

Development of a measure to examine social network site use in older adults

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Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Overview

The focus of this thesis is the use of Social Networking Sites (SNSs) in older adults, in the context of social wellbeing in later life.

The literature review (Part 1) is a review of SNSs from an older adult perspective, encompassing characteristics of older adults who use SNSs, attitudes towards SNSs and the relationship between SNS use and social wellbeing (social isolation and loneliness), and SNS use and cognitive function.

The empirical paper (Part 2) describes the development of a measure to understand SNS use in older adults, according to measure development guidelines (including consultation with the target population, piloting, and evaluation of the measure's psychometric properties). The relationship between the measure and social wellbeing is also explored.

The critical appraisal (Part 3) is comprised of two parts: a follow-up study to further investigate the limitations of the measure as found by the analysis in Part 2, and challenges encountered in undertaking research in this field.

Impact Statement

Loneliness and social isolation are associated with poor psychological, cognitive and physical health in later life. In the digital age, it has been suggested that Social Networking Sites (SNSs), with their accessibility, convenience and potential for overcoming spatial barriers with others, could ameliorate these challenges in older age. The small body of research that has explored this idea has used only simple conceptualisations of SNS use (e.g. use versus non-use). However, research indicates that it is important to ascertain *how* SNSs are used in understanding their relationship to social wellbeing. In the light of a paucity of appropriate measures to answer this question, the current research sought to develop a measure of SNS use for older adults, focusing on motives and affect associated with use ('SNS-Older Adults Measure'). The hope was that this measure could be used in future research to obtain a more detailed picture of SNS use in older adults and its relationship to social wellbeing, with a view to make recommendations for researchers and clinicians regarding the viability of SNSs as a tool to combat loneliness and social isolation in later life.

Despite attempts to create a methodologically rigorous measure, the results of the current study indicated that the older adult participants did not feel sufficiently strongly about SNSs to be meaningfully captured by a quantitative measure (either in their endorsement of motives for using SNSs or in their affective response to SNSs). The dominant motive for SNS use appeared to be maintaining contact with close family and friends.

These results may assist researchers in the following ways: (1) they suggest that SNS use alone is not a particularly important part of most older

adults' lives and therefore that SNSs *alone* and their relationship to social wellbeing, are unlikely to provide fertile grounds for future research with current cohorts of older adults; (2) that a more fruitful avenue of future research for current cohorts of older adults is likely to be studying SNS use in the wider landscape of individuals' Internet use and communication practices (e.g. telephone, face-to-face contact). However, given the fast-changing nature of technology, researchers might consider using the 'SNS-Older Adults Measure' with future generations of older adults, or with longitudinal designs, to explore whether developmental or cohort effects account for the results observed here.

These results might assist clinicians working with older adults in the following ways: (1) they suggest that SNS use needs to be considered alongside other mediums of social contact in ameliorating social wellbeing; (2) that the degree to which SNSs are helpful for wellbeing needs to be considered in the context of individual characteristics and circumstances.

In addition, the insights from this research regarding older adults' attitudes towards SNSs might assist SNS or technology developers in designing and developing SNSs that are suited to the needs and preferences of older adults.

As this research was conducted in the UK, these recommendations will be most relevant to this country, however it is hoped that it could stimulate research in other countries where different SNSs, and social and communication practices abound.

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Part 1: Literature Review

**A review of literature on social networking sites from
an older adult perspective**

1.1 Abstract

1.1.1 Background/Aims

The aim of this literature review was to systematically review the use of Social Networking Sites (SNSs) from an older adult perspective. Characteristics of older adult SNS users, incentives and disincentives for use and the relationship between SNS use, wellbeing and cognitive function were explored.

1.1.2 Method

From a systematic search, 21 papers met inclusion criteria and were subjected to a quality review.

1.1.3 Results

Paper quality was often low or medium, as rated by a standard quality assessment framework. Results indicated that older adult SNS users are more likely to have particular characteristics e.g. female, younger. The main incentive for use was to maintain contact with family and friends. Disincentives included privacy concerns and lack of perceived usefulness. The relationship between SNS use, wellbeing and cognitive function was inconclusive.

1.1.4 Conclusions

SNS use is a multidimensional phenomenon that needs to be understood in the context of broader communication practices, individuals' social relationships and individual preferences and characteristics.

1.2 Introduction

1.2.1 Social relationships, wellbeing and health

A vast body of literature has highlighted the importance of social relationships for health, wellbeing and mortality in later life (Barth, Schneider, & von Känel, 2010; Boss, Kang, & Branson, 2015; Golden et al., 2009; Hawkey & Cacioppo, 2010; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Holwerda et al., 2012; Valtorta, Kanaan, Gilbody, Ronzi, & Hanratty, 2016; Wilson et al., 2007). Life events including physical morbidity and bereavement can lead to an increased risk of loneliness and social isolation (Victor, Scambler, Bowling, & Bond, 2005). Amongst adults aged 65+, 5-15% report frequent loneliness and an additional 20-40% report occasional loneliness. For adults aged 80+, loneliness is more common with around 40-50% reporting feeling 'often' lonely (Dykstra, 2009; Pinquart & Sorensen, 2001).

A number of theories or mechanisms have been proposed to explain the link between social relationships and wellbeing. These include the diversity of social networks (Fiori, Antonucci & Cortina, 2006; Murayama et al., 2013), a sense of group belonging (Cruwys et al., 2014; Jetten, Haslam, Haslam & Dingle, 2014), social support (the extent to which one feels cared for) (Fiori et al., 2006), the extent to which relationships provide tangible benefits and resources (Cohen & Wills, 1985), and reduced stress (Cacioppo & Patrick, 2008). Yet, some social connections may have negative consequences for wellbeing, e.g. by provoking stress or inducing negative health behaviours (Jetten et al., 2014), highlighting the importance of considering the valence of a relationship in the link between social relationships and wellbeing.

Some researchers have highlighted the importance of a sense of belonging to a group over simple social contact (Jetten et al., 2014; Cruwys et al., 2014). In support of this, social or group identification has been found to have positive effects on mental health, over and above simple social contact (Cruwys et al., 2014; Sani, Herrera, Boroch & Gulyas, 2012). Other research has highlighted a lack of evidence for simple befriending schemes in reducing loneliness, suggesting that simple social contact may be insufficient to result in real benefits for wellbeing (Sansoni, Marosszeky, Sansoni & Fleming, 2010).

Regarding cognitive function, studies have found that both structural aspects of a person's social network, for example, the size and frequency of social contact, participation in groups, and number of social roles (Crooks, Lubben, Petitti, Little & Chiu, 2008; Ellwardt, Van Tilburg & Aartsen, 2010; Haslam, Cruwys & Haslam, 2014), and functional aspects, such as reciprocity and satisfaction in social interactions, feeling understood, social support and group identification (Amieva, Stoykova, Matharan, Helmer, Antonucci & Dartigues, 2010; Haslam, Cruwys, Milne, Kan & Haslam, 2016; Marioni et al., 2015; Pillemer & Holtzer, 2016), are associated with reduced risk of cognitive decline.

1.2.2 Social Networking Sites (SNSs)

It has been proposed that Social Networking Sites (SNSs) might play a part in reducing social isolation and loneliness in older adults (Bell et al., 2013; Campos et al., 2016; Coelho, Rito, & Duarte, 2017; Cornejo, Tentori, & Favela, 2013; Goswami, Köbler, Leimeister, & Krcmar, 2010; Sundar, Behr, Oeldorf-Hirsch, & Nussbaum, 2011). Some research has also suggested that SNS use

(Myhre, Mehl, & Glisky, 2016; Quinn, 2017) or training in use of tablet computers (Chan, Haber, Drew, & Park, 2014), may have benefits for cognitive function.

Defining an SNS is not straightforward for two main reasons: the rapidly evolving nature of the Web 2.0 (characterised by the change from static web pages to user-generated, and dynamic content) and the similarities between SNSs and other communication platforms (Obar & Wildman, 2015). For example, the recent advent of messaging applications (e.g. *Facebook Messenger*) stem from SNS platforms, but they diverge from SNSs in that they can be used in a similar way to text messaging. Examples of SNSs include *Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, and WhatsApp*. Obar and Wildman (2015) identified four commonalities between 'social media sites': (1) they are built on Web 2.0; (2) they are underpinned by user-generated content; (3) users create profiles designed and maintained by the site; and (4) they facilitate the development of online connections to other individuals and/or groups. Although other communication media platforms share commonalities with SNSs, no other platform facilitates these functions to the same extent as SNSs.

SNSs are now being widely adopted by older adults: A recent survey by OfCom (UK communications regulator; 2016) examining adults' media use and attitudes in the UK found that 51% of adults aged 55-64 and 30% of adults aged 65+ had an SNS account (up from 27% and 11% from 2010, respectively). *Facebook* was the most common site, with 88% of those aged 55+ reporting it as their main SNS.

Given the growing presence of SNSs, researchers are turning their attention towards understanding the use and impact of SNSs amongst older adults. Most research on SNSs to date has focused on adolescent and younger adult populations (e.g. Deters & Mehl, 2013; Ellison, Steinfield, & Lampe, 2007; Skues, Williams, & Wise, 2012; Steinfield, Ellison, & Lampe, 2008). However, cohort effects and the divergent quality of challenges and social relationships in younger and later life (Carstensen, 2006) warrant a distinct examination of SNSs use from an older adult perspective.

1.2.3 Existing reviews of Social Networking Sites and older adults

To date, three reviews have been conducted in which SNS use was examined from an older adult perspective (Coto, Lizano, Mora, & Fuentes, 2017; Leist, 2013; Nef, Ganea, Müri, & Mosimann, 2013), alongside broader reviews of technology use, including SNSs (Campos et al., 2016; Coelho et al., 2017).

The rationale for an updated review was as follows. First, the fast-changing pace of the Web 2.0 and SNSs necessitates regular updates of the field. Second, Nef et al. (2013) included samples of adults aged 55+, and Coto et al. (2017) and Leist (2013) did not specify a lower age limit. Third, the current review attempts to improve upon the methodology used by former reviews. Fourth, given differences between SNSs and other communication media, a review of SNS use (as opposed to technology use) may help to identify unique qualities and outcomes of this medium.

Adults aged 65+ typically face different circumstances to adults in their fifties and early sixties, e.g. they are less likely to be in employment, and to have dependent children as well as their own parents. As such, only papers

that included samples with an average age of 65+ were included in the current review. This review will outline specific questions to be answered, in contrast to former reviews where the exact research question was unclear. It also aims to use a more comprehensive search strategy than that of Coto et al. (2017), and by incorporating a quality assessment of papers. This review retains the format of a 'scoping review' (see Arksey & O'Malley, 2005; Daudt, van Mossel, & Scott, 2013; Dijkers, 2015; Levac, Colquhoun, & O'Brien, 2010). Scoping reviews aim to map the size and content of a topic area, which can be used to identify gaps in the literature and identify future research directions (University of York, 2009). The format of a scoping review was selected because they are a useful way of exploring a new and emerging field, are appropriate for exploring broad topics where a wide range of study designs are applicable (Arksey & O'Malley, 2005), and are helpful in planning primary research studies (University of York, 2009).

1.2.4 Current review

The aim of the review was to identify, characterise and summarise existing research on SNS use from an older adult perspective. It was also undertaken to inform the author's primary research study (see Part 2: Empirical Paper). Research questions were as follows:

- What are the characteristics of older adult SNS users?
- Why do older adults use or not use SNSs?
- What is the association between SNS use and older adults' wellbeing?
- What is the association between SNS use and cognitive function?

1.3 Method

1.3.1 Search strategy

A systematic review of the following databases was performed: PsychINFO, Web of Science Core Collection, SCOPUS, International Bibliography of the Social Sciences (IBSS), Psychology Database and Medline. Databases were searched from 2004 to the present (*Facebook*, the most popular SNS amongst older adults was founded in 2004) using the following terms: “Older adults” or “Older people” or “Older persons” or “Old people” or “Old age” or “Older age” or “Late life” or “Later life” or “Aging”, “Ageing” or “Elderly” or “Elderlies” or “Seniors” or “Senior citizens” or “Active older Internet users” or “Over 65” and “Social media” or “Social networking” or “Social network site” or “Social network sites” or “Social network use” or “Social networks use” or “Social platform” or “Online network” or “Online networks” or “Online networking” or “Online social networks” or “Facebook”. English language restrictions were applied where possible. In line with recommendations for scoping reviews, where the aim is to be as comprehensive as possible in identifying primary studies, both published and unpublished literature was included (Arksey & O'Malley, 2005). In line with the iterative process of a scoping review (Arksey & O'Malley, 2005), some of the inclusion/exclusion criteria were developed during the process of reviewing the papers.

1.3.1.1 *Inclusion criteria*

- Original research paper on SNS use and older adults.
- Papers examining the specific use of SNSs.

- Papers from a social sciences and psychology perspective.
- Papers where the average age of the sample was 65+.
- No restrictions were placed on the type of methodology employed in the paper.

1.3.1.2 *Exclusion criteria*

- Papers exploring general Information Communication Technology, technology or Internet use.
- Papers focusing primarily on the computer science aspects of SNSs (e.g. programming or technological).
- Papers focusing primarily on the development and feasibility of new technology to support access to SNSs.
- Papers focusing primarily on the marketing, business and advertising aspects of SNSs.
- Focus of the paper is on dating websites.
- Focus of the paper is 'online communities'.
- Focus of the paper is on SNSs from the perspective of health conditions associated with older age e.g. Aphasia.
- Review papers.
- Dissertations.
- Published version is available (for unpublished literature).

If papers explored general Internet use and SNS use independently they were included, but only results pertaining to specific SNS use are considered here. 'Online communities' bear many similarities to SNSs however the decision was

taken to exclude these papers because they allow the user to access forums and message boards without creating a profile or an online social network. For more information on 'online communities' see Nimrod (2013).

1.3.2 Quality Review

The shortlisted papers were subjected to a quality review using the Standard Quality Assessment Criteria (Kmet, Lee, & Cook, 2004), developed to assess the quality of primary research papers using a variety of research designs. A summary score was computed to indicate the overall quality of the study. The guidelines consider a wide range of criteria pertaining to study quality including design, sampling strategy, analysis, results, conclusions and clarity of the research question. In addition, the use of verification procedures (e.g. coding by more than one author), reflexivity (i.e. assessing the impact of the author's personal characteristics on the account), and connection to a theoretical framework are considered for qualitative studies (see Table 1 and Table 2). Where mixed methods are used, summary scores are reported for the quantitative and qualitative sections of the study (Lüders & Brandtzaeg, 2014). As no qualitative description of scores is provided by Kmet et al. (2004), the following labels were used for the purposes of this review, approximately corresponding to liberal and conservative cut-offs for scores used by Kmet et al. (2004): < 0.55 = low; > 0.55 medium; > 0.75 = high.

Table 1. *Quality criteria for quantitative studies (Kmet et al, 2004).*

Quality criteria	
1	Question/objective sufficiently described?
2	Study design evident and appropriate?
3	Method of subject/comparison group selection <i>or</i> source of information/input variables described and appropriate?
4	Subject (and comparison group, if applicable) characteristics sufficiently described?
5	If interventional and random allocation was possible, was it reported?
6	If interventional and blinding of investigators was possible, is it reported?
7	If interventional and blinding of subjects was possible, was it reported?
8	Outcome and (if applicable) exposure measure(s) well defined and robust to measurement/misclassification bias? Means of assessment reported?
9	Sample size appropriate?
10	Analytic methods described/justified and appropriate?
11	Some estimate of variance is reported for the main results?
12	Controlled for confounding?
13	Results reported in sufficient detail?
14	Conclusions supported by the results?

Note. Items are given a score of 2 (yes), 1 (partial), 0 (no), or not applicable. Total quality rating is awarded based on sum of possible scores.

Table 2. *Quality criteria for qualitative studies (Kmet et al, 2004).*

Quality criteria	
1	Question/objective sufficiently described?
2	Study design evident and appropriate?
3	Context for the study clear?
4	Connection to a theoretical framework/wider body of knowledge?
5	Sampling strategy described, relevant and justified?
6	Data collection methods clearly described and systematic?
7	Data analysis clearly described and systematic?
8	Use of verification procedure(s) to establish credibility?
9	Conclusions supported by the results?
10	Reflexivity of the account?

Note. Items are given a score of 2 (yes), 1 (partial), 0 (no), or not applicable. Total quality rating is awarded based on sum of possible scores.

1.4 Results

1.4.1 Shortlisting

Based on the search strategy a total of 1164 papers, excluding duplicates, were identified from the database search and managed using the referencing software *Endnote* (version X8.1). Sixty-three items (conference titles) were incorrectly identified as research papers and were excluded. Titles were subsequently reviewed for relevance, resulting in 252 shortlisted papers. Abstracts of these papers were assessed for relevance, resulting in 48 papers for which the full text was reviewed. Thirty papers were excluded at this stage, with the most common reason for exclusion being the average age of the

sample (< 65). A further three papers were identified via hand-search, resulting in a final shortlist of 21 papers (12 peer-reviewed papers and nine conference papers). Reference lists of shortlisted papers and past reviews were also reviewed for references, but no additional papers were identified in this way (see Figure 1). Table 3 provides an overview of the peer-reviewed papers and Table 4 provides an overview of the unpublished literature (all conference papers).

Figure 1. Shortlisting process for literature review

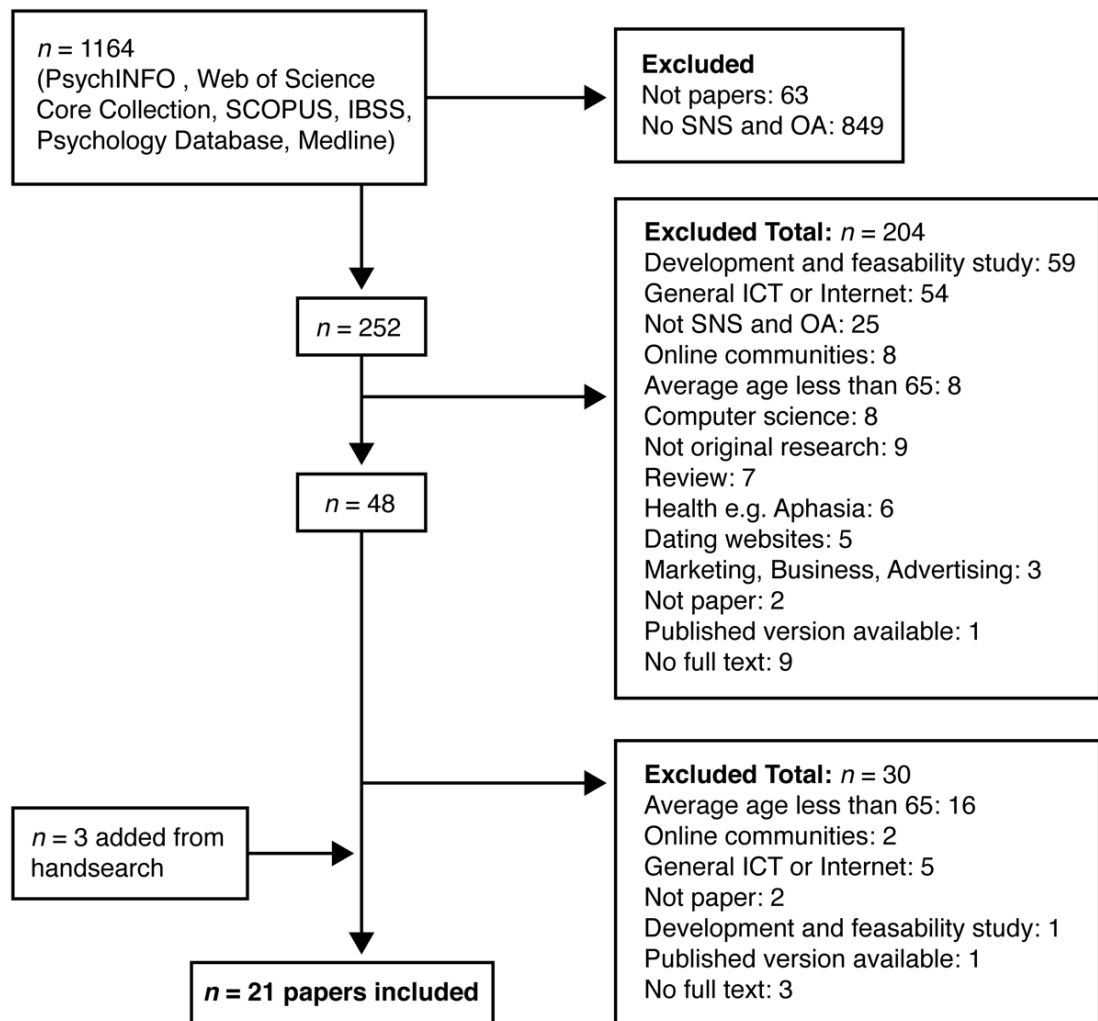


Table 3. Summary of included studies (peer-reviewed).

