiastic about anything+
17. I felt I wasn't worth much as a person+

18. I felt that I was rather touchy\*
19. 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)^
20. I felt scared without any good reason^
21. I felt that life was meaningless+

*Note.* Items marked with + comprise the depression subscale; items marked with ^ comprise the anxiety subscale; and items marked with \* comprise the stress scale. Total subscale scores are derived by summing individual items, with a higher score indicating levels of depression, anxiety, or stress.

## Appendix A5

Satisfaction with Life Scale (SWLS; Diener et al., 1985)

**Directions:** Please rate how much you agree or disagree with the following statements from 1 = *strongly disagree*; 2 = *disagree*; 3 = *slightly disagree*; 4 = *neither disagree nor agree*; 5 = *slightly agree*; 6 = *agree*; to 7 = *strongly agree*.

1. In most ways my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far I have gotten the important things I want in life.
5. If I could live my life over, I would change almost nothing.

*Note.* Total score is derived by summing individual items. Higher scores indicate a greater satisfaction with life.

## Appendix A6

### Belongingness Orientation Scale (Lavigne et al., 2011)

**Directions:** Please rate how much you agree or disagree with the following statements from 1 = *strongly disagree*; 2 = *disagree*; 3 = *neither disagree nor agree*; 4 = *agree*; to 5 = *strongly agree*.

My interpersonal relationships are important to me because:

#### *Growth Orientation*

1. I find it exciting to discuss with people on numerous topics
2. I have a sincere interest in others
3. I consider that the people I meet are fascinating
4. They allow me to discover a lot about others
5. They allow me to learn about myself

*Note.* Total subscale score is derived by summing individual items. Higher scores on indicate higher growth orientation.

## Appendix A7

### Short-Form Health Survey: SF-12 (Ware et al., 1995)

**Directions:** Each question has its own unique direction. Please see below.

1. In general, would you say your health is:\*

**Answers:** 1 = *excellent*; 2 = *very good*; 3 = *good*; 4 = *fair*; 5 = *poor*.

Does your health now limit you in these activities? If so, how much?

2. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
3. Climbing several flights of stairs?

**Answers:** 1 = *yes, limited a lot*; 2 = *yes, limited a little*; 3 = *no, not limited at all*.

Does the past 4 weeks, have you had any of the following problems with your work or any other regular daily activities as a result of your physical health?

4. Accomplished less than you would like?
5. Were limited in the kind of work or other activities?

**Answers:** 1 = *yes*; 2 = *no*.

6. During the last 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?\*

**Answers:** 1 = *not at all*; 2 = *a little bit*; 3 = *moderately*; 4 = *quite a bit*; 5 = *extremely*.

*Note.* Items marked with \* are reverse scored. Total score is derived by summing individual items. Items above comprise the Physical Component Summary (PCS). A higher score indicates better physical health.

## Appendix A8

### UCLA Loneliness Scale (Russell et al., 1978)

**Directions:** Please rate how you feel in relation to the following statements from 1 = *I never feel this way*; 2 = *I rarely feel this way*; 3 = *I sometimes feel this way*; to 4 = *I often feel this way*.

1. I am unhappy doing so many things alone
2. I have nobody to talk to
3. I cannot tolerate being so alone
4. I lack companionship
5. I feel as if nobody really understands me
6. I find myself waiting for people to call or write
7. There is no one I can turn to
8. I am no longer close to anyone
9. My interests and ideas are not shared by those around me
10. I feel left out
11. I feel completely alone
12. I am unable to reach out and communicate with those around me
13. My social relationships are superficial
14. I feel starved for company
15. No one really knows me well
16. I feel isolated from others
17. I am unhappy being so withdrawn
18. It is difficult for me to make friends

19. I feel shut out and excluded by others

20. People are around me but not with me

*Note:* Total Score is derived by summing individual items. A higher score indicates more loneliness.

## Appendix B1

### Tasmanian Social Sciences HREC Approval



Social Science Ethics Officer  
Private Bag 01 Hobart  
Tasmania 7001 Australia  
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Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

14 August 2015

Dr Rachel Grieve  
Psychology  
Private Bag 30

Dear Dr Grieve

Re: **MINIMAL RISK ETHICS APPLICATION APPROVAL**  
Ethics Ref: H0015105 - "Staying Connected": Online Mechanisms Related to Wellbeing in Older Adults

We are pleased to advise that acting on a mandate from the Tasmanian Social Sciences HREC, the Chair of the committee considered and approved the above project on 23 July 2015.