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
Aarts et al. (2014)	Correlational, cross-sectional	Any SNS	626	- 1 Likert style, 7-point question on frequency of SNS use (collapsed into low, medium, high usage) - DJG Loneliness scale - Mental Health Inventory-5 (depressive symptoms)	60+ M=66.9	50.5 %	Netherlands	No simple association between SNS use (frequency) and loneliness or mental health in community-dwelling older adults.	0.86	3
Ballantyne et al. (2010)	Qualitative, semi-structured interviews (intervention)	Their own	6	'Inductive' qualitative analysis of interview transcripts and reflective journals	69-85	25% ^a	Australia	Participants from a community aged care programme reported beneficial effects of participating in an SNS intervention, clustered around four themes: reduction in feelings of loneliness; perceiving technology as an enabler; importance of one-on-one teaching for successful participation; increased feelings of connectivity to the outside world.	0.45	3
Braun et al. (2013)	Correlational, cross-sectional	FB, Twitter, My Space	124	- Likert style questions on perceived usefulness, perceived ease of use, social influence, trust (regarding SNSs) - Likert style questions on frequency SNS use - Answered how many hours per week used SNS - Likert style 7-point question on intention to use SNS in the next six months	60-90 M=70	71%	USA	Perceived usefulness, trust in SNSs and frequency of Internet use were predictors of intention to use SNSs. Perceived ease of use of websites, social pressure from family and age not predictors of intention to use SNSs.	0.77	2

Table 3. (continued)

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
Hutto et al. (2015)	Descriptive/ Correlational, cross-sectional	FB	141	- Satisfaction with social roles Likert style 5-point scale (PROMIS) - UCLA-R loneliness scale. - Likert style questions on confidence with technology (10-point), attitudes towards technology (6-point) - Likert style 6-point questions on frequency of SNS use/other media - Likert style 6 point questions on frequency of SNS activities	M= 71.7	67.4 %	USA	<i>Facebook</i> users younger, greater confidence in technology, more favourable attitudes to SNSs, higher social role satisfaction than non-users. No difference in loneliness between <i>Facebook</i> users/non-users. Users high in directed communication/passive consumption less loneliness than those reporting low levels of these activities. Higher levels of directed communication correlated with higher social role satisfaction. Reasons for non-use of <i>Facebook</i> were lack of access, privacy/security concerns, lack of interest, and perception that too complicated.	0.73	1, 2, 3
Jung and Sundar (2016)	Descriptive/ Correlational, cross-sectional	FB	352	- Five questions on SNS usage (frequency, duration SNS use, number SNS friends) - Likert style questions on SNS motives (7-point) and activities performed on SNS (7-point)	60-86 M= 67.7	52.3 %	USA	Participants used <i>Facebook</i> for: social bonding, social bridging, curiosity, responding to family member requests. <i>Facebook</i> motives not discretely linked to particular activities, although some patterns indicated.	0.60	2
Jung et al. (2017)	Qualitative, semi-structured interviews	FB	46	Open coding technique (qualitative analysis)	M= 80.4	63%	USA	Participants used <i>Facebook</i> for: keeping in touch, sharing photos, social surveillance, responding to family member requests, convenient communication, curiosity. Non-users did not use <i>Facebook</i> for: privacy concerns, need for media richness, preference for familiarity, perceived triviality of communication, time commitment required by <i>Facebook</i> , frustration with site tools.	0.75	2

Table 3. (continued)

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
Kim and Kim (2014)	Correlational, cross-sectional	Any SNS	213	Mini Mental State Examination (global cognitive function)	60+ M = 66.7/ 66.6 (users/ non)	41.8 %/58.2 %	USA	Significant difference in measure of general cognitive function for SNS and non-SNS users.	0.45	4
Lüders and Brandtzaeg (2014)	Correlational, cross-sectional and qualitative, focus groups (mixed methods)	Any SNS	290/ 39 ^b	- Likert style questions on intention to use SNS, Internet self-efficacy, perceived privacy protection, perceived ease of use, perceived usefulness (regarding SNSs) - Thematic analysis of focus group interviews. and deductive methods to compare findings with literature	53+ M= 73/75	57%	Norway	Perceived usefulness/privacy protection associated with increased intention to use SNSs. Perceived ease of use associated with decreased intention to use SNSs. Main reasons for non-SNS use: seeing SNSs as cold and narcissistic form of communication, detracting from relationships with strong ties; privacy and information security concerns; lack of competence. Main motive for becoming SNS user: to increase contact with family and close ties.	0.65/ 0.65	2
Myhre et al. (2016)	Experimental (pre/post with comparative treatment group and waitlist control)	FB	41	- Rey Auditory (verbal learning) - Rey Complex Figure (nonverbal memory) - Digit Symbol Substitution /Deary-Liewald reaction time (speed of processing) - Trail Making (visual scanning, processing speed, EF) - Controlled Oral Word Association, Category Fluency, Letter Memory, Keep Track, Global-Local, Letter Number, Stroop and Simon tasks (EF) - UCLA loneliness scale, Social Support Survey, Lubben Social Network Scale (18-item).	M= 81.8/ 75.7	70.7 %	USA	Improvement in an aspect of executive function (updating) following a <i>Facebook</i> intervention in older adults living in retirement communities. No improvement in other cognitive measures or social wellbeing.	0.69	3, 4

Table 3. (continued)

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
van Ingen et al. (2017)	Correlational, longitudinal	Any SNS	203 2/ 216 2	- Single item Likert style, 7-point question on subjective wellbeing (state and trait – single item). - DJG Loneliness - Activities of Daily Living and Instrumental Activities of Daily Living scales - Yes/no question to Internet activities (including SNSs and online shopping) how many hours per week for each	M=66.81	Gender not reported	Netherlands	Evidence that time spent on SNSs buffers the impact of functional disability on subjective wellbeing, and to lesser extent social loneliness (not emotional loneliness). Time spent on online shopping also buffered impact of functional disability on subjective wellbeing.	0.86	3
Yu, McCammon et al. (2016)	Correlational, cross-sectional	Any SNS	607	- Yes/no question to SNS use - Likert style, 4-point questions on perceived support from children, other immediate family and friends - 11 items from the UCLA-R loneliness scale, factor analysed to dimensions of 'feelings of isolation and connectedness' - Single question on number of close contacts for children, family members, friends - Likert style, 6-point question on frequency social contact with children, family members, friends - Ten-word immediate and delayed recall (memory), serial 7s subtraction (working memory), counting backwards (attention, processing speed) - Single Likert style, 5-point question on self-rated health	52-98 M=65.2	51.5 %	USA	In a nationally representative sample of older adults, SNS use (use vs. non-use) predicted: perceived social support from children, but for 'younger' older adults only; perceived social support from non-kin; feelings of connectedness (to greater extent for 'older' older adults). SNS use did not predict perceived social support from immediate family or feelings of isolation.	0.77	3

Table 3. (continued)

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
Yu, Ellison et al. (2016)	Correlational, cross-sectional	Any SNS	869 ^c	- Age, gender, ethnicity, years of education, marital status, employment status, income and wealth (5 categories) - Cognitive function and self-rated health – see Yu, McCammon et al. (2016). - Answered yes/no questions to performing a list of Internet activities	52-103 M=65.7	54%	USA	In a nationally representative sample of older adults, diversity of online activities, younger age, and female gender increased likelihood of being SNS user. Moderating effect of age (<60 vs. 60+) on ethnicity, marital and employment status on odds of using SNSs. No association between economic resources, health resources and SNS use.	0.95	1

Notes.

DJG Loneliness = De Jong Gierveld Loneliness scale; EF = Executive function; FB = Facebook; M = Mean; PROMIS= Patient-Reported Outcomes Measurement Information System; UCLA-R = Revised UCLA Loneliness scale; % F = % of sample that were female.

*1 = What are the characteristics of older adult SNS users? 2 = Why do older adults use or not use SNSs? 3 = What is the association between SNS use and older adults' wellbeing? 4 = What is the association between SNS use and cognitive function? † = colour coding indicates quality, corresponding to liberal and conservative cut-offs for scores used by Kmet et al. (2004): < 0.55 = low (red); > 0.55 medium (orange); > 0.75 = high (green).

^a Of those who completed intervention. ^b 290 (survey); 39 (focus groups). ^c n in SNS study (from larger sample of Internet users).

Table 4. Summary of included studies (unpublished conference papers).

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No*
Bell et al. (2013)	Descriptive/ Correlational cross-sectional	FB	142	- Satisfaction with social roles Likert style 5-point scale (PROMIS) - UCLA-R Loneliness scale - Likert style questions on confidence with technology (10-point), attitudes towards technology (6-point) - Questions on SNS usage (connections, activities)	50+ M= 72	66.9 %	USA	<i>Facebook</i> users younger, more likely to be female, higher social role satisfaction and confidence with technology, than non-users. Most connections in participants' networks were family and friends; only minority used <i>Facebook</i> to meet new people. No significant difference in loneliness between <i>Facebook</i> users/non-users.	0.65	1, 2, 3
Erickson (2011)	Qualitative, semi-structured interviews	FB	7	Interpretive thematic analysis of interview transcripts	65-72	71.4 %	USA	<i>Facebook</i> allowed participants to have an awareness of family and friends' lives; <i>Facebook</i> used for 'light' (not personal) conversation; most connections were family and close friends. Perceived negative aspects of <i>Facebook</i> use were: seeing content as vulgar, inappropriate; privacy concerns. Overall, <i>Facebook</i> not seen as particularly important part of participants' lives.	0.5	2
Hope et al. (2014)	Qualitative, semi-structured interviews	Any SNS	22	Inductive thematic analysis of interview transcripts	71-92 M= 80.9	68.2 %	USA	Minority of participants used SNSs, and they used it for posting messages, connecting with younger family, 'lurking', playing games and 'following' people of interest. Participants preferred to communicate with traditional communication media. Reasons for non-use: lack of interest, perceiving it as non-meaningful, unimportant, trivial, for younger people, privacy concerns, inappropriate arena to discuss personal views, lack of credibility, perception that requires 'constant communication', preference for communication with closer ties over weak ties.	0.57	2

Table 4. (continued)

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
Matilainen et al. (2016)	Qualitative, semi-structured interviews (intervention)	FB	6	No detail on qualitative analysis provided	69-88	Not reported	Australia	Intervention was acceptable to participants and preliminary results suggest participants found it beneficial. No conclusions could be drawn about impact on social connectedness due to unforeseen developments in the intervention setting.	0.38	3
Quinn (2016)	Qualitative, focus group	FB, Twitter, LinkedIn	16	Thematic analysis of focus group transcripts	65-72	56.3%	USA	SNSs perceived as helpful in overcoming reduced mobility, staying connected with family, staying connected with technologies used by younger generations, maintaining cognitive stimulation. Also perceived as time wasting, trivial and unnecessary. Participants spoke about physical and cognitive barriers to using SNSs.	0.6	2
Quinn (2017)	Experimental (pre/post/waitlist control)	FB, Twitter	36	- Mini Mental State Examination (global cognitive function) - Trail Making (processing speed) - California Older Adult Stroop (inhibitory control) - Symbol digit modalities (divided attention) - Wechsler Digit Span (working memory)	65+ M= 76.8	69.4%	USA	Improvement in aspect of executive function (inhibition) at 4 weeks/4 months and processing speed at 4 weeks following SNS intervention. No improvement on an overall measure of cognition, attention, working memory.	0.54	4

Table 4. (continued)

Author	Design	SNS site	n	Measures	Age	% F	Country	Main finding	Quality review score [†]	Results section No.*
Richter et al. (2013)	Correlational, cross-sectional	Any SNS	3126	- Psychosocial Consequences Scale (18 items from Internet Consequences Scale) - Mental Health Inventory-5 (depressive symptoms)	68.6 (online group); 74.9 (offline)	38.9% (online) 2.7% (offline)	Germany Netherlands Switzerland	SNS users younger, less educated, more socially engaged No difference between SNS users/non-users in likelihood of having a partner or someone to talk to, or in mental health.	0.64	1, 3
Rylands and van Belle (2017)	Descriptive/ Correlational, cross-sectional	FB	59	- The Quality of Life Scale (CASP-19) and own questions derived from Klein's Choice Framework (ability to achieve desired outcomes), adapted to ask about Facebook use	60+ M= 65.9	64%	South Africa	Most participants used Facebook to stay connected with friends/family, not to form new relationships. Participants used limited set of Facebook features. Association found between Facebook functionality (i.e. more functions used) and the extent to which participants perceived Facebook to have a beneficial impact on Quality of Life. Obstacles to using Facebook: false, unwanted advertising, complicated privacy and security settings.	0.50	2, 3
Sundar et al. (2011)	Descriptive/ Correlational, cross-sectional	FB	168	- Likert style 5-point questions on Quality of Life (adapted from Life Satisfaction Index), and three open-ended questions - Items adapted from WHO (physical health) - Frequency SNS use and activities, number of 'friends' - Facebook Intensity Scale	55+ M= 69	33%	USA	Primary motivation for using Facebook was request from family/friends. Non-users lacked interest in joining. No association between Facebook use (use vs. non-use; frequency use; Facebook Intensity Scale) and Quality of Life.	0.50	2, 3

Notes. FB = Facebook; M = Mean; PROMIS= Patient-Reported Outcomes Measurement Information System; UCLA-R = Revised UCLA Loneliness scale; WHO = World Health Organisation; % F = % of sample that were female.

*1 = What are the characteristics of older adult SNS users? 2 = Why do older adults use or not use SNSs? 3 = What is the association between SNS use and older adults' wellbeing? 4 = What is the association between SNS use and cognitive function? † = colour coding indicates quality, corresponding to liberal and conservative cut-offs for scores used by Kmet et al. (2004): < 0.55 = low (red); > 0.55 medium (orange); > 0.75 = high (green).

1.4.2 Overview of papers

Twelve papers were peer-reviewed original research papers (see Table 3) and nine were conference papers (see Table 4). Significant homogeneity existed in the literature in terms of country of origin and SNSs under study. Only seven studies were conducted outside of the USA, with four in Europe (Aarts, Peek, & Wouters, 2014; Lüders & Brandtzaeg, 2014; Richter, Bannier, Glott, Marquard, & Schwarze, 2013; van Ingen, Rains, & Wright, 2017), two in Australia (Ballantyne, Trenwith, Zubrinich, & Corlis, 2010; Matilainen, Schwartz, & Zeleznikow, 2017) and one in South Africa (Rylands & Van Belle, 2017). Nine papers considered *Facebook* use only (Bell et al., 2013; Erickson, 2011; Hutto et al., 2015; Jung & Sundar, 2016; Jung, Walden, Johnson, & Sundar, 2017; Matilainen et al., 2017; Myhre et al., 2016; Rylands & Van Belle, 2017; Sundar et al., 2011). Participants ranged in age from 50 to 98. Mean sample age ranged from 65.3 (Yu, McCammon, Ellison, & Langa, 2016) to 78.7¹ (Myhre et al., 2016). Females were more represented than males in the majority of studies (on average representing 56.8% of the sample).

Two studies used an experimental design (Myhre et al., 2016; Quinn, 2017). Seven studies used a correlational design (Aarts et al., 2014; Braun, 2013; Kim & Kim, 2014; Richter et al., 2013; van Ingen et al., 2017; Yu, Ellison, McCammon, & Langa, 2016; Yu, McCammon, et al., 2016). Five studies used descriptive and correlational methods (Bell et al., 2013; Hutto et al., 2015; Jung & Sundar, 2016; Rylands & Van Belle, 2017; Sundar et al., 2011). Of the descriptive and correlational studies, one study used a longitudinal design (van

¹ For Myhre et al. (2016), mean age was calculated from mean age of separate samples recruited from two retirement communities (mean age = 75.7 and 81.8).

Ingen et al., 2017), with the remaining studies using a cross-sectional design. Six studies employed qualitative methods via the use of semi-structured interviews or focus groups (Ballantyne et al., 2010; Erickson, 2011; Hope, Schwaba, & Piper, 2014; Jung et al., 2017; Matilainen et al., 2017; Quinn, Smith-Ray, & Boulter, 2016). Two of these qualitative studies implemented an intervention (Ballantyne et al., 2010; Matilainen et al., 2017). One study used mixed qualitative and quantitative (correlational, cross-sectional) methods (Lüders & Brandtzaeg, 2014).

The remaining results are structured according to the questions outlined in the *Method* section.

1.4.3 What are the characteristics of older adult SNS users?

1.4.3.1 Overview

Four studies examined characteristics of older adult SNS users (Bell et al., 2013; Hutto et al., 2015; Richter et al., 2013; Yu, Ellison, et al., 2016). One study was rated as high quality (Yu, Ellison, et al., 2016) and three studies were rated as medium (Bell et al., 2013; Hutto et al., 2015; Richter et al., 2013). Main limitations included use of convenience samples (Bell et al., 2013; Hutto et al., 2015; Richter et al., 2013) and small sample size (Bell et al., 2013; Hutto et al., 2015).

One study utilised a population-based sample from a large longitudinal survey (Yu, Ellison, et al., 2016), two studies administered a survey to participants enrolled to test health products (Bell et al., 2013; Hutto et al., 2015), and one study administered a survey to a sample recruited via

'snowballing' methods (relying on initially sampled participants to recruit others in their network [Johnson, 2014]) (Richter et al., 2013).

1.4.3.2 Findings

Older adults who are SNS users were more commonly female (Bell et al., 2013; Yu, Ellison, et al., 2016) and younger (typically early to mid-sixties) (Bell et al., 2013; Hutto et al., 2015; Yu, Ellison, et al., 2016). While one study found that SNS users had fewer years of education than non-users (Richter et al., 2013), another study found no association between education, income and SNS use (Yu, Ellison, et al., 2016). According to Yu, Ellison, et al. (2016), SNS users aged 60+² were more likely to be white, employed, and married. Cognitive functioning and self-rated health was not associated with SNS use (Yu, Ellison, et al., 2016). Bell et al. (2013) found no association between SNS use and ethnicity or income, however their sample was highly homogenous in terms of ethnicity (90.8% White), thereby weakening this finding. SNS users were more confident with technology (Bell et al., 2013; Hutto et al., 2015; Richter et al., 2013), used the Internet more (Richter et al., 2013; Yu, Ellison, et al., 2016), and perceived more positive consequences to using the Internet (Richter et al., 2013) and SNSs (Hutto et al., 2015).

1.4.3.3 Section summary

This research suggests that differences in attitudes towards technology and some sociodemographic measures (particularly gender and age) currently

² Mean age of the sample is 65+ however only findings for <60 years of age and >60 years of age were reported.

exist between SNS older adult users and non-users. However, the small number of studies and limitations in sampling method mean that these findings should be regarded with caution. Nevertheless, the quality of studies was either medium or high, lending some strength to these findings.

1.4.4 Why do older adults use or not use SNSs?

1.4.4.1 Overview

Eleven studies included content relevant to incentives and disincentives for using SNSs. Three papers were rated as low quality (Erickson, 2011; Rylands & Van Belle, 2017; Sundar et al., 2011); six papers as medium quality (Bell et al., 2013; Hope et al., 2014; Hutto et al., 2015; Jung & Sundar, 2016; Lüders & Brandtzaeg, 2014; Quinn et al., 2016) and only two papers as high quality (Braun, 2013; Jung et al., 2017). A common limitation was the use of convenience samples, meaning that findings may not be representative of the wider population. Samples were often highly educated (Braun, 2013; Hope et al., 2014; Jung et al., 2017), making it unclear to what extent findings generalise to individuals with fewer years of education. Furthermore, qualitative papers were limited by a lack of link to theory, inadequate description of data analysis, lack of verification procedures and lack of reflexivity in the account.

Jung and Sundar (2016) had participants rate how much they agreed with a number of motives for SNS use identified from the literature and performed a factor analysis to extract 'categories' of motives. Four studies performed a thematic analysis of semi-structured interviews or focus groups on SNS use (Erickson, 2011; Hope et al., 2014; Jung et al., 2017; Quinn et al.,

2016). Five studies used surveys (Bell et al., 2013; Braun, 2013; Hutto et al., 2015; Lüders & Brandtzaeg, 2014; Rylands & Van Belle, 2017; Sundar et al., 2011). Seven out of the 11 studies examined *Facebook* use only, suggesting that some of the following findings may not be generalisable to other SNSs. Samples included users as well as non-users of SNSs.

1.4.4.2 Findings: Incentives

A primary motivation for using SNSs amongst older adults was to maintain close ties e.g. family and friends (Erickson, 2011; Jung & Sundar, 2016; Jung et al., 2017; Quinn et al., 2016; Rylands & Van Belle, 2017; Sundar et al., 2011), or because they were asked to join by family and friends (Jung & Sundar, 2016; Jung et al., 2017; Rylands & Van Belle, 2017; Sundar et al., 2011). Related motives for SNS use were passively observing what is happening in family and friends' lives (Erickson, 2011; Hope et al., 2014; Jung et al., 2017) and looking at photos of family (Quinn et al., 2016; Rylands & Van Belle, 2017). Perceived benefits of joining SNSs included a means of staying connected to younger generations (Hope et al., 2014; Quinn et al., 2016), a means of remaining cognitively active (Quinn et al., 2016), playing games, and keeping up to date with persons of interest (Hope et al., 2014).

Jung and Sundar (2016) indicated that a motivation for SNS use was to strengthen relationships with 'weaker ties' e.g. casual friends or acquaintances. Jung et al. (2017) identified *Facebook* as a means to keep in touch with hard-to-reach friends, colleagues or family. Knowing someone in real life was a pre-requisite for being an online 'friend' in one study (Erickson, 2011), suggesting that meeting new people is not a major motivation for SNS

use. Elsewhere, only a minority of participants were interested in using *Facebook* to meet new people (Bell et al., 2013; Rylands & Van Belle, 2017).

Participants perceived SNSs to be a forum for superficial conversation or information, rather than one for personal conversations or emotional support (Erickson, 2011). Other reasons for using SNSs included curiosity about what was happening in others' lives (Jung & Sundar, 2016; Jung et al., 2017), convenient communication and sharing photos (Jung et al., 2017).

1.4.4.3 Findings: Disincentives

Privacy concerns were identified as a deterrent to SNS use (Hope et al., 2014; Hutto et al., 2015; Jung et al., 2017; Lüders & Brandtzaeg, 2014; Sundar et al., 2011), although these concerns were not ubiquitous (Sundar et al., 2011). Concerns regarded losing control over personal information shared online (e.g. via SNSs sharing with commercial providers) or rescinding social privacy (e.g. seeing SNSs as an inappropriate forum to air personal views). It was unclear whether these concerns extended to general Internet use or were specific to SNSs.

A common reason for non-use was a lack of interest or perceived relevance (Hope et al., 2014; Hutto et al., 2015; Quinn et al., 2016; Sundar et al., 2011) and perceived usefulness predicted increased intention to use SNSs (Braun, 2013; Lüders & Brandtzaeg, 2014), suggesting that non-users perceive SNSs to be unimportant for their needs. Participants perceived SNSs as a non-meaningful way to spend time (Hope et al., 2014; Jung et al., 2017; Quinn et al., 2016). Some participants said that SNSs detracted from their primary interest in nurturing close relationships, since they saw it as a forum

for non-meaningful interactions with 'weaker ties' (Hope et al., 2014; Lüders & Brandtzaeg, 2014). Qualitative interviews suggested that some non-users disliked the communication or content on SNSs (Hope et al., 2014; Jung et al., 2017; Lüders & Brandtzaeg, 2014; Quinn et al., 2016), which was described as trivial, unimportant and self-centred. Some participants also disliked what they perceived as the unreliable nature of information broadcast on SNSs (Hope et al., 2014; Rylands & Van Belle, 2017).

Other factors included a lack of familiarity with SNSs (Jung et al., 2017), lack of access to SNSs (Hutto et al., 2015; Sundar et al., 2011), and perceived lack of skill or competence in understanding or mastering SNSs (Jung et al., 2017; Lüders & Brandtzaeg, 2014; Quinn et al., 2016; Sundar et al., 2011). However, other research indicated that 'perceived ease of use' (i.e. how easy participants think SNSs are to use) was not a deterrent to SNS use (Braun, 2013; Lüders & Brandtzaeg, 2014) and the majority of participants in Hope et al. (2014) asserted that their non-use of SNSs was a choice, rather than because of lack of perceived skill. Together, these findings suggest that a lack of confidence in learning how to use SNSs is not a major obstacle to use.

1.4.4.4 Section summary

Together, these papers suggest that SNSs are used by older adults to maintain connections to people they are already close to rather than being used as a vehicle to form new ties. The extent to which it is used by older adults to maintain and strengthen 'weaker ties' (e.g. casual friends and acquaintances) is unclear. Privacy concerns and lack of perceived usefulness were common

deterrents to SNS use. However, paper quality was most often low or medium, limiting the strength of these conclusions.

1.4.5 What is the association between SNS use and older adults' wellbeing?

1.4.5.1 Overview

The relationship between SNS use and wellbeing was considered in 11 studies, the majority of which examined social wellbeing. However, other indices of wellbeing, e.g. mental health and quality of life (QoL), were also considered in a small number of studies.

Four of the studies were of low quality (Ballantyne et al., 2010; Matilainen et al., 2016; Rylands & Van Belle, 2017; Sundar et al., 2011), four of the studies were of medium quality (Bell et al., 2013; Hutto et al., 2015; Myhre et al., 2016; Richter et al., 2013), and three of the studies were of high quality (Aarts et al., 2014; van Ingen et al., 2017; Yu, McCammon, et al., 2016). The most common limitation across studies was the use of cross-sectional data (Aarts et al., 2014; Bell et al., 2013; Hutto et al., 2015; Richter et al., 2013; Rylands & Van Belle, 2017; Sundar et al., 2011; Yu, McCammon, et al., 2016), preventing conclusions about the direction of any relationship between SNS use and wellbeing. Many studies used samples characterised by higher levels of social wellbeing (Bell et al., 2013; Hutto et al., 2015; Sundar et al., 2011), making it difficult to know how SNS use might impact on social wellbeing in individuals with high levels of social isolation and loneliness. Most studies used simple measures of SNS use (use versus non-use; frequency of use), making it difficult to discern how different types of SNS use might relate to wellbeing (Aarts et al., 2014; Bell et al., 2013; Richter et al., 2013; Sundar et al., 2011;

van Ingen et al., 2017; Yu, McCammon, et al., 2016). Only one study controlled for offline interactions (Yu, McCammon, et al., 2016) and only one study controlled for general Internet use (van Ingen et al., 2017), meaning that in most studies it was not possible to exclude these as confounding variables.

Aarts et al. (2014) examined how frequency of SNS use relates to loneliness and mental health in community-dwelling older adults. Yu, McCammon, et al. (2016) examined whether loneliness and perceived social support differed between users and non-users of SNSs in a nationally representative sample (USA). Using longitudinal data, van Ingen et al. (2017) considered whether time spent on SNSs moderated the impact of functional disability on wellbeing in a nationally representative sample (Netherlands). One study used an experimental design to observe the effect of a *Facebook* intervention on the social wellbeing of older adults living in retirement communities (although their primary outcome was cognitive function – see section 1.4.6) (Myhre et al., 2016). Two studies used qualitative methods to examine the effect of an SNS intervention in older adults living in care homes and a community care programme (Ballantyne et al., 2010; Matilainen et al., 2017). Five studies used surveys with convenience samples (Richter et al., 2013; Rylands & Van Belle, 2017), with participants enrolled in a programme to test health products (Bell et al., 2013; Hutto et al., 2015), and with a purchased sample (Sundar et al., 2011).

1.4.5.2 Findings: Social wellbeing

‘Social wellbeing’ is used as an umbrella term for constructs measuring aspects of social relationships that have relevance to psychological wellbeing.

Six of the studies considered the relationship between SNS use and loneliness (Aarts et al., 2014; Bell et al., 2013; Hutto et al., 2015; Myhre et al., 2016; van Ingen et al., 2017; Yu, McCammon, et al., 2016). Evidence for the relationship between SNS use and loneliness was mixed. Aarts et al. (2014) and Bell et al. (2013) found no evidence for a simple association between SNS use and loneliness. Myhre et al. (2016) found no change in levels of loneliness compared to a control group following an intervention in which participants learned how to use an SNS site over a period of several weeks.

In contrast, Ballantyne et al. (2010) delivered an SNS intervention and their qualitative results suggest that some users felt less lonely as a result of using SNSs. Results from van Ingen et al. (2017) suggest that SNS use reduced the impact of functional disability on 'social' loneliness (linked to frequency of social contact), although no corresponding effect for 'emotional' loneliness (linked to having a close confidante or spouse) was evident. Yu, McCammon, et al. (2016) identified two factors, 'feelings of connectedness' and 'feelings of isolation', via a factor analysis performed on a measure of loneliness. Results suggested that SNS users, compared to non-users, were higher in 'feelings of connectedness', but not 'feelings of isolation'. Hutto et al. (2015) split their sample of SNS users into 'low' versus 'high' frequency users of particular activities on SNSs (directed communication and passive consumption³). Loneliness was lower in the 'high' frequency samples, suggesting higher intensity of SNSs may be related to social wellbeing.

Two studies examined the relationship between SNS use and social support (Myhre et al., 2016; Yu, McCammon, et al., 2016). Yu, McCammon, et

³ Directed communication is sending and receiving messages; passive consumption is observing or consuming content passively.

al. (2016) found evidence to suggest that SNS use was related to higher levels of perceived social support from children, as well as friends (it was not related to perceived support from other immediate family). However, for perceived support from children, this was only the case for those younger than 60 years (not for those aged 60+). Due to the cross-sectional nature of the data, it is not possible to know whether this was a cohort or developmental effect. Myhre et al. (2016) found no change in perceived social support following their intervention.

Richter et al. (2013) found that SNS users were more socially engaged than non-SNS users (meeting with friends at least weekly and engaged in pro-social activities). However, there were no differences between SNS users and non-users in social isolation (having someone to talk to or living alone). Bell et al. (2013) found that SNS users scored higher on levels of social satisfaction compared to non-users (defined as the extent of satisfaction with an individual's social roles and activities). Hutto et al. (2015) elaborated on this finding by suggesting that only 'directed communication' on SNSs correlated with social satisfaction.

Matilainen et al. (2017) provided training for residents in an elderly care facility in the use of *Facebook*, in order to observe its impact on feelings of social connectedness. Due to unforeseen changes in the intervention setting the intervention could not be completed. However, preliminary findings suggested that the intervention was acceptable to the small number of participants.

1.4.5.3 Findings: Other wellbeing indices

Five studies investigated other indices of wellbeing including relationship of SNSs to QoL (Rylands & Van Belle, 2017; Sundar et al., 2011), mental health (Aarts et al., 2014; Richter et al., 2013) and 'subjective wellbeing' (van Ingen et al., 2017). No difference was found between SNS users and non-users on a measure of mental health problems (Aarts et al., 2014; Richter et al., 2013). Results from van Ingen et al. (2017) indicated that the more time participants spent on SNSs, the smaller the effect of functional disability on both state and trait wellbeing. However, the same relationship was observed for online shopping, suggesting this effect was not specific to SNS use. Sundar et al. (2011) found no relationship between a number of *Facebook* use indices and QoL. The majority of participants in Rylands and Van Belle (2017) agreed with statements that *Facebook* allowed them to be more socially and intellectually engaged and brought about increased choice (aspects of their QoL measure). Greater use of *Facebook* functions was also associated with stronger endorsement of QoL statements, possibly indicating that participants who were more active on SNSs reaped greater rewards for wellbeing. However, they adapted an existing QoL measure without testing its psychometric properties, thereby weakening their findings.

1.4.5.4 Section summary

Owing to the fact that most papers were of low or medium quality, these findings suggest that the relationship between SNS use and wellbeing amongst older adults is currently inconclusive. The major limitations that restrict firmer conclusions include the preponderance of cross-sectional data,

limitations regarding measurement and difficulty in controlling for extraneous or confounding variables e.g. offline social interaction.

1.4.6 What is the association between SNS use and cognitive function?

1.4.6.1 Overview

Three studies examined the relationship between SNS use and cognitive function (Kim & Kim, 2014; Myhre et al., 2016; Quinn, 2017). Two papers were classified as low quality (Kim & Kim, 2014; Quinn, 2017) and one paper as medium quality (Myhre et al., 2016). All studies were limited by their use of convenience samples and small sample size. Use of cross-sectional data in Kim and Kim (2014) and absence of an appropriate control group in Quinn (2017), preclude conclusions about causality.

Two studies studied changes in cognitive function following an SNS intervention (Myhre et al., 2016; Quinn, 2017) and one study investigated differences in cognitive function between SNS users and non-users (Kim & Kim, 2014). All papers studied participants without a diagnosis of cognitive impairment or dementia.

1.4.6.2 Findings

Kim and Kim (2014) found a significant difference between cognitive function for SNS users and non-users, but they did not control for confounding variables (e.g. general Internet use, socio-economic status). Moreover, part of their analysis was flawed: they appeared to have used a t-test (which examines

differences) to examine the *relationship* between length of SNS use and cognition scores.

Quinn (2017) examined the effect of an SNS intervention on cognitive function relative to waitlist control. They demonstrated a beneficial effect of the intervention on processing speed and cognitive inhibition (an aspect of executive function), although only inhibition sustained improvement at follow-up. However, the use of a waitlist control group alone means that these effects cannot be attributed to the specific nature of the SNS intervention.

Myhre et al. (2016) provided stronger evidence of a link between SNS use and cognitive function, with a single aspect of executive function ('updating', defined as monitoring and refreshing of information in working memory) showing improvement following an SNS intervention. Other measures of cognitive function did not show improvement. Since Myhre et al. (2016) used a control group which underwent training in a non-social online intervention – and which demonstrated no benefit for cognitive function – this study suggests that learning to use an online social platform benefits the 'updating' aspect of executive function.

1.4.6.3 Section summary

The evidence for the relationship between SNS use and cognitive function based on this very small number of studies was mixed. There was some preliminary indication that learning how to use an SNS site had benefits for an aspect of executive function ('updating'). However, study quality was either low or medium, indicating that these findings should be interpreted with caution.

1.5 Discussion

The aim of this review was to identify, characterise and summarise existing research relating to SNS use from an older adult perspective. In this section, findings are summarised, and methodological problems, implications for future research and practice are discussed. Finally, limitations of this review are highlighted.

1.5.1 Summary of findings

1.5.1.1 *What are the characteristics of older adult SNS users?*

SNS users were more likely to be younger (early to mid-sixties), female and to have more favourable attitudes towards using the Internet. Quality of studies was either medium or high, lending some strength to findings. These findings suggest that it is important to take into account sociodemographic characteristics and technological attitudes of older adults when examining the uptake and impact of SNSs on this population (e.g. by controlling for these characteristics in analyses). Nevertheless, the small number of studies and limitations in sampling method preclude strong conclusions. It remains to be seen to what extent any differences between older adult SNS users and non-users reflect a cohort effect or developmental effect i.e. a shift in attitudes and preferences as individuals age.

1.5.1.2 *Why do older adults use or not use SNS?*

The quality of the studies in this area was variable so results should be interpreted with caution. Nevertheless, areas of consensus emerged across

diverse studies. Overall, results suggested that older adults mainly use SNSs to keep in touch with close family and friends. Using SNSs to strengthen or form new connections appeared to be less important. It is interesting to consider this finding in the context of Socio-Emotional Selectivity theory (Carstensen, 2006), which suggests that adults derive more satisfaction from a smaller number of social relationships in later life.

Concerns about privacy were a common reason for non-use of SNS, especially concerns regarding ownership of data and social privacy. While the latter could be remedied by personalised privacy settings and the way one chooses to use SNSs (e.g. private versus public messaging), the former is less easily remedied by individual user choice. Although two of the studies considered Internet use (Braun, 2013; Lüders & Brandtzaeg, 2014), it was not clear from these studies whether privacy concerns were specific to SNSs or extended to other media, such as the Internet. However, privacy concerns were not ubiquitous amongst samples, and the increasing uptake of SNSs amongst older adults suggests that such concerns are not a major deterrent (OfCom, 2016).

Many studies seemed to suggest that non-users simply perceived SNSs as unimportant for their needs and preferences. It is unclear whether this was because these individuals felt that their social, communication or information needs were being met elsewhere (e.g. through face-to-face contact, email etc.), or because they did not have the same needs or characteristics of SNS users (e.g. they might be more satisfied with their social life). The role of lack of perceived competence in deterring older adults from using SNSs was more

inconclusive, in part due to the high levels of education amongst samples (Braun, 2013; Jung et al., 2017).

1.5.1.3 What is the association between SNS use and older adults' wellbeing?

Quality of studies in this area was also variable. Overall, the impact of SNS use on social wellbeing was inconclusive, largely due to the predominance of cross-sectional data making it difficult to establish the direction of any relationship. Notably, Richter et al. (2013) found that SNS users were more socially engaged than non-users, highlighting the possibility that users' level of offline sociability accounted for any difference between social wellbeing in SNS users and non-users. Methodological and design limitations limit the conclusions that can be drawn from the intervention studies included in this review.