This approval constitutes ethical clearance by the Tasmanian Social Sciences Human Research Committee for the study to commence. It is important to note that the research may be conducted on factors beyond the remit of the ethics approval. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. **Complaints:** If any complaints are received or ethical issues arise during the course of the project, please contact the Executive Officer of the Ethics Committee on 03 6220 7479 or [human.ethics@utas.edu.au](mailto:human.ethics@utas.edu.au).

3. **Incidents or adverse effects:** Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. **Amendments to Project:** Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. **Annual Report:** Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. Failure to submit a Progress Report will mean that ethics approval for this project will lapse.

6. **Final Report:** A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Natasha Jones  
Ethics Officer  
Tasmania Social Sciences HREC

## Appendix B2

### Information Sheet

#### **Participant Information Sheet**

##### **Invitation**

You are invited to take part in a research project, which aims to examine online social interactions and their relationship with health and wellbeing in people aged 55 or older. This study is being conducted by Dr. Rachel Grieve, PhD (Lecturer at the University of Tasmania, School of Psychology).

##### **What is the purpose of this study?**

As access to Internet is rapidly evolving, it is changing some of the ways that we interact with each other. The purpose of this research is to examine the links between the feelings of social connectedness that people experience online, and people's perceptions of their psychological health, physical health, and wellbeing.

##### **Why have I been invited to participate?**

You are invited to participate because you are over the age of 55 and use Facebook. Participating in this project is entirely voluntary. If you choose not to take part, there will be no consequences and this will not affect any future relationship with the University of Tasmania. However, we hope that the responses from people who do take part may be helpful in preventing and/or treating psychological problems and social isolation in older adults in the future.

##### **What will I be asked to do?**

If you choose to participate, you will be asked to complete two anonymous online surveys, approximately 3 - 4 weeks apart. The surveys will ask you to rate your level of agreement with statements about your social networks (such as "*I have a sense of togetherness with my Facebook friends*" and "*I feel distant from people*"), and your reasons for using Facebook (for example "*I use Facebook to learn more about other people living near me*"); some questions about your emotional well-being (such as "*how often have you felt down-hearted and blue recently?*"); as well as rating your perceptions of your daily activities (such as "*Does your health limit you in climbing several*

*flights of stairs?*” and your ability to find your way around familiar places). The first survey will take around 30-35 minutes to complete, the second survey is shorter, and will take around 15-20 minutes to complete.

At the end of the second survey, you will be able to provide your contact details, so we can send you a \$20.00 gift voucher (your choice of Coles/Myer, Amazon, JB hi fi, Woolworths, Big W, or Woolworths Caltex) to thank you for your time. Note that we will not be able to link your survey answers to your contact details, so your participation will remain anonymous.

### **Are there any possible benefits from participation in this study?**

On completion of the study, you will receive a \$20.00 gift voucher (your choice of Coles/Myer, Amazon, JB hi fi, Woolworths, Big W, or Woolworths Caltex) to thank you for your time and your participation. More generally, the findings from this research will enhance understanding how online social media influences social interactions for people aged 55 and above.

### **Are there any possible risks from participation in this study?**

It is not anticipated that there are any risks from participation in this study. However, in the unlikely case that distress is experienced, participants should contact Lifeline (131114), or their General Practitioner.

### **What will happen to the information when this study is over?**

Data will be kept for a minimum of five years from the publication of this study at the University of Tasmania on a secure database. All data will remain confidential and access will be limited only to the researchers. After five years, the data will be erased.

### **How will the results of the study be published?**

A summary of this study’s findings will be published on the Division of Psychology website. It is further anticipated that these results will be submitted to an academic journal for publication. As participation is completely anonymous, you will remain unidentifiable from published results and at all times throughout the research process.

**What if I have questions about this study?**

Please do not hesitate to direct any questions or concerns regarding this study to Dr Rachel Grieve (email: Rachel.Grieve@utas.edu.au or phone: 03 6226 2244). This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on +61 3 6226 6254 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number [H15105].

**Thank you for taking the time to consider taking part in this research project.**

**If you wish to participate in this study, please click “next” to give your consent on the next page.**

**Appendix B3**

## Online Consent Form

**Informed Consent**

I have read and understood the information provided to me and I voluntarily agree to participate in the research study.

**Yes**     **No**