Given some research suggesting that simple social contact (e.g. through befriending schemes) has limited benefits for wellbeing (Sani et al., 2012; Sansoni et al., 2010), it may be that social contact accrued through SNS use is of limited benefit to wellbeing unless accompanied by the perception of social support (Fiori et al., 2006), or a sense of group belonging (Cruwys et al., 2014; Jetten et al., 2014), both putative mechanisms for the link between social relationships and wellbeing. The potential negative effect of some relationships on wellbeing (Jetten et al., 2014), also has implications for SNS use which has the potential to put users in contact with a broad network of contacts, some of which may diminish wellbeing.

An important question is whether benefits for social wellbeing accrued from SNS use is specific to SNS use or could be achieved in other ways. One study found that subjective wellbeing was not specific to SNS use as it was also associated with online shopping (van Ingen et al., 2017). This highlights the importance of considering general Internet use and wider communication practices when studying the relationship between SNS use and wellbeing.

van Ingen et al. (2017) found that SNS use reduced the impact of functional disability on wellbeing, suggesting that SNS use may be more beneficial for those with high levels of functional impairment. It is therefore possible that SNSs are more beneficial for particular groups of older adults e.g. 'older' older adults (aged 80+), adults facing high levels of social isolation and loneliness, or adults with restricted mobility (Sims, Reed, & Carr, 2017).

1.5.1.4 What is the association between SNS use and cognitive function?

Quality of studies was either low or medium. There was preliminary evidence from an intervention study that learning how to use an SNS website could have some benefit for the 'updating' aspect of executive function. Learning how to use a non-social website did not demonstrate similarly beneficial effects, suggesting that the social component of the task was important. Notably, this is at odds with two studies showing that beneficial effects on cognition following a learning task were not due to the social component of the intervention (Chan et al., 2014; Park et al., 2014).

1.5.2 Methodological problems and limitations

A large proportion (43%) of the studies considered *Facebook* use only. This reflects a general trend in the literature to focus on this SNS site (e.g. Chang, Choi, Bazarova, & Löckenhoff, 2015; Hayes, van Stolk-Cooke, & Muench, 2015; Sinclair & Grieve, 2017). This is understandable given that *Facebook* is the most popular SNS site amongst older adults (OfCom, 2016). Nevertheless, a narrow focus on *Facebook* means that the continued relevance of this literature is questionable as SNSs continues to evolve and develop.

With the exception of one study, all studies were conducted in Western countries, although English language restrictions applied in this review would have biased the papers identified. Research has indicated that cultural context encourages different types of SNS use (Lee, Kim, Golden, Kim, & Park, 2016; Vasalou, Joinson, & Courvoisier, 2010). These findings therefore do not address possible cultural differences.

All of the research presented here was based on self-report. Researchers have questioned the reliability of self-report around SNS use (Junco, 2013). In younger adults, some research has attempted to address this issue by examining SNS data directly, i.e. via access to SNS accounts (Burke & Kraut, 2016; Junco, 2013). However, this remains challenging practically and ethically and may bias the sample of participants willing to take part.

SNS use was often measured as a binary concept (use versus non-use) or in terms of time spent on SNSs. This overlooks important differences in how SNSs are used. Such differences may have implications for outcomes in wellbeing or cognitive function (Brandtzaeg, 2012; Campisi, Folan, Diehl,

Kable, & Rademeyer, 2015; Rae & Lonborg, 2015). Furthermore, the gratifications sought by media users do not necessarily map onto the gratifications gained (Katz, Blumer, & Gurevitch, 1974). For example, a user may seek closer connections with family and friends on SNSs, but not necessarily obtain them. This highlights the importance of studying outcomes as well as motives and activities on SNSs.

1.5.3 Implications for future research

Future research should consider general levels of sociability, broader communication practices (e.g. email, text messaging) and Internet use when examining the relationship between SNS use and social wellbeing or cognitive function. This will address the issue of confounding (e.g. in excluding the possibility that offline sociability accounts for any relationship between SNS use and wellbeing). It would also help to elucidate how SNS use fits into the broader context of individuals' social lives and communication practices e.g. in distinguishing between those who use SNSs to compensate for, or complement, existing social contact.

Future research on the link between SNS use and wellbeing, and cognitive function, should be considered in the context of research investigating putative mechanisms by which social relationships protect against cognitive decline and poor wellbeing. Regarding wellbeing, it may be particularly important to consider the valence and quality of social relationships accrued on SNSs, as well as the affordances brought by those connections (e.g. group identification, perception of social support), in understanding how SNS use may, or may not, benefit wellbeing. With regards to cognitive function,

it may be that a broader consideration of the structural (e.g. network size) and functional aspects (e.g. group identification) would be important in understanding how SNS use may or may not be of benefit to cognitive health.

To determine the direction of effect between SNS use and outcomes, future research should endeavour to use experimental or longitudinal designs where possible. It is also important to consider the potentially detrimental effect of SNS use on wellbeing, more commonly explored in literature on younger adults (Frison & Eggermont, 2015; Frost & Rickwood, 2017; Kross et al., 2013; Sagioglou & Greitemeyer, 2014; Teppers, Luyckx, Klimstra, & Goossens, 2014; Tromholt, 2016).

Future research should consider how characteristics of older adults (e.g. age, gender, level of social integration, functional disability, cognitive function, technological attitudes) might modify any relationship between SNS use and outcomes. Moreover, it will be important to consider how different motives for, or activities on SNSs, might moderate its impact on social wellbeing and cognitive function. Further research is also needed to isolate any active components of SNS interventions for cognition (e.g. social interaction component, learning component).

It would be important to explore how culture and socio-demographic characteristics impact on the attitudes towards, and motives for, SNS use amongst older adults. A more global examination of SNS use amongst older adults would also help to ameliorate the existing narrow focus on *Facebook*, since other SNSs sites predominate in non-Western countries. Future research should endeavour to go beyond *Facebook* in order to obtain a broader and more generalised understanding of SNS use.

Finally, future research should try and incorporate ways of maximising the reliability of self-report e.g. using measures that have undergone thorough psychometric development, avoiding measures of SNSs that have been found to be less reliable (e.g. time spent on SNSs [Junco, 2013]) or privileging actual behaviour over retrospective report where possible (e.g. Deters & Mehl, 2013; Sagioglou & Greitemeyer, 2014). Experimental studies of SNS use are helpful because research suggests that users make 'forecasting errors' when they go on SNSs, i.e. users expect to feel better when they actually feel worse (Sagioglou & Greitemeyer, 2014). Such studies have already been undertaken with young adults (Deters & Mehl, 2013; Kross et al., 2013; Sagioglou & Greitemeyer, 2014; Tromholt, 2016).

1.5.4 Implications for practice

On the basis of research identified in this review, it is not currently possible to recommend SNS use as a means to reduce social isolation and loneliness in older adults. Similarly, SNS use cannot be currently recommended as a means to improve cognitive functioning. This is not to deny the many benefits that older adults report from using SNSs, and future research using experimental and longitudinal designs may reveal beneficial effects for wellbeing and cognition from SNS use. Nevertheless, it is likely that any impact of SNS use on wellbeing or cognition will depend on how it is used. On the premise that nurturing close relationships in later life leads to higher wellbeing (Carstensen, 2006), SNS use for maintaining contact with family and close friends may indeed provide benefits. Incidentally, this was the most common motivation for using SNSs identified by this review. It is possible that SNSs are more

beneficial for older adults with particular characteristics e.g. high functional impairment, high levels of social isolation or 'older' old age (aged 80+) (Sims et al., 2017). However, the current review indicates that many older adults see SNSs as incompatible with their needs and preferences. It should therefore not be presumed that it is preferable or beneficial for all older adults, and researchers should be wary of advocating SNSs as a panacea for challenges faced in later life.

1.5.5 Limitations of the review

This review is based on a small number of studies. It includes unpublished literature since consideration of the wider literature can be helpful and illuminating in reviewing a new and emerging field such as this one (Arksey & O'Malley, 2005). Furthermore, papers with higher quality were given more weight in drawing conclusions. Nevertheless, it is acknowledged that including non-peer reviewed literature may have compromised the quality of the papers included in this review. The papers were not reviewed by an additional author owing to practical constraints. As such, quality ratings represent the subjective ratings of a single author.

This review focuses on SNS use and does not encompass Information Communication Technology or Internet use from an older adult perspective. Unfortunately, this might result in some important information being overlooked (e.g. studies in which SNSs are subsumed under the heading of Internet use). It is therefore unknown to what extent the findings in this paper are unique to SNS use or apply to other communication media.

Only papers with an average sample age of 65+ were shortlisted for this review. Obviously, this does not preclude some samples from including adults younger than 65. In addition, 'older' older adults (aged 80+) were under-represented across studies. Although there is significant heterogeneity across the older adult lifespan, 'older' older adults are likely to differ in the types of concerns and challenges from those faced by adults in their late sixties and early seventies. Very little research has been conducted on 'older' older adults specifically, probably due to the relative low uptake of SNSs amongst this age cohort.

Finally, many of the studies were conducted by a small number of research groups (Bell et al., 2013; Hutto et al., 2015; Jung & Sundar, 2016; Jung et al., 2017; Yu, Ellison, et al., 2016; Yu, McCammon, et al., 2016). Two studies appeared to have used the same set of participant data, although the dataset was analysed for different purposes (Bell et al., 2013; Hutto et al., 2015). Two studies used data from the same longitudinal dataset (Health and Retirement Study) (Yu, Ellison, et al., 2016; Yu, McCammon, et al., 2016). Jung et al. (2017) appears to have been conducted as part of a larger study (Jung & Sundar, 2016). This is indicative of the small size of the field of SNSs and older adults. More heterogeneity might emerge as research in the field of SNSs and older adults continues.

1.5.6 Conclusions

The purpose of this review was to identify, characterise and summarise existing research on SNS use from an older adult perspective. Because of the small number of papers, their variable quality, and the nature of a scoping

review, the findings presented here should not be considered as conclusive answers to research questions but rather as a guide to the current state of this emerging field. Findings from this review help to inform future directions for research. Results indicated that SNS use is a multidimensional phenomenon that needs to be understood in the context of broader communication practices, individuals' social relationships and individual preferences and characteristics. The challenge for future research is to continue to understand the nature and impact of SNS use for this population as it continues to evolve and develop with technological and social change.

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Part 2: Empirical Paper

**Development of a measure to examine social network
site use in older adults**

2.1 Abstract

2.1.1 Background/Aims

It has been suggested that Social Networking Sites (SNSs) could ameliorate social isolation and loneliness in later life. However, existing studies have not gone beyond simple conceptualisations of SNSs (e.g. use versus non-use). The aim of this study was to develop a psychometrically robust measure, the 'SNS Older Adults measure' (SNS-OA), of motives and affect associated with SNS use amongst older adults.

2.1.2 Methods

The 'SNS-OA measure' was developed according to measure development guidelines in three stages. First, during the initial development stage, literature reviews and consultation with the target population ($n = 9$) were conducted to identify salient themes, items were generated and the measure was submitted to a group of experts ($n = 9$) for feedback. Second, the measure was piloted ($n = 74$) and modified based on item analysis and feedback. Third, the measure was evaluated empirically in a large-scale study ($n = 263$) to establish psychometric properties, including factor structure, internal consistency and convergent validity.

2.1.3 Results

A factor analysis indicated that the final measure comprised five subscales, interpreted as three motive scales (using SNSs to maintain close ties, maintain and strengthen weaker ties and diversion) and two affect scales (positive and negative affect). The measure demonstrated good reliability (internal consistency and test-retest), and some convergent validity with the Mini-

International Personality Item Pool scale (Mini-IPIP). No correlations were observed between the measure and a social isolation index or loneliness scale (UCLA – Revised). However, the measure had several limitations, the most important being that items were not strongly endorsed by participants.

2.1.4 Conclusions

The development of the ‘SNS-OA measure’ was an attempt to obtain a more nuanced picture of SNS use in older adults. Despite the limitations of the measure, this was an important first step towards a more detailed understanding of SNS use in older adults and may have implications for future investigations of the complex relationship between loneliness or isolation and SNS use in older adults.

2.2 Introduction

2.2.1 Social networking sites and loneliness

Traditionally used by younger populations, Social Networking Sites (SNSs) are now being widely adopted by older adults (here considered as adults aged 65+). Approximately 30% of adults aged 65+ used SNSs in 2015, an increase of 19% from 2010 (OfCom, 2016). SNSs have been defined in the following way: (1) they are built on Web 2.0⁴; (2) they are underpinned by user-generated content; (3) users create profiles designed and maintained by the site; and (4) they facilitate the development of online connections to other individuals and/or groups (Obar & Wildman, 2015). Examples include *Facebook*, *Twitter* and *WhatsApp*. However, defining SNS can be challenging because of the rapidly evolving nature of technology and blurred boundaries between SNS and other communication platforms (e.g. email, text messaging). Because of their accessibility, convenience and potential for overcoming spatial barriers to connecting with others, it has been argued that SNSs could play a part in reducing social isolation and loneliness in older adults (Campos et al., 2016; Coelho, Rito, & Duarte, 2017).

2.2.2 Social isolation and loneliness

Social relationships are important for wellbeing and health (Umberson & Montez, 2010). In later life, events such as physical morbidity and bereavement can lead to increased risk for social isolation and loneliness (Victor, Scambler, Bowling, & Bond, 2005). Loneliness has been defined as an

⁴ Characterised by the change from static web pages to user-generated, and dynamic content.

unpleasant, subjective state related to unfulfilled social and emotional needs (Perlman & Peplau, 1981). In contrast, social isolation is an objective measure of the size of one's social network and degree of social contact (Steptoe, Shankar, Demakakos, & Wardle, 2013). Research has indicated that loneliness and social isolation may be risk factors for mortality (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015), cognitive decline (Boss, Kang, & Branson, 2015), Alzheimer's disease (Holwerda et al., 2012; Wilson et al., 2007), depression (Golden et al., 2009), cardiovascular disease, and stroke (Valtorta, Kanaan, Gilbody, Ronzi, & Hanratty, 2016).

Mechanisms by which social relationships influence health and wellbeing are debated. Regarding cognitive function, studies have found that both structural aspects of a person's social network, for example the size and frequency of social contact, participation in groups, number of social roles (Crooks, Lubben, Petitti, Little & Chiu, 2008; Ellwardt, Van Tilburg & Aartsen, 2010; Haslam, Cruwys & Haslam, 2014), and functional aspects, such as reciprocity and satisfaction in social interactions, feeling understood, social support and group identification (Amieva, Stoykova, Matharan, Helmer, Antonucci & Dartigues, 2010; Haslam, Cruwys, Milne, Kan & Haslam, 2016; Marioni et al., 2015; Pillemer & Holtzer, 2016), are associated with reduced risk of cognitive decline. With regards to psychological wellbeing, studies have focused to a greater extent on the functional aspects of social relationships, with social support (the extent to which one feels cared for) (Fiori, Antonucci & Cortina, 2006), the provision of tangible benefits and resources (Cohen & Wills, 1985), reduced stress (Cacioppo & Patrick, 2008), and a sense of group belonging (Cruwys et al., 2014), amongst others, being identified as potential

means by which social relationships influence wellbeing. However, structural aspects e.g. the diversity of social networks may also play a role (Fiori et al. 2006; Murayama et al., 2013).

Although loneliness exists across the lifespan, 5-15% of adults aged 65+ report 'frequent' loneliness and 20-40% report 'occasional' loneliness. Amongst adults aged 80+, loneliness rates increase, with 40-50% of adults in this age group saying they were 'often' lonely (Dykstra, 2009; Pinquart & Sorensen, 2001). The higher prevalence of loneliness for adults aged 80+ may be due to increased risk of functional impairment and bereavement at this stage of life (Luhmann & Hawkley, 2016).

2.2.3 Interventions to reduce social isolation and loneliness

Meta-analyses have revealed small effect sizes for psychosocial interventions designed to reduce social isolation and loneliness, with greater effectiveness associated with delivery in a group format, a support or educational component, being participatory, and being targeted at specific groups (e.g. individuals high in social isolation and loneliness) (Cattan, White, Bond, & Learmouth, 2005; Masi, Chen, Hawkley, & Cacioppo, 2011).

In the digital age, interventions designed to increase participation in computer and Internet based activities as a means of reducing loneliness and social isolation in older adults have been developed. Evidence for the effectiveness of such interventions is mixed (Chen & Schulz, 2016; Chipps, Jarvis, & Ramlall, 2017; Choi, Kong, & Jung, 2012; Larsson, Padyab, Larsson-Lund, & Nilsson, 2016). However, a lack of methodological rigour across studies (Chipps et al., 2017), and the heterogeneous nature of computer and

Internet based interventions suggest more research is needed to understand the role of such media in older adults' social wellbeing. Here, 'social wellbeing' is used as an umbrella term for social isolation and loneliness.

2.2.4 SNS, social wellbeing and personality

The vast majority of research on the association between social wellbeing and SNS use has been conducted in adolescent and young adult populations and has demonstrated mixed outcomes for wellbeing (e.g. Deters & Mehl, 2013; Kross et al., 2013). A number of studies have examined how different types of, and motives for SNS use, moderate its impact on wellbeing. This research has suggested that 'active'⁵ use of SNSs, and use of SNSs to maintain friendships and socialise, improves social wellbeing, while passive use and using it to make new friends diminishes it (Brandtzaeg, 2012; Frison & Eggermont, 2016; Rae & Lonborg, 2015; Yang & Brown, 2013).

In older adults, a small number of studies have explored the impact of SNS use on wellbeing (Aarts, Peek, & Wouters, 2014; Ballantyne, Trenwith, Zubrinich, & Corlis, 2010; Myhre, Mehl, & Glisky, 2016; van Ingen, Rains, & Wright, 2017; Yu, McCammon, Ellison, & Langa, 2016). As well as being limited by the preponderance of cross-sectional data and lack of control for confounding variables, the question of how different types of SNS use might differentially affect wellbeing in later life remains largely unexplored. Only one study seems to explore this question: Hutto et al. (2015) found that 'directed

⁵ Active behaviour constitutes contributing to activity and relationships on SNS e.g. content creation, online chatting (Chen et al., 2014).

communication', as opposed to 'passive consumption' was associated with increased social satisfaction. In addition, a study on Internet use suggested that use of the Internet for communication, but not information or commercial reasons, was associated with lower loneliness amongst older adults (Sum, Mathews, Hughes, & Campbell, 2008).

There is a small body of research demonstrating a link between personality and different motives for SNS use, Internet use and social engagement. For example, using SNS or the Internet for socialising has been found to correlate with extraversion, neuroticism, intellect (similar to 'openness to experience') and sociability, and conscientiousness has been found to correlate negatively with use of SNSs for self-presentation and entertainment (Hughes, Rowe, Batey, & Lee, 2012; Liu & Campbell, 2017; Ross et al., 2009; Seidman, 2013; Tosun & Lajunen, 2010). Most of this research has been conducted in younger adults. In older adults, there is some research demonstrating a link between agreeableness and social engagement (Lodi-Smith & Roberts, 2012), suggesting that individual high in agreeableness may use SNSs to maintain their relationships.

2.2.5 SNS, affect and personality

Affect has also been highlighted as important in understanding SNS use and its relationship to social wellbeing. For example, SNS use can have a detrimental impact on affective wellbeing in younger adults (de Vries, Möller, Wieringa, Eigenraam, & Hamelink, 2017; Kross et al., 2013; Sagioglou & Greitemeyer, 2014; Verduyn et al., 2015). 'Negative' feelings (sadness, stress,

anger) and 'positive' feelings (happiness) during SNS use are differentially associated with self-reported quality of life (Campisi, Folan, Diehl, Kable, & Rademeyer, 2015), and research has demonstrated an association between affect and loneliness (Buz, Pérez-Arechaederra, Fernández-Pulido, & Urchaga, 2015; Russell, Peplau, & Cutrona, 1980).

Studies of personality and affect in older adults have also indicated that individuals high in extraversion, conscientiousness, intellect and agreeableness experience higher levels of positive affect, in contrast to individuals high in neuroticism who experience higher levels of negative affect (Hillerås, Jorm, Herlitz, & Winblad, 1998; Kahlbaugh & Huffman, 2017).

2.2.6 SNS measures

Research has suggested that it is important to consider how different types of motives for, or affective response to, SNS use may differentially affect wellbeing. To better study SNS use, many studies have developed measures. However, the majority have been developed to gauge researchers' construct of interest without consideration of their psychometric properties (e.g. Ellison, Steinfield, & Lampe, 2007; Frison & Eggermont, 2016; Rae & Lonborg, 2015; Yang & Brown, 2013). This has been highlighted as a general limitation of research in cyberpsychology, attributed to the field being in its infancy and the fast-paced nature of technological change (Howard & Jayne, 2015). From those measures having undergone more systematic psychometric development, two could be identified that considered motives regarding SNSs.

Topaloglu, Caldibi, and Oge (2016) developed a scale to examine the use, purpose and preferences of young adults regarding SNSs. However, the

scale does not distinguish between different motives for SNS use and there was a lack of thorough scale development and psychometric analyses. Bodroža and Jovanović (2016) developed a scale to examine psychosocial aspects of *Facebook* amongst younger and middle-aged adults. This scale underwent fairly thorough development and psychometric analyses. However, the target construct was broader than motives alone and the scale was developed for *Facebook* use only.

In summary, existing measures of SNS use are limited by a lack of thorough scale development, a narrow focus on younger adult populations and a single SNS, *Facebook*. Given the evolving nature of technology, research going beyond *Facebook* use is warranted.

2.2.7 Study aim

To obtain a better understanding of SNS use and its relationship to social wellbeing, valid and reliable measures are needed. Therefore, the aim of this research was to develop a psychometrically robust measure. Termed the 'SNS Older Adults Measure' (SNS-OA), it measures motives for SNS use and affect associated with SNS use in older adults. To establish the psychometric properties of the measure, analyses exploring its factor structure, convergent validity, internal consistency and test-retest reliability were conducted. In addition, preliminary analyses of the measure's relationship to loneliness and social isolation were carried out.

2.3 Method

2.3.1 Overview

This study was performed in collaboration with The Platform for Research Online investigating Cognition and Genetics in Aging (PROTECT), an online cohort study for the study of healthy brain ageing in adults aged 50+ (Huntley et al., 2018; Wesnes et al., 2017). Participant sampling, administration, programming and data extraction were conducted by the PROTECT team, in consultation with the author. Participants aged 65+ and who had indicated that they used SNS in an earlier questionnaire ($n = 2,884$) were eligible to take part in the current study (both pilot and empirical study). From this sample, participants were randomly selected by sorting participants according to their 7-digit ID number in *Excel*. Participants completed all questionnaires online. The remit of the study was covered by existing ethical approval for the PROTECT study (reference number: 13/LO/1578, London Bridge NHS Research Ethics Committee). Additional ethical approval for a focus group was provided by the UCL Ethics Committee (reference number: CEHP_2017_558). Ethical approval, study materials, additional pilot data, the complete questionnaire (empirical study), and an overview of all items during the development process can be found in Appendices 1-5.

An overview of the measure development process can be found in Figure 1. The development of the measure was informed by guidelines from DeVellis (2003) and is described here in three stages: (1) initial development; (2) pilot study; and (3) empirical evaluation.

2.3.2 *Initial Development*

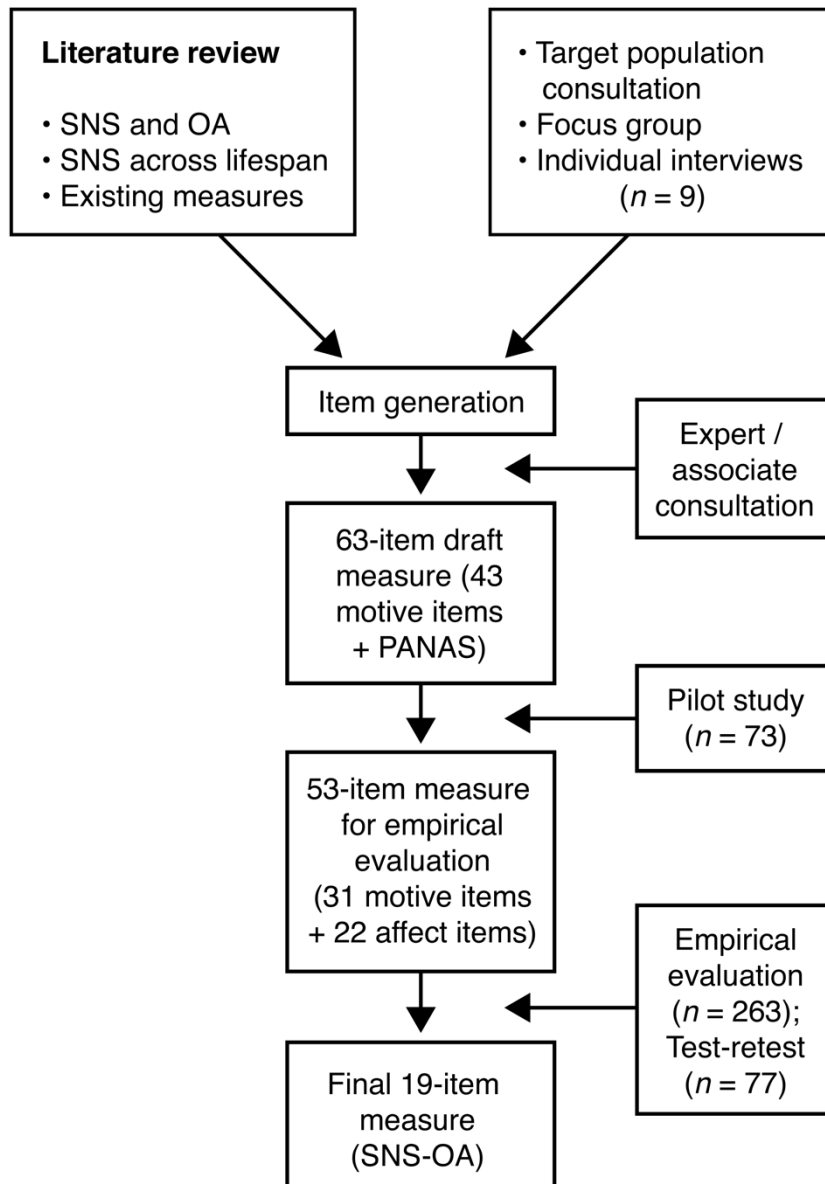
2.3.2.1 *Literature search*

A literature search was performed of SNS use from an older adult perspective (aged 65+), encompassing motives for SNS use amongst older adults (see Part 1: Literature Review). In addition, published and unpublished literature on motives for SNS use and existing SNS measures was reviewed to compile additional motives for SNS use. Literature was identified using electronic databases (PsycInfo and Google Scholar) with relevant keywords (e.g. 'social media', 'social networking sites', 'motives', 'uses') and by searching the references of relevant articles. Literature focusing on younger and middle-aged adults was included to ensure adequate content coverage at this stage.

2.3.2.2 *Consultation with target population*

Consultation with older adult SNS users (aged 65+) was conducted to canvas motives, attitudes and affect pertaining to SNS use. First, a 1.5-hour focus group was conducted with four participants. Recruitment for the focus group was conducted via posters displayed in public places and via *University of the Third Age* (lifelong learning organisation). Second, using a stratified random sampling technique to ensure representation of adults from across the older age lifespan, five participants from the PROTECT study took part in a telephone interview.

Figure 1: Overview of measure development process.



2.3.2.3 Item generation and choice of format

On the basis of the literature review and consultation, motives for SNS use were compiled and grouped into themes. For example, the items 'to find old friends', 'to communicate with casual acquaintances', 'to get in touch with people I would lose contact with otherwise' (amongst others) were considered to reflect a general motive to maintain and strengthen links with weaker ties. If items generated from the consultation stage and literature review were

considered to be too similar, an item was omitted. The item with wording generated by the target group or older adult literature was preferred. Consultation with colleagues and acquaintances also took place to refine themes and generate additional items where content coverage was judged to be insufficient. Item generation was over-inclusive owing to the number of items usually lost during the measure development process (Clark & Watson, 1995). As the result of this stage, a draft measure with seven provisional motive themes or subscales was generated; provisional because it was intended that the measure's structure would be determined by data-driven methods (i.e. Exploratory Factor Analysis – section 2.4.3.4), as well as by theory. The order in which items were presented (i.e. across subscales) was randomised. A 5-point Likert scale response ranging from 0-4 (*not at all, a little, moderately, quite a bit, very much*) was selected because it was appropriate for both the motives and affect sections of the scale, thereby reducing load on participants. A more commonly used response format, 'agree-disagree', was not selected on the basis of research indicating it evokes an acquiescence response bias (Kuru & Pasek, 2016).

2.3.2.4 Expert and informal consultation

Nine researchers from the field of SNSs, older adults and SNS measure development (36% of total number of researchers contacted) commented on the content, relevance and wording of the draft measure (see Appendix 2 for email). In addition, informal consultation with family and friends of the author (including adults aged 60+) was conducted to ensure the clarity and readability of the items.

2.3.3 *Pilot study*

A random sample of 90 participants from the PROTECT study were invited by email to complete the pilot measure (from participants aged 65+, who had indicated they used SNSs from an earlier questionnaire). Data collection took place over a two-week period (October 2017).

In addition to the draft measure, participants completed basic questions about their SNS use (i.e. SNSs used, frequency of use, duration of use, composition of online network), drawn from the literature (Aarts et al., 2014; Ellison et al., 2007; OfCom, 2016). Participants were also given free text space at the end of the measure and asked to provide comments on the content, relevance and wording of the measure to further improve content validity.

2.3.3.1 *Pilot study: Analytic plan*

Item variance and item means were examined, since it is desirable for items to have relatively high variance and for item means to be close to the centre of the range (DeVellis, 2003). For item reduction purposes, items with a standard deviation (SD) < 0.4 were excluded (Schepers, Orrell, Shanahan, & Spector, 2012). Items to which >60% of participants responded 'not at all' were excluded as they were considered to lack content validity (Spector, Hebditch, Stoner, & Gibbor, 2016). Cronbach α coefficients (a measure of internal consistency) and corrected item-scale correlations (item correlation with other subscale items, *excluding* itself) were inspected for individual subscales. According to Terwee et al. (2007), acceptable Cronbach α ranges from 0.7 to

0.95. Items with corrected item-scale correlations of < 0.3 should be excluded (Open University, 2018).

In response to qualitative feedback from participants that items were repetitive, associates of the author ($n = 5$) were asked to rate the similarity of items within subscales. An item was excluded if at least three respondents rated two items as highly similar. The item with the smallest value for *Cronbach α if item deleted* was retained (indicating a better fit with the target construct).

2.3.4 Empirical study

2.3.4.1 *Participants*

A random sample of 290 PROTECT participants were invited by email to take part in the main study (from participants aged 65+, who had indicated they used SNSs from an earlier questionnaire, excluding pilot participants). Data collection took place over a one-month period (February 2018). To assess test-retest reliability, 90 respondents were randomly selected and invited by email to complete the main measure one week later.

2.3.4.2 *Measures*

Alongside the 'SNS-OA' measure, the following measures were included.

2.3.4.2.1 Internet and SNS use

Two questions regarding participants' Internet use (frequency and purpose of use) were adopted from the English Longitudinal Study of Ageing (ELSA;

personal communication). As in the pilot, five questions regarding participants' SNS use were administered (section 2.3.3).

2.3.4.2.2 The Mini-IPIP

The Mini-International Personality Item Pool scale (Mini IPIP; Donnellan, Oswald, Baird, & Lucas, 2006) is a 20-item scale measuring the 'Big Five' factor model of personality (extraversion, neuroticism, agreeableness, conscientiousness and intellect⁶) and was used for the purpose of assessing convergent validity. Respondents rated how much each item described them on a 5-point Likert scale, ranging from '*very inaccurate*' to '*very accurate*', with possible scores ranging from 4 to 20 on each subscale. The Mini-IPIP was selected because it has acceptable reliability and validity, and is brief and freely available (Cooper, Smillie, & Corr, 2010; Donnellan et al., 2006). Although the Mini-IPIP has not been validated in an older adult sample, it has been observed to correlate with other 'Big Five' measures of personality used in studies with older adults (Donnellan et al., 2006). This suggests that psychometric properties of the Mini-IPIP may be acceptable for this population (Costa & McCrae, 1988; Lucas & Donnellan, 2011).

2.3.4.2.3 Sociability Scale

The Cheek & Buss (1981) Sociability Scale was used to measure sociability for the purpose of convergent validity. Sociability is preference for affiliation or need to be with people, and is associated with using SNSs for social and

⁶ Intellect is similar to 'openness to experience' used by other personality measures (Costa & McCrae, 1988; John & Srivastava, 1999).

informational use (Hughes et al., 2012). Respondents rated how much each item described them on a 5-point Likert scale ranging from 'very *inaccurate*' to 'very *accurate*', with possible scores ranging from 0 to 20. The sociability scale has adequate psychometric properties (Bruch, Gorsky, Collins, & Berger, 1989; Cheek & Buss, 1981), but is yet to be assessed within an older adult population.

2.3.4.2.4 University of California, Los Angeles Loneliness Scale (UCLA Loneliness Scale)

The 20-item UCLA Loneliness scale (Version 3) was used to measure loneliness (Russell, 1996). Respondents rated how often they felt alone or isolated on a 4-point Likert scale ranging from 'never' to 'often'. Possible scores ranged from 20 to 80. It has good psychometric properties and has been validated in older adult populations (Russell, 1996).

2.3.4.2.5 Social Isolation Index

A social isolation index taken from ELSA was administered (Shankar, McMunn, Banks, & Steptoe, 2011; Steptoe et al., 2013). Participants are given a point if they are not married/cohabiting with a partner, had less than monthly contact (including face-to-face, telephone or written/e-mail contact) with children, other immediate family and friends (scored 1 respectively) and if they did not participate in any organisations, religious groups or committees. Possible scores ranged from 0-5.

2.3.4.3 *Analytic plan*

As with the pilot data, items with an SD < 0.4 and with > 60% answering 'not at all' were removed.

2.3.4.3.1 Exploratory Factor Analysis

An Exploratory Factor Analysis (EFA) is a data reduction technique to identify the factor structure of a larger set of variables. Prior to running the EFA, the data were inspected for multicollinearity by inspecting the 'determinant' of the correlation matrix (with values smaller than 0.00001 indicating multicollinearity [Field, 2013]). Sample size for EFA was checked for adequacy based on criteria by Terwee et al. (2007), recommending a sample size greater than seven multiplied by the number of items.

An EFA using the extraction method 'principal axis factoring' (PAF) was conducted on the items with oblique rotation (direct oblimin). PAF was selected because it has been recommended for non-normally distributed data, as was found in the data (Fabrigar et al. 1999). Oblique rotation was selected due to expected correlations between factors, with correlations between factors >0.3 warranting oblique rotation (Brown, 2009b). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was inspected, as well as the KMO for individual items, with acceptable values exceeding 0.5 (Kaiser, 1974; as cited in Field, 2013). Factor loadings < 0.4 were suppressed (i.e. discounted) in the EFA, based on guidance by Stevens (2002, as cited in Field, 2013) that only factor loadings explaining around 16% of the variance should be considered substantive. Both theory-driven and data driven criterion for determining how many factors to extract were considered (Brown, 2009a; Field, 2013). The

distribution (skewness and kurtosis) of total subscale scores, as determined by the EFA, were inspected. For the present sample size ($n = 263$), Kim (2013) recommends a z-score of greater than ± 3.29 as a threshold, with scores within this range considered to be normally distributed.

2.3.4.3.2 Reliability

Reliability of subscales was measured by internal consistency (Cronbach's α coefficient) and test-retest reliability (Intra-Class Correlation Coefficient or ICC). Internal consistency is an indication of the extent to which items measure the same construct (Tavakol & Dennick, 2011). The ICC reflects the degree of correlation and agreement between measures administered at separate time points. A two-way mixed effects model, with absolute agreement and single measurement, was used (Koo & Li, 2016).

2.3.4.3.3 Validity

Face, content and convergent validity were explored.

2.3.4.3.3.1 Face and content validity

Content validity specifies whether the measure adequately covers all aspects of the construct under study. Face validity considers whether the measure *appears* to measure what it is supposed to measure. Consultation with the target population and experts in the field, a literature review and feedback on the questionnaire from pilot participants were undertaken to ensure content and face validity.

2.3.4.3.3.2 Convergent validity

Convergent validity of subscales was assessed via the relationship of the 'SNS-OA measure' with related measures (Pearson r correlations). Pearson r correlations measure the strength of linear agreement between two variables, making it appropriate for the purpose of convergent validity. Pearson r correlations were deemed admissible for the present study (despite results indicating non-normally distributed data) because it has been shown that parametric tests are robust against violations of normality (particularly for large samples) and have increased power to detect effects (Norman, 2010).

To reduce the chance of Type I error from performing a large number of correlations ($n = 40$, i.e. 5 subscales correlated with personality traits, social isolation and loneliness), it was necessary to control for multiple tests. Because of the reduced power of the classical Bonferroni approach, the False Discovery Rate (FDR) was employed (Benjamini & Hochberg, 1995). Instead of controlling for the proportion of false negatives as performed by Bonferroni, this method controls for the proportion of false positives, and therefore has increased power to detect non-null results (Keselman et al., 1998). The FDR rate was set at the standard 5% ($p = 0.05$).

Personality, social isolation and loneliness measures were used to assess convergent validity. On the basis of prior research (e.g. Liu & Campbell, 2017; Hughes et al., 2012; Seidman, 2013), it was hypothesised that:

- Extraversion will be positively correlated with subscales reflecting SNS use for the purpose of maintaining close ties (e.g. family and close friends), and weaker ties (e.g. casual friends, former friends,

and acquaintances), diversion (i.e. diverting one's attention), and positive affect.

- Neuroticism will be positively correlated with all motives, and negative affect.
- Agreeableness will be positively correlated with SNS use for the purpose of maintaining close ties, and positive affect.
- Conscientiousness will be positively correlated with SNS use for the purpose of maintaining close ties, and positive affect, and negatively correlated with diversion.
- Intellect will be positively correlated with maintaining weaker ties, diversion and positive affect.
- Sociability will be positively correlated with scales reflecting SNS use for the purpose of maintaining close and weaker ties.

There is a paucity of research on how loneliness and social isolation are associated with SNS use in older adults. However, on the basis of prior research (Buz et al., 2015; Hutto et al., 2015; Morahan-Martin & Schumacher, 2003; Sum et al., 2008) it was hypothesised that loneliness would be (1) negatively correlated with use of SNSs to maintain close and weaker ties, as well as positive affect; and (2) positively correlated with SNS use for the purpose of diversion, as well as negative affect. In addition, it was hypothesised that social isolation would be negatively correlated with SNS use for the purpose of maintaining close and weaker ties.

2.4 Results

2.4.1 Initial Development

2.4.1.1 *Literature search*

The review of older adult literature suggested that older adults primarily used SNSs to maintain close ties, and to a lesser extent to maintain and strengthen weaker ties. Other reasons for SNS use included curiosity about others' lives, staying connected to younger generations and playing games (see Part 1: Literature Review). Younger adults also used SNSs for information seeking, entertainment, social surveillance, self-expression and passing the time (Ahmad, Mustafa, & Ullah, 2016; Joinson, 2008; Kwon & Wen, 2010; Sheldon, 2008; Tosun, 2012).

2.4.1.2 *Consultation with target population*

Consultation with the target population ($n = 9$; aged 66 – 89; 78% female) revealed that participants used SNSs to connect with family and friends, to be curious or 'nosy' about others' lives, to stay connected with global events, as a source of learning and pursuing interests, to unwind, out of boredom and for entertainment. Regarding affect, participants mentioned feeling anger, bewilderment, sadness, shock or irritation, as well as amusement or pleasure in response to particular content on SNS. However, in general, participants generated relatively little content regarding how they felt using SNSs.

2.4.1.3 *Item generation and choice of format*

Although the target population were asked about affect prompted by SNS use, participants generated a limited range of emotions. Therefore, based on

research using the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) to measure the emotional impact of SNS use (de Vries et al., 2017; Sagioglou & Greitemeyer, 2014), the PANAS was selected to measure SNS affective experience. The PANAS has been validated in older adults (Buz et al., 2015; Kercher, 1992), is sensitive to changes in external circumstances, and can be used with short-term and longer-term instructions (Watson et al., 1988). For the purpose of the measure, instructions were adapted to reflect SNS use.

Therefore, the draft measure consisted of motives (43 items) and affect (20 items), totalling 63 items, and consisted of seven motive subscales, reflecting SNS use for the purpose of (1) maintaining close ties; (2) forming, maintaining and strengthening weaker ties; (3) self-expression (e.g. expressing one's identity, opinions and preferences); (4) connecting to local and global events; (5) learning and pursuit of interests; (6) diversion (diverting one's attention); (7) social surveillance (passively viewing others' content, particularly that of weaker connections); and the PANAS, comprised of positive and negative affect items. The number of subscale items varied between four and nine.

2.4.1.4 Expert and informal consultation

The wording and structure of the measure was modified according to suggestions by experts and associates. For example, 'to chat' was changed 'to communicate' and two subscales were combined based on comments that certain subscales were similar. Motive items incorporated into the measure

based on suggestions by experts were interpersonal curiosity and sharing knowledge or skills with others.

2.4.2 *Pilot study*

2.4.2.1 *Participants*

A total of 74 participants completed the pilot (response rate 82%). One participant was excluded due to being younger than 65 years, resulting in a total sample size of 73. The mean age of participants was 69.1 (range 65 – 84). The majority of the sample was female (79.5%), White British (90.4%), married (61.6%), retired (89%) and educated to at least post-secondary level. See Appendix 3 for pilot descriptive statistics.

2.4.2.2 *Pilot study: Item reduction*

The initial pool of items was 63. Eight items with an SD of <0.4 and 17 items to which <60% of participants responded 'not at all' were excluded, resulting in 38 items.

Many participants indicated that items were repetitive. Excluding items rated as highly similar by associates of the author left 30 items (section 2.3.3.1). Cronbach α remained > 0.8 and < 0.95 for subscales with the exception of subscale 7 (social surveillance; $\alpha = 0.54$), as only two items remained on this scale (Tavakol & Dennick, 2011). Items on subscale 7 were retained at this stage for content coverage. All item-scale correlations for subscales remained > 0.3.

Nineteen of the remaining items had a mean of < 1.0 (scale ranges from 0 – 4). However, in order to maintain content coverage and because item-scale correlations coefficients were adequate (with 73% > 0.6, and all > 0.4), these items were retained. The wording of six items was also modified to improve clarity e.g. ‘share my knowledge or opinions’ was changed to ‘share information or ideas’.

2.4.2.3 Pilot study: feedback

In general, participants felt that the answers were relatively easy to answer (mean = 3.08, *SD* = 0.79; 0 = *very difficult*, 4 = *very easy*), enabled them to give a relatively ‘true and complete picture’ of their reasons for using SNSs (mean = 2.41, *SD* = 0.9), and to a lesser degree their affective experience of SNSs (mean = 2.1, *SD* = 1.17; 0 = *not at all*, 4 = *very much*).

Some participants expressed relating differently to *WhatsApp* than to other SNSs. This SNS was retained because only eight of the respondents in the pilot (10.9%) used *WhatsApp* alone, it was considered to have similar features to other SNSs, and for the sake of consistency with earlier PROTECT questions (for which *WhatsApp* was included as an SNS).

Many participants indicated that items were repetitive, and steps were taken to rectify this (section 2.4.2.2). On the basis of qualitative feedback, additional items were added to the measure for the empirical study (5 motive and 17 affect items). This resulted in a final measure of 53 items (31 motive items grouped under seven subscales, and 22 affect items).

2.4.3 Empirical study

2.4.3.1 *Participants*

A total of 263 participants took part in the main study (response rate 91.1%). The mean age of participants was 70.8 (range 65 – 90; $SD = 4.04$). The majority of the sample was female (80.2%), White British (93.5%), married or co-habiting (70.0%), retired (87.8%) and educated to at least secondary level (Table 1). The test-retest group yielded 77 responses (response rate 85.6%), of which 77.9% were female and the mean age was 70.8 ($SD = 4.04$).

2.4.3.2 *Internet and SNS use*

The majority (63.1% of the sample) used the Internet three or more times a day. The most popular Internet activities were email (100% of the sample), information searching (99.2%) and online shopping (93.2%) (Table 2).

Regarding SNS use, the most commonly used SNS in the last six months was *Facebook* (89%), followed by *WhatsApp* (66.2%) and *Twitter* (27%). The majority of participants (36.9%) reporting using SNSs 2-3 times a day, or for 10-30 minutes per day (39.5%). Most participants reported that family (94.3%) and friends (92.8%) made up their network on SNSs (Table 2).

Table 1. Participant characteristics for empirical study (*n* = 263).

Description	% (<i>n</i>)
Age	
Mean (range)	70.8 (65-90)
65-69	48.7% (128)
70-79	47.5% (125)
80+	3.8% (10)
Gender	
Female	80.2% (211)
Male	19.8% (52)
Marital Status	
Married/Co-habiting	70% (184)
Widowed	14.8% (39)
Separated/Divorced	11.7% (31)
Single	3.4% (9)
Ethnic Origin	
White British	93.5% (246)
White European	3% (8)
White Irish	1.5% (4)
White Non-European	0.8% (2)
Asian British: Indian	0.8% (2)
Any other Asian British background	0.4% (1)
Education Level	
Undergraduate	29.7% (78)
Vocational (e.g. Diploma)	20.9% (55)
Secondary (GCSEs)	18.3% (48)
Postgraduate	14.1% (37)
Post-Secondary (College, A-Levels)	12.2% (32)
Doctorate	4.9% (13)
Employment Status	
Retired	87.8% (231)
Self-employed	6.5% (17)
Employed (part-time)	3.4% (9)
Employed (full-time)	1.9% (5)
Unemployed	0.4% (1)

2.4.3.3 *Item properties*

The mean scale score for the 53 items was 1.00 ($SD = 0.48$). Cronbach α for the 53-item scale was 0.946, indicating marginal collinearity (Terwee et al., 2007). Analysis of item properties subsequently guided reduction of the number of items. One item with an SD of < 0.4 and ten items with $>60\%$ of participants answering 'not at all' were excluded.

Eighteen of the items had a mean of < 1.00 , indicating that participants weakly endorsed many of the items. These items were retained for the sake of content coverage, and because including skewed items does not adversely affect the reliability of scales when internal consistency is high (Enders & Bandalo, 1999). Mean scale scores for individual items retained in the final scale can be found in Table 4.

Table 2. *Internet and SNS use descriptive statistics for empirical study (n = 263).*

Description	% (n)
Frequency Internet/Email use	
< Once a month	-
1-3 times per month	-
Once a week	-
Several times a week	1.1% (3)
Once a day	6.5% (17)
2-3 times a day	29.3% (77)
> 3 times a day	63.1% (166)
Internet activities	
Sending/receiving e-mails	100% (263)
Searching for info. for learning/research/fact finding	99.2% (261)
Shopping/ buying goods or services	93.2% (245)
Use social networking sites (e.g. <i>Facebook, Twitter</i>)	88.6% (233)
Finances (banking, paying bills)	87.5% (230)
News/ newspaper/ blog websites	65.4% (172)
Streaming/downloading live or on demand TV/radio	55.5% (146)
Games	41.1% (108)
Telephoning over the Internet/video calls (via webcam)	38.8% (102)
Creating, uploading or sharing content (e.g. Youtube)	17.1% (45)
Selling goods or services over the Internet	13.3% (35)
Other	12.9% (34)
Looking for a job or sending a job application	2.7% (7)
SNS used last 6 months	
Facebook	89% (234)
WhatsApp	66.2% (174)
Twitter	27% (71)
Instagram	17.5% (46)
LinkedIn	12.9% (34)
Other	3% (8)
Snapchat	1.9% (5)
Tumblr	1.9% (5)
Quora	-

Table 2 (continued)

Description	% (n)
Main SNS used	
Facebook	67.7% (178)
WhatsApp	27% (71)
Twitter	3.4% (9)
Other	1.5% (4)
Instagram	0.4% (1)
Frequency social media use	
< Once a month	0% (0)
1-3 times per month	0.8% (2)
Once a week	1.9% (5)
Several times a week	16% (42)
Once a day	21.7% (57)
2-3 times a day	36.9% (97)
> 3 times a day	22.8% (60)
Average time spent on SNSs per day	
< 10 minutes	33.5% (88)
10-30 minutes	39.5% (104)
31-60 minutes	13.3% (35)
1-2 hours	8% (21)
2-3 hours	3.4% (9)
>3 hours	2.3% (6)
Connections on SNS	
Family	94.3% (248)
Friends	92.8% (244)
Group members	53.6% (141)
Colleagues	47.5% (125)
Acquaintances	41.1% (108)
People never met	16% (42)
Other	2.3% (6)

2.4.3.4 Factor structure (Exploratory Factor Analysis)

The determinant for the correlation matrix of 42 variables was < 0.00001 , indicating a problem with collinearity. As recommended by Field (2013), an exploratory strategy was used to inspect the variables that were problematic. By removing variables with more than 12 correlations > 0.4 ($n = 19$) multicollinearity was satisfactorily removed from the dataset. The resulting 23 items were entered into an EFA.

Based on Kaiser's criterion, the EFA identified six factors (factors with Eigenvalues greater than 1). However, the average communality (proportion of common variance within a variable) after extraction was < 0.6 , contraindicating use of Kaiser's criterion (Field, 2013). The scree plot suggested retention of two factors (a graph plotting each factor against its associated eigenvalue, demonstrating the relative importance of each factor). Based on criteria for retaining 'non-trivial' factors (those with a greater than three loadings of > 0.3) (Brown, 2009a), five factors were retained, since this number of factors made better theoretical sense than two factors.

Correlations between factors exceeded 0.3, warranting oblique rotation. The sample size was adequate ($7 \times 23 = 161$). The KMO measure of sampling adequacy, as well as all KMO values for individual items, exceeded the acceptable limit of 0.5, with the majority being greater than 0.8.

The five-factor solution after rotation accounted for 49.5% of the variance (Table 3). Since variables that loaded < 0.4 were suppressed, the final scale consisted of 19 items. The items that clustered on the same factor suggested that factor 1 represented 'maintain close ties', factor 2 represented

'maintain or strengthen weaker ties', factor 3 represented 'diversion', factor 4 represented 'positive affect' and factor 5 represented 'negative affect'.

2.4.3.5 Refined measure properties

The final 19-item scale had an overall mean *scale* score of 1.21 ($SD = 0.51$). The mean scale score of subscale 1 (maintain close ties; mean = 1.97, $SD = 0.87$), and subscale 4 (positive affect; mean = 1.37, $SD = 0.85$), was close to the centre of the range (2, on a scale of 0 – 4). The mean scale score of subscale 2 (maintain and strengthen weaker ties; mean 0.92, $SD = 0.66$); subscale 3 (diversion; mean = 0.72, $SD = 0.72$); and subscale 5 (negative affect, mean = 0.77, $SD = 0.76$) were all less than 1.00 (Table 4).

Mean *total* scores on subscales were also calculated. For subscale 1 (maintain close ties), scores spanned the range of possible scores (0 – 20), and the mean total score was close to the centre of the range (mean = 9.86, $SD = 4.36$). This was similar for subscale 4 (positive affect; mean = 4.13, $SD = 2.54$), with scores ranging from 0 – 11 (from a possible range of 0 – 12). Remaining subscales did not demonstrate mean total scores within the centre of the range, although scores generally spanned the possible range: The mean total score for subscale 2 (maintain and strengthen weaker ties) was 4.61 ($SD = 3.32$), with scores ranging from 0 – 19 (possible range, 0 – 20). The mean total score on subscale 4 (diversion) was 2.89 ($SD = 2.88$), ranging from 0 – 15 (possible range, 0 – 16). Finally, on subscale 5 (negative affect), scores spanned the range of possible scores (0 – 8), and the mean total score on this subscale was 1.54 ($SD = 1.52$) (Table 4).

Table 3. Summary of the exploratory factor analysis for the SNS measure.

Item	Item description	Rotated Factor Loadings				
		1	2	3	4	5
1	To look at family or good friends' photos	0.574	0.216	0.013	0.083	-0.016
2	To share my news with family and good friends	0.78	-0.088	0.008	-0.024	0.005
3	To know what family or good friends are up to	0.548	0.151	-0.042	-0.042	0.006
4	To share things (e.g. articles, photos) with family or good friends	0.682	-0.127	0.177	-0.023	0.05
5	To keep in touch with family or good friends	0.775	-0.051	-0.063	-0.066	-0.106
6	To communicate with people I haven't seen in a while	0.338	0.429	0.005	-0.023	-0.037
7	To stay connected with current or former work colleagues	0.066	0.634	0.015	0.039	-0.09
8	To reconnect with people I've lost contact with	0.012	0.683	0.052	-0.107	0.114
9	To browse around people I used to know	-0.12	0.785	0.013	-0.084	0.051
10	To check out the posts (e.g. photos, links, notes) of people I used to know	-0.013	0.752	0.03	0.038	0.041
11	To pass the time when I'm bored	0.017	-0.036	0.775	0.042	0.037
12	To relax or unwind	-0.03	0.009	0.784	-0.014	-0.053
13	To keep myself occupied	-0.067	-0.024	0.938	0.024	-0.013
14	To update my profile and or status	0.107	0.152	0.414	-0.047	-0.069
15	I feel alert when I use social media	-0.027	-0.011	-0.022	-0.85	0.011
16	I feel attentive when I use social media	0.008	-0.053	-0.075	-0.881	-0.102
17	I feel enriched when I use social media	0.14	0.069	0.131	-0.552	-0.213
18	I feel irritated when I use social media	0.008	-0.048	-0.011	0.047	0.619
19	I feel ambivalent when I use social media	-0.065	0.035	-0.06	0.073	0.571
20	To keep up with changes in the way people communicate	0.262	0.226	0.095	-0.104	0.212
21	To connect with the local community	0.09	0.165	0.149	-0.145	0.334
22	To get information or answers to my questions	0.249	-0.013	0.164	-0.183	0.193
23	I feel amazed when I use social media	-0.019	0.16	0.106	-0.369	0.162
Eigenvalue		6.71	2.29	1.83	1.60	1.29
% of variance		29.21	9.95	7.95	6.95	5.61

Notes:

Factor loadings over .40 appear in bold.

Factors were interpreted as: 1 = maintain close ties; 2 = maintain and strengthen weaker ties; 3 = diversion; 4 = positive affect; 5 = negative affect.

Using criteria from Kim (2013), where z-scores within ± 3.29 are considered normally distributed, subscale 1 (maintain close ties) and subscale 4 (positive affect) were normally distributed. Remaining subscales were positively skewed and leptokurtic (peaked) (Table 4).

2.4.3.6 Reliability Analysis

2.4.3.6.1 Internal consistency

The final 19-item scale had a Cronbach α of 0.854. Internal consistency for all subscales, with the exception of subscale 5 (negative affect), was good, with Cronbach α ranging from 0.81 – 0.82. Cronbach α for subscale 5 was 0., indicating inadequate internal consistency (Table 5). All corrected item-total correlations exceeded 0.3, indicating good fit with the scale.

2.4.3.6.2 Test-retest reliability

The ICC for all items ($n = 53$) was 0.85 ($F(76,76) = 12.32, p = 0.000, 95\% \text{ CI: } 0.77 \text{ to } 0.90$), indicating 'good to excellent' reliability (Koo & Li, 2016). The ICC for the final 19-item measure was 0.82 ($F(76, 76) = 10, p = 0.000, 95\% \text{ CI: } 0.73 \text{ to } 0.88$), indicating 'moderate to good' reliability. ICCs for individual subscales were 'moderate to good' (Table 5).

Table 4. *Item and subscale characteristics for the final 19-item scale.*

Item	Subscale	Item description ^a	Item mean (SD) ^a	Subscale mean (SD) ^b	Mean total score (SD) ^c	Skew (z)	Kurtosis (z)
1	1. Maintain close ties	To look at family or good friends' photos	2.27 (1.12)	1.97 (0.87)	9.86 (4.36)	2.11	-2.00
2		To share my news with family and good friends	1.71 (1.18)				
3		To know what family or good friends are up to	2.06 (1.16)				
4		To share things (e.g. articles, photos) with family or good friends	1.68 (1.13)				
5		To keep in touch with family or good friends	2.14 (1.12)				
6	2. Maintain, strengthen weaker ties	To communicate with people I haven't seen in a while	1.72 (1.06)	0.92 (0.66)	4.61 (3.32)	8.65	8.36
7		To stay connected with current or former work colleagues	1.03 (0.97)				
8		To reconnect with people I've lost contact with	0.70 (0.80)				
9		To browse around people I used to know	0.50 (0.70)				
10		To check out the posts (e.g. photos...) of people I used to know	0.65 (0.80)				
11	3. Diversion	To pass the time when I'm bored	0.87 (1.00)	0.72 (0.72)	2.89 (2.88)	8.79	6.43
12		To relax or unwind	0.89 (1.03)				
13		To keep myself occupied	0.64 (0.86)				
14		To update my profile and or status	0.48 (0.64)				
15	4. Positive affect	I feel alert when I use social media	1.59 (1.00)	1.37 (0.85)	4.13 (2.54)	2.90	-1.42
16		I feel attentive when I use social media	1.49 (0.98)				
17		I feel enriched when I use social media	1.04 (0.98)				
18	5. Negative affect	I feel irritated when I use social media ^f	0.70 (0.91)	0.77 (0.76)	1.54 (1.52)	8.21	6.11
19		I feel ambivalent when I use social media ^f	0.83 (0.90)				

Notes: a = Individual item scale score, ranging from 0 – 4 ('not at all' to 'very much'). b = mean *scale* score on subscale, ranging from 0 – 4. c = mean *sum* of scores on a subscale. Possible total scores range are as follows: subscale 1 (0 – 20), subscale 2 (0 – 20), subscale 3 (0 – 16), subscale 4 (0 – 12), subscale 5 (0 – 8).

Table 5. Reliability statistics for the 19-item final scale.

Item	Subscale	Item description ^a	Subscale alpha ^b	Alpha ^b if item deleted	Item-total correlation ^c	Subscale ICC ^d (95% CI)
1	1. Maintain close ties	To look at family or good friends' photos	0.82	0.80	0.59	0.75 (0.63 - 0.83)
2		To share my news with family and good friends		0.78	0.65	
3		To know what family or good friends are up to		0.80	0.56	
4		To share things (e.g. articles, photos) with family or good friends		0.79	0.61	
5		To keep in touch with family or good friends		0.77	0.67	
6	2. Maintain & strengthen weaker ties	To communicate with people I haven't seen in a while	0.81	0.81	0.52	0.81 (0.72 - .088)
7		To stay connected with current or former work colleagues		0.78	0.59	
8		To reconnect with people I've lost contact with		0.75	0.69	
9		To browse around people I used to know		0.77	0.66	
10		To check out the posts (e.g. photos...) of people I used to know		0.77	0.62	
11	3. Diversion	To pass the time when I'm bored	0.82	0.76	0.69	0.79 (0.69 - 0.86)
12		To relax or unwind		0.75	0.70	
13		To keep myself occupied		0.71	0.78	
14		To update my profile and or status		0.85	0.45	
15	4. Positive affect	I feel alert when I use social media	0.82	0.72	0.71	0.74 (0.61 - 0.83)
16		I feel attentive when I use social media		0.69	0.75	
17		I feel enriched when I use social media		0.85	0.59	
18	5. Negative affect	I feel irritated when I use social media ^e	0.59	.	0.42	0.65 (0.50 - 0.76)
19		I feel ambivalent when I use social media ^e		.	0.42	

Notes:

a = Motive items (items 1 – 15) were prefixed with 'I use social media...'. b = Cronbach's alpha coefficient (internal consistency). c = Corrected (correlation of item with other subscale items, *excluding* itself). d = Intraclass Correlation Coefficient (test-retest reliability). ICC < 0.5 = poor; 0.5 – 0.75 = moderate; 0.75 – 0.9 = good; >0.9 = excellent (Koo & Li, 2016). e = as only two items on the subscale, α if item deleted not applicable.

2.4.3.7 Validity

2.4.3.7.1 Convergent validity

2.4.3.7.1.1 Personality

Descriptive statistics for personality measures can be found in Table 6. Internal consistency for the Mini-IPIP personality subscales ranged from poor to very good (sociability $\alpha = 0.82$; extraversion $\alpha = 0.81$; agreeableness $\alpha = 0.60$; conscientiousness $\alpha = 0.67$; neuroticism $\alpha = 0.70$; intellect $\alpha = 0.64$), probably indicative of the short length of the scales (each having four items).

Results for Pearson r correlations are displayed in Table 7. Significant results with and without FDR correction are reported. The hypothesis that using SNSs to maintain close ties would be correlated with extraversion was supported in corrected analyses ($r = 0.206$, $p = 0.001$). The hypothesis that positive affect would correlate with agreeableness ($r = 0.179$, $p = 0.004$) and intellect ($r = 0.222$, $p = 0.000$) was supported in corrected analyses. There was also a negative correlation between negative affect and conscientiousness ($r = -0.194$, $p = 0.002$) after correction.

The following hypotheses gained support only in analyses without FDR correction: an association between using SNSs to maintain close ties and sociability ($r = 0.150$, $p = .015$), as well as agreeableness ($r = 0.130$, $p = 0.036$); and an association between using SNSs to maintain and strengthen weaker ties and extraversion ($r = 0.123$, $p = 0.047$). All effect sizes (R^2) were small (< 0.1). No other hypotheses regarding personality were supported (section 2.3.4.3.3.2).

Table 6. Descriptive statistics for personality traits, social isolation and loneliness.

Measure	Mean (SD)
Social Isolation	
All	0.9 (0.95)
Male	0.7 (0.81)
Female	1.0 (0.97)
Loneliness	
All	35.6 (11.1)
Male	33.6 (10.1)
Female	36.1 (11.3)
Personality	
Extraversion	12.0 (3.7)
Agreeableness	17.1 (2.3)
Conscientiousness	15.4 (3.0)
Neuroticism	9.6 (3.2)
Intellect	14.5 (3.1)
Sociability	13.0 (3.9)

Notes:

Social Isolation measured by the Social Isolation Index, developed by ELSA, possible scores range from 0 – 5. Loneliness measured by the UCLA (Version 3), possible scores range from 20 – 80. Personality traits measured by the Mini-IPIP, possible scores range from 4 – 20. Sociability measured by the sociability scale, possible scores range from 0 – 20. For all measures, higher scores reflect higher endorsement of the construct. For loneliness and social isolation, statistics are also reported by gender, since research suggests gender is important.

2.4.3.7.1.2 Social wellbeing

Descriptive statistics for social isolation and loneliness can be found in Table 6. The mean social isolation score was 0.9 ($SD = 0.95$) and the mean loneliness score was 35.6 ($SD = 11.1$), with females scoring slightly higher than males. Internal consistency was very good for the for the UCLA scale ($\alpha = 0.947$), although approaching multicollinearity.

The hypothesis that negative affect would correlate positively with loneliness was only supported in uncorrected analyses ($r = 0.159$, $p = 0.010$).

Unexpectedly, positive affect correlated with social isolation in uncorrected analyses ($r = 0.148$, $p = 0.017$). All effect sizes (R^2) were small (< 0.1).

2.4.3.8 Content and Face validity

Overall, participants felt that the answers were relatively easy to answer (mean = 2.75, $SD = 0.85$; 0 = *very difficult*, 4 = *very easy*). In general, they indicated that the questionnaire enabled them to give a relatively 'true and complete picture' of their reasons for using SNSs (mean = 2.62, $SD = 0.81$), and their feelings when using SNSs (mean = 2.46, $SD = 0.87$; 0 = *not at all*, 4 = *very much*).

Seven participants commented that their SNS use was more nuanced than could be captured by the questionnaire (e.g. feelings might depend on what they see on SNSs), and three participants said they found it difficult to answer the questionnaire because of wording or formatting. Twenty-two participants contextualised their SNS use by providing information about their communication practices, social and personal lives. Finally, 13 participants commented that they perceived important differences between different SNSs, most commonly *WhatsApp*.

Table 7. Pearson *r* correlations between subscales and loneliness, social isolation and personality traits.

	Statistic	Measure ^a							
		Loneliness	Social Isolation	Extrav'ion	Agree'ness	Consc'ness	Neurot'ism	Intellect	Sociability
1. Maintain close ties	Pearson <i>r</i>	-0.104	-0.076	0.206**	0.130*	0.030	0.070	0.061	0.150*
	R ²	0.011	0.006	0.042	0.017	0.001	0.005	0.004	0.023
	P-value	0.091	0.217	0.001	0.036	0.630	0.259	0.325	0.015
2. Maintain and strengthen weaker ties	Pearson <i>r</i>	0.020	-0.009	0.123*	0.112	-0.090	0.030	0.074	0.090
	R ²	0.000	0.000	0.015	0.013	0.008	0.001	0.005	0.008
	P-value	0.746	0.888	0.047	0.071	0.146	0.624	0.234	0.145
3. Diversion	Pearson <i>r</i>	0.046	-0.011	0.089	0.061	-0.101	0.035	0.066	-0.024
	R ²	0.002	0.000	0.008	0.004	0.010	0.001	0.004	0.001
	P-value	0.460	0.859	0.151	0.322	0.102	0.569	0.284	0.702
4. Positive affect	Pearson <i>r</i>	-0.062	0.148*	0.080	0.179**	0.010	-0.054	0.222**	0.012
	R ²	0.004	0.022	0.006	0.032	0.000	0.003	0.049	0.000
	P-value	0.317	0.017	0.196	0.004	0.874	0.387	0.000	0.842
5. Negative affect	Pearson <i>r</i>	0.159*	-0.096	-0.050	0.000	-0.194**	0.076	-0.013	0.003
	R ²	0.025	0.009	0.003	0.000	0.038	0.006	0.000	0.000
	P-value	0.010	0.122	0.423	0.996	0.002	0.221	0.834	0.965

Notes: *Significant at $p < 0.05$ (uncorrected threshold). **Significant at corrected threshold (False Discovery Rate = 0.05). R² is proportion of total variance accounted for by correlation between two variables: ± 0.1 = small; ± 0.3 = medium; ± 0.5 = large.

2.5 Discussion

2.5.1 Main findings

2.5.1.1 SNS-OA measure

This study described the development of the ‘SNS-OA measure’ (Social Networking Sites – Older Adults), designed to capture motives and affect associated with SNS use in older adults. The development of the measure included a literature review, consultation with the target population and researchers, piloting, and empirical evaluation of the measure. The final factor structure of the measure consisted of five subscales, which were interpreted as three motive scales: (1) *maintain close ties*, reflecting SNS use for the purpose of maintaining relationships with family and close friends; (2) *strengthen and maintain weaker ties*, reflecting SNS use for the purpose of maintaining and strengthening relationships with weaker ties such as casual friends or acquaintances; and (3) *diversion*, reflecting SNS use for the purpose of diverting one’s attention. The remaining two scales were interpreted as: (4) *positive affect*, reflecting a pleasurable engagement with SNSs, and (5) *negative affect* (here comprised of feeling irritated or ambivalent), reflecting a level of psychological discomfort from using SNSs.

Convergent validity was demonstrated for subscales 1 and 4 (maintain close ties and positive affect), however other hypotheses regarding convergent validity either gained no support, or only gained support in uncorrected analyses (for subscales 2 and 5: maintain and strengthen weaker ties, and negative affect). However, subscale 5 (negative affect) correlated negatively with conscientiousness in corrected analyses, in common with past

research in young and middle-aged adults (Nunes et al. 2018). Content and face validity was sought from consulting with the target group, but some participants reported that their SNS use was more nuanced than could be represented by the questionnaire indicating limitations to face validity. Overall the measure demonstrated good test-retest reliability and internal consistency, with the exception of the negative affect subscale, which demonstrated inadequate internal consistency. This could be explained by the small number of items on the scale ($n = 2$) (Tavakol & Dennick, 2011).

2.5.1.2 Relationship between SNS-OA measure and social wellbeing

Loneliness was uncorrelated with all of the subscales after correction for multiple comparisons. This is in contrast to findings from young adults demonstrating that SNS use for the purpose of maintaining friendships and socialising was associated with lower loneliness (Yang & Brown, 2013), and in older adults, use of the Internet for communication purposes was associated with lower loneliness (Sum et al., 2008). Two possible explanations for this finding are considered here. The absence of any association may be due to the fact that this sample was relatively low in social isolation and loneliness. This could be a sampling bias issue as it is possible that older adults volunteering for cohort studies are particularly socially connected. Given that more effective interventions at reducing social isolation and loneliness have been found to target specific at-risk groups (Masi et al., 2011), it is possible that SNS use is of particular benefit to individuals with high levels of social isolation and loneliness.

Alternatively, there might be no association between different SNS motives and social wellbeing in this sample. Evidence for the association between SNS use and social wellbeing amongst older adults is mixed and comes from a small number of studies (Aarts et al., 2014; Ballantyne et al., 2010; Myhre et al., 2016; Yu et al., 2016). Perhaps SNS does not confer the same affordances to social wellbeing for older adults as other types of communication and interaction (e.g. face-to-face contact, telephone contact). In support of this, past research has suggested that some older adults preferred telephone calls, email and written communication to SNSs because they were perceived to afford deeper and more meaningful communication with others (Hope, Schwaba, & Piper, 2014). It may also be the case that the putative mechanisms by which social relationships impact on wellbeing, for example feeling understood, social support and group identification (Amieva et al., 2010; Haslam et al., 2016; Marioni et al., 2015; Pillemer & Holtzer, 2016), do not translate into SNS use. However, these hypotheses need to be considered in light of the limitations of the measure.

2.5.2 Methodological problems and limitations

Many items evoked low response variance, with most respondents weakly endorsing those items, and three of the subscales were positively skewed due to low scale means on these subscales. Low mean scores may suggest that this older adult sample used SNSs for a limited number of reasons (notably maintaining close ties, which had the highest mean scale score), and experienced a limited range and intensity of affect in response to SNS use. In other words, it appeared as though this older adult sample did not feel

sufficiently strongly or divergently about SNSs to be captured meaningfully by this measure (see 'Part 3: Critical Appraisal' for further discussion). Previous older adult research with non-SNS users has highlighted a lack of interest or perceived relevance as a common reason for not using SNSs (Hope et al., 2014; Hutto et al., 2015; Quinn, Smith-Ray, & Boulter, 2016; Sundar, Behr, Oeldorf-Hirsch, & Nussbaum, 2011). Incidentally, four participants commented that SNSs was not a particularly important part of their lives. This is in contrast to studies on younger adult SNS users, indicating a greater emotional impact of SNSs compared to their older counterparts (Hayes, van Stolk-Cooke, & Muench, 2015).

It was clear from both the item analysis and participant feedback that the majority of affect items were not representative of participants' SNS experience. Moreover, some participants remarked that it was difficult for them to respond to questions about how they *generally* felt using SNSs, since their emotional reaction was dependent on particular content. It seems that participants did not experience a particularly large range or intensity of affect from using SNSs. Alternatively, the measure may not have been sensitive to subtler emotional aspects of users' SNS experience.

Generating and classifying motives in the initial development stage was challenging because of the inherent subjectivity in the process. This subjectivity is reflected by the fact that many apparently similar motives or activities were often interpreted differently in the literature. For example, using SNSs 'to look at photos of family and friends' could be construed as 'social surveillance' (passively observing others) or as 'maintaining close ties'. In addition, it was often difficult to distinguish between an activity, motive and

affordance regarding SNS use. Although the best possible efforts were made to make the process of item generation and classification less subjective from consultation with third parties, a certain degree of subjectivity could not be avoided.

The measure was designed to capture motives and affect associated with SNS use. However, one's 'offline' behaviour, attitudes and affect are likely to influence this. This could mean that aspects of the measure might be measuring characteristics of 'offline' behaviour or affect. For example, using SNSs to maintain close ties might reflect a broader propensity to engage and maintain social relationships, both 'offline' and 'online'.

The aim of this research was to develop a measure that was relevant to any SNS, however it was challenging to generate items that could apply broadly to all SNSs. Developing a measure specific to the most commonly used SNS (*Facebook*) was considered, however a general SNS measure was preferred because there are many similarities between different SNSs (Obar & Wildman, 2015) and because a general SNS measure is more robust to the fast-changing nature of technological change. Nevertheless, there are limitations to treating all SNSs as the same, and this was reflected in the feedback from some participants who felt they used different SNSs in different ways. In particular, participants indicated that their use of *WhatsApp* was distinct, perhaps because it is perceived more similar to text messaging than to an SNS.

The majority of the sample was female, White British, and married or cohabiting. Only a minority of participants were aged 80+. As such, results may obscure differences in SNS use according to gender, ethnicity, marital status

and age. Given that factors associated with loneliness in later life include being unmarried or living alone and older age (Cohen-Mansfield, Hazan, Lerman, & Shalom, 2016), findings here may not be relevant to those individuals at particular risk for loneliness and social isolation. The generally low to medium levels of loneliness and social isolation amongst this sample would seem to support this.

There were limitations to the use of a personality measure to assess convergent validity. Unfortunately, the vast majority of research on SNS use and personality, with the exception of Lodi-Smith and Roberts (2012), was conducted in younger adults. Effect sizes for the relationship between SNS use and personality were very small, suggesting that personality is a limited factor in SNS use for this older adult sample. However, owing to the fact that this area of research is in its infancy, and the corresponding difficulties in identifying measures for convergent validity, it was determined that personality was the construct with the most relevance to the new scale.

Finally, a Confirmatory Factor Analysis (CFA) was not performed to verify the factor structure suggested by the EFA, both for practical reasons and because of concerns about the limitations of the measure.

2.5.3 Implications for research

Future research should explore whether the relatively weak attitudes towards SNSs reflected by the measure in this population vary as a function of age. Only a small percentage of the present sample were aged 80+, and it is likely that attitudes vary across the older age spectrum. It is also possible that the attitudes represented here were indicative of a cohort effect, due to the

relatively low uptake of SNSs amongst this population compared to younger adults. Future research could explore this hypothesis by administering the 'SNS-OA measure' in middle-age and younger adults, as well as through the use of longitudinal designs. It is possible that as current cohorts of younger adults move into older age, the 'SNS-OA measure' will reveal a different set of attitudes towards SNSs.

More detailed qualitative methodology should be conducted alongside quantitative studies to assist in contextualising and interpreting findings. This has been done elsewhere in the literature on SNSs and older adults (Lüders & Brandtzaeg, 2014). Such studies would be particularly helpful in understanding how SNS use compares to, and interacts with, the broader landscape of older adults' communication practices and social lives.

Future research using the 'SNS-OA measure' should ideally perform a CFA to confirm its factor structure and perform further convergent validity analyses to establish its validity. However, the latter is currently difficult given the paucity of research in this area.

Regarding the relationship between SNS use and social wellbeing, future research should seek to understand whether the relationship between SNS use and social wellbeing is moderated by levels of loneliness, social isolation, age, gender, marital status, domicile status (e.g. own home, retirement home), and functional impairment, all of which might affect loneliness and social isolation. Another avenue for further research would be to investigate whether the mechanisms by which social relationships are posited to exert a beneficial impact on wellbeing, operate at all, or to the same extent, in SNS use. For example, one could explore the degree to which SNS use fosters a sense of

group identification, social support, or feeling understood, all of which have been identified as potential means by which social relationships improve wellbeing.

2.5.4 Implications for practice

As indicated by the highest mean scale-score, the strongest motive for SNS use in this sample was using it to maintain close ties. Moreover, it seemed that participants experienced a greater degree of positive than negative affect when engaging with SNSs. This might suggest that, on average, SNS use afforded older adults a pleasurable experience by allowing them to engage with their close family and friends on SNSs (e.g. through seeing photos of family). However, endorsement of items was generally weak, suggesting that SNS use was not a particularly important part of older adults' lives. Furthermore, there was no simple association between SNS use and social wellbeing in corrected analyses. As such, these results suggest that, at present, SNS use is unlikely to function as a panacea for social isolation and loneliness in later life. However, given that this was a relatively socially connected, homogenous sample (e.g. in terms of age, gender), it is possible that samples higher in levels of social isolation and loneliness would give rise to different results. Finally, SNS use for the purpose of improving social wellbeing should be considered in the broader context of SNS motives and emotional response to SNSs, individual preferences and circumstances (e.g. functional impairment, domicile status), wider communication practices and social lives, as well as generational differences.

2.5.5 Conclusions

This study described the development of the 'SNS-OA measure'. This was motivated by the proposal that psychometrically robust measures of SNS use are needed to understand its impact on social wellbeing. The measure demonstrated some adequate psychometric properties, although scores on items suggested that this cohort of older adults may not feel adequately strongly about SNSs to be meaningfully captured by a measure. Despite its limitations, this study was a first step towards capturing a more detailed understanding of SNS use in older adults. It has highlighted the challenges in developing a valid and reliable measure of SNS use in older adults, and in understanding its relationship to social wellbeing.

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Part 3: Critical Appraisal

3.1 Overview

The aim of the critical appraisal is twofold. First, it will describe a follow-up study conducted to explore the limitations of the measure described in Part 2. Second, it will reflect on the challenges encountered in undertaking this research, including reflections on being a novice researcher in the field of SNSs, older adults and measure development.

3.2 Follow-up study

3.2.1 Rationale

As described in Part 2, we observed low-item means on the 'SNS-OA measure'. We hypothesised that this might be due to our older adult sample not having strong feelings about social media, rather than being due to the sensitivity of the measure. To explore this, we administered the 53-item scale to a convenience sample of ten younger adults (associates of the author; mean age = 29.1, range 25 – 32) using *Google Forms*. Given the large differences in sample size, comparisons between samples are only descriptive and exploratory.

3.2.2 Results

We found that mean item scores were higher in younger adults. Specifically, the mean item scale score was 1.43 ($SD = 0.43$), compared to 1.00 ($SD = 0.48$) in the older adult sample. Separating motives from affect items, the mean scale score for motive items ($n = 31$) amongst the younger adult sample was 1.40 ($SD = 0.37$), compared to 1.10 ($SD = 0.60$) for the older adult sample. For

the affect items ($n = 22$), the mean scale score for younger adults was 1.48 ($SD = 0.62$), compared to 0.86 ($SD = 0.40$) for the older adult sample. The proportion of items falling in the 'middle range' (1 – 3, on a scale of 0 – 4) was also compared. This was 75.5% for the younger adult sample and 39.6% for the older adult sample. The proportion of items falling in a more conservative 'middle range' (from 1.5 – 2.5), was 35.9% for the younger adult sample and 22.6% for the older adult sample.

3.2.3 Discussion

As indicated by higher mean scale scores, and the higher proportion of items falling in the middle range, results suggest that the measure was more sensitive in this younger adult sample. In other words, motives and affect associated with SNS use may be more relevant to younger adult SNS users, compared to their older adult counterparts. As such, older adults in the present study may have had insufficiently strong feelings about SNS to be meaningfully captured by a measure. Because these results are based on the 53-item measure (without omission of psychometrically weaker items), and these items were developed with an older adult population in mind, the sensitivity of an SNS measure in younger adults may be greater than that indicated here. However, because of the small sample size and absence of inferential statistics, this interpretation should be regarded with caution.

3.2.3.1 Older adults' relationship to SNSs

Qualitative research with older adults has indicated a preference for face-to-face or telephone interactions over SNSs because of perceived greater

opportunities for reciprocity (Lindley, Harper & Sellen, 2009). In addition, amongst non-users of SNSs, SNSs were considered to be an unimportant and trivial use of time, with a perceived lack of opportunity for deep and meaningful communication, as compared to telephone, letter or email (Hope, Schwaba & Piper, 2014; Quinn, Smith-Ray, & Boulter, 2016). Therefore, for some older adults, such media may provide more fertile ground for measurement, beyond SNSs.

On the other hand, some older adults perceive SNSs to be an integral part of their lives (Hope et al., 2014), and a handful of participants in the consultation stage of this study indicated similar sentiments. Interestingly, three of the four participants aged 80+ were of this view. It has been found that use of Information and Communication Technology (ICT) for social purposes was related to psychological wellbeing amongst adults aged 80+ (Sims, Reed, & Carr, 2017). This might suggest that ICT or SNS use brings more benefits for 'older' older adults, perhaps because of higher rates of social isolation and loneliness at this stage of life (Dykstra, 2009). Alternatively, 'older' older adults might be more likely to use ICT or SNSs in a way that is beneficial for psychological wellbeing, such as maintaining relationships with close family.

3.2.3.2 SNSs and social relationships in later life

It is useful to interpret older adults' SNS use and the findings of the present study in the context of lifespan theories of social relationships. Studies suggest that social network size reaches a peak in early adulthood and declines steadily over the life span (English & Carstensen, 2014; Wrzus, Hänel, Wagner, & Neyer, 2013). Whereas the number of close ties (e.g. family)

remain stable across the lifespan and into older age, more peripheral network members decline in number (Wrzus et al., 2013).

Social Convoy Theory (Kahn & Antonucci, 1980) and Socioemotional Selectivity Theory (Carstensen, 1991) explain these developments in different ways. Social Convoy Theory suggests that these changes are due to key life events (e.g. marriage, retirement, bereavement), whereas Socioemotional Selectivity Theory suggests that these changes are due to a shift in life goals, driven by a change in perspective of how much time one has left to live. Specifically, it suggests that in later life, individuals invest more in relationships that benefit emotional wellbeing. In support of this theory, cross-sectional analyses have suggested that older adults (who had a smaller number of peripheral network members compared to earlier life), reported more positive affect and less negative affect from their social relationships (English & Carstensen, 2014).

From an SNS perspective, it has been found that older adults' SNS networks were smaller than those of younger adults, but made up a greater proportion of members considered to be actual friends (Chang, Choi, Bazarova, & Löckenhoff, 2015). Moreover, SNS networks with more actual friends were associated with lower levels of loneliness and social isolation across the lifespan (18 – 93 years-old). One might therefore hypothesise that older adults use SNSs in a way consistent with emotional regulation goals, i.e. to maintain relationships with close ties, because it brings greater benefits for emotional wellbeing. In line with this, the highest mean score of the three motive scales of the 'SNS-OA measure' was 'using SNSs to maintain close ties', and the literature review identified this as the primary motive for SNS use.

Furthermore, positive affect scores were higher than negative affect scores. As such, the weaknesses of this measure in older adults may be indicative of the circumscribed way in which many older adults use SNSs, and respond to SNSs. In other words, there is too little variance in motives and affect to be captured by the measure developed here.

The theories described above predict that using SNSs as a means to maintain close ties, in the service of positive affect and emotional wellbeing, is a normative reflection of the way individuals conduct their social relationships in later life. Alternatively, cohort effects may play a role, because SNSs are a recent phenomenon primarily targeted at, and utilised by, adolescents and younger adults. Studies using longitudinal designs are needed to distinguish between these possibilities.

3.3 Challenges to conducting research in this field

Challenges encountered whilst undertaking this research are described in the following section. They include those specific to the field of SNSs, the term older adults, the concept of loneliness, and measure development. Personal reflections on the challenges of working with these phenomena are also remarked upon.

3.3.1 Research in SNSs and communication media

3.3.1.1 SNSs as a multidisciplinary field

SNS research encompasses a broad range of disciplines including computer science, marketing, advertising, social sciences and psychology. Being from a clinical psychology background, this made it a difficult field to navigate (with

relevant research being published across a breadth of journals), comprehend and interpret. The literature review was limited to papers exploring SNSs from a Social Sciences and Psychology perspective, because to do so otherwise would have made meaningful comparisons between the literature challenging. We also considered that other researchers with different expertise were better equipped to explore SNS use from these perspectives. Nevertheless, it is likely that greater collaboration across disciplines would increase the utility of research in this field, as well as lead to better recommendations for research.

3.3.1.2 Boundaries between SNSs and communication media

Unclear boundaries between SNSs and other forms of communication made it challenging to delineate participants' SNS use from their use of other media. Moreover, these boundaries are likely to become less clear as the Internet and SNSs evolve. For example, the advent of messaging platforms built around SNSs (e.g. *Facebook Messenger*), have made the line between SNSs and text messaging less clear. By studying SNSs only, we hoped to achieve internal validity, i.e. avoid confounding SNS use with other communication media, which may diverge in their features and outcomes. However, participants may not have made the same distinction between SNSs and other forms of communication, such as email, blogging or messaging applications, as were assumed by this study and in common with much SNS research. Hence, by collapsing across SNSs for this measure, we may have compromised the measure's external validity, face validity, and utility. Moreover, communication in one domain can stimulate it in others (e.g. an SNS message stimulates a

phone call), making it even more challenging to demarcate the effects of SNS use.

The use of multiple communication media to maintain relationships has been termed 'media multiplexity' (Haythornthwaite, 2005), and suggests that closer ties are maintained via a greater number and diversity of communication media, as compared to weaker ties. In other words, the closer the tie, the greater number of communication media used to maintain that relationship. If older adults use SNSs primarily to maintain relationships with close ties (e.g. family, Chang et al., 2015), SNSs are likely to constitute a small segment of their repertoire of communication with their networks. Consistent with this perspective, there is evidence that older adults switch to other communication channels to continue more 'serious' conversations started on SNSs (Erickson, 2011). Hence, this suggests that delineating the effects of SNS use may be particularly challenging with older adults (Chan, 2014).

3.3.1.3 The term 'older adults'

Studying adults aged 65+ as a homogenous group obscures important differences across this age-range, both in terms of normative age-related change (a 65-year-old adult is likely to face, on average, different circumstances to 90-year-old), and in terms of interindividual differences. Perhaps it is more important to consider functional characteristics, e.g. extent of social contact or level of functional impairment, rather than the static indicator of chronological age, when considering what, and in whom, to measure. For example, an individual living in a rural area with high levels of functional impairment might place more importance on SNSs than an older

adult living in an urban area with low levels of functional impairment, regardless of their chronological age.

Age can also be regarded as contingent on individual perception and experience. One study demonstrated that after controlling for chronological age, women (but not men) who *felt younger* were more optimistic about life (Schafer & Shippee, 2009). Perceived younger age has also been linked to improved health outcomes (Demakakos, Gjonca, & Nazroo, 2007). Therefore, conducting this research has made me reflect on the validity and utility of the term 'older adults', and has encouraged me to consider functional characteristics as well as one's individual relationship to ageing, as crucial aspects in studying phenomena in later life.

3.3.1.4 Concept of loneliness

In reading about loneliness, I learned that it is a more complex phenomenon than I perceived at the outset. Loneliness has been proposed to comprise emotional and social dimensions (Weiss, 1973). Emotional loneliness is more strongly influenced by the availability of a close, emotional relationship, such as a spouse (Dahlberg & McKee, 2014; Drennan et al., 2008; Green, Richardson, Lago, & Schatten-Jones, 2001; van Baarsen, Snijders, Smit, & van Duijn, 2001), as well as health and psychological characteristics such as self-esteem (Dahlberg & McKee, 2014; van Baarsen et al., 2001). In contrast, social network characteristics, e.g. network size, frequency of contact and network support, seem to be more closely related to social loneliness (Dahlberg & McKee, 2014; Drennan et al., 2008; Green et al., 2001; van Baarsen et al., 2001). Although SNSs have been advocated as a means of

reducing loneliness in later life, it is plausible that SNS use for the purpose of maintaining and strengthening ties has greater potential to ameliorate social, as opposed to emotional loneliness. This is because SNS use is more likely to affect factors such as network size and frequency of social contact, as opposed to the availability of a close, emotional relationship. Interestingly, some research has demonstrated that emotional isolation (the loss of a spouse) accounted for more loneliness than frequency of social contact (Dugan & Kivett, 1994). As such, the potential beneficial impact of SNS use on feelings of loneliness may be very limited.

Beyond being an unpleasant subjective state, loneliness has been associated with particular ways of thinking and behaving that affect how the individual interacts with their social world (Qualter et al., 2015). For example, loneliness has been associated with a greater tendency to perceive hostility in social interactions, thereby provoking withdrawal from social situations. Loneliness may therefore affect how individuals interact with the online world, suggesting that SNS use may even exacerbate negative feelings (Nowland, Necka, & Cacioppo, 2017). This would suggest that individuals high in loneliness may need support in reducing the impact of unhelpful cognitive and behavioural patterns on their SNS and Internet use.

3.3.1.5 Measure development

Since developing a psychometrically sound measure requires clear and circumscribed articulation of a target construct, the developer needs to decide what is, and what is not, important to capture. In doing so, one naturally loses contextual information e.g. the wider landscape of individuals' social and

communication practices, or the nature of specific content encountered on SNS.

I found it difficult to forgo this information in the process of developing a quantitative measure. The process of undertaking this research project has made me more appreciative, as well as accepting, of the necessary realities of developing a valid and reliable measure (and quantitative research more generally), i.e. gaining an understanding of a specific phenomenon at the expense of broader contextual information. In turn, this has made me recognise the importance of considering findings in the context of other research, as well as the utility of conducting qualitative research alongside quantitative research in interpreting results.

I found it challenging to manage the inherent subjectivity involved in generating items during stage 1 of measure development, as well as in decisions regarding factor extraction and interpretation during Exploratory Factor Analysis (EFA). As well as having appreciated the need to consult with third parties in order to reduce such bias, I have also learned to think more critically about psychometric measures in my academic and clinical work. More broadly, these challenges have illustrated the importance of compromise in research, and similarly, acceptance and transparency regarding the limitations of one's work.

3.4 Conclusions

The critical appraisal has described a follow-up study to further scrutinise research findings and challenges encountered whilst undertaking this research, including reflections as a novice researcher in the fields of SNSs,

older adults, social wellbeing and measure development. Overall, performing this research has taught me how me how to think more critically about measure development, as well as the concepts of loneliness and older age. Finally, it has impressed upon me the importance of considering SNS use in the broader context of wider communication practices, age-related normative influences, and individual functional characteristics and circumstances.

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Appendices

Appendix 1: Ethical approval

1.1. UCL Ethics Application Form for Non-Invasive Research on Healthy Adults.

SECTION A	APPLICATION DETAILS
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A1	Project details	
	Project title:	Development of a measure to examine psychosocial motivations for social media use in older adults
	Date of submission:	January 2017
	Proposed start date:	January 2017
	Proposed end date:	December 2021

A2	Principal researcher									
		<p><i>(Note: A student – undergraduate, postgraduate or research postgraduate – cannot be the principal researcher for ethics purposes).</i></p> <p>Full name: Dr Aimee Spector</p> <p>Position held: Reader in Clinical Psychology</p> <p>Research Department: Clinical, Educational and Health Psychology</p> <p>The principal researcher must read and sign (electronic signature or scanned pdf with signature are acceptable) the following declaration. Please tick the box next to each of the statements below to acknowledge you have read them and provided all required information.</p>								
		<table border="1" style="width: 100%;"> <tr> <td style="width: 80%;"> <ul style="list-style-type: none"> ▪ I will ensure that changes in approved research protocols are reported promptly and are not initiated without approval by the Departmental Ethics Committee, except when necessary to eliminate apparent immediate hazards to the participant. </td> <td style="width: 20%; text-align: center; vertical-align: top;">√</td> </tr> <tr> <td> <ul style="list-style-type: none"> ▪ I have completed a risk assessment for this programme of research and hereby confirm that the risk assessment document will be discussed with any researcher/student involved in this programme of research (currently or in the future). I will ensure that all researchers/students sign the risk assessment form following this discussion. <p>Risk assessment forms for projects can be downloaded from the Ethics section of the PaLS Intranet.</p> </td> <td style="text-align: center; vertical-align: top;">√</td> </tr> <tr> <td> <ul style="list-style-type: none"> ▪ I have obtained approval from the UCL Data Protection Officer stating that this research project is compliant with the Data Protection Act 1998. My Data Protection Registration Number is: You can find a data protection registration form here: http://www.ucl.ac.uk/efd/recordsoffice/data-protection/ </td> <td style="text-align: center; vertical-align: top;">√</td> </tr> <tr> <td> <ul style="list-style-type: none"> ▪ I have included examples of the Information Sheet and Consent Form for the proposed research. It will be made clear to the participants that they can withdraw from the study at any time, without giving a reason. </td> <td style="text-align: center; vertical-align: top;">√</td> </tr> </table>	<ul style="list-style-type: none"> ▪ I will ensure that changes in approved research protocols are reported promptly and are not initiated without approval by the Departmental Ethics Committee, except when necessary to eliminate apparent immediate hazards to the participant. 	√	<ul style="list-style-type: none"> ▪ I have completed a risk assessment for this programme of research and hereby confirm that the risk assessment document will be discussed with any researcher/student involved in this programme of research (currently or in the future). I will ensure that all researchers/students sign the risk assessment form following this discussion. <p>Risk assessment forms for projects can be downloaded from the Ethics section of the PaLS Intranet.</p>	√	<ul style="list-style-type: none"> ▪ I have obtained approval from the UCL Data Protection Officer stating that this research project is compliant with the Data Protection Act 1998. My Data Protection Registration Number is: You can find a data protection registration form here: http://www.ucl.ac.uk/efd/recordsoffice/data-protection/ 	√	<ul style="list-style-type: none"> ▪ I have included examples of the Information Sheet and Consent Form for the proposed research. It will be made clear to the participants that they can withdraw from the study at any time, without giving a reason. 	√
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<ul style="list-style-type: none"> ▪ I have obtained approval from the UCL Data Protection Officer stating that this research project is compliant with the Data Protection Act 1998. My Data Protection Registration Number is: You can find a data protection registration form here: http://www.ucl.ac.uk/efd/recordsoffice/data-protection/ 	√									
<ul style="list-style-type: none"> ▪ I have included examples of the Information Sheet and Consent Form for the proposed research. It will be made clear to the participants that they can withdraw from the study at any time, without giving a reason. 	√									

<ul style="list-style-type: none"> ▪ I will ensure that all adverse or unforeseen problems arising from the research project are reported in a timely fashion to the UCL Research Ethics Committee. 	√	
<ul style="list-style-type: none"> ▪ I will undertake to provide notification when the study is complete and if it fails to start or is abandoned. 	√	
<ul style="list-style-type: none"> ▪ I have met with and advised students on the ethical aspects of this project/programme of research. 	√	
<ul style="list-style-type: none"> ▪ I am satisfied that the proposed research complies with current professional, departmental and university guidelines. 	√	
Signature:		Date: 11/01/2017

A 3	Contact details
	<p>Principal Researcher Full name: Aimee Spector Position held: Reader in Clinical Psychology Research Department: Clinical, Educational and Health Psychology Email: a.spector@ucl.ac.uk Telephone:</p>
	<p>Additional applicant 1 Full name: Loveday Newman Position held: DCLinPsy trainee Research Department: Clinical, Educational and Health Psychology Email: loveday.newman.13@ucl.ac.uk Telephone:</p>

A 4	<p>Approval from the Departmental Ethics Committee <i>(Approval cannot be given by the principal researcher of this project – if necessary the application must be sent to an Ethics Officer from a different Research Department, or to the College Ethics Committee, for approval)</i></p> <p>Declaration by the Research Department Ethics Chair: I have reviewed this project and I approve it. YES The project is registered with the UCL Data Protection Officer and a formal signed risk assessment form has been completed.</p> <p>Allocated Departmental Project ID Number for the approved application: <u> _CEHP_2017_558_____</u></p> <p>Name of the Research Department Ethics Chair (type in): John King Date: 23/01/2017</p>
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1.2. Ethical Approval for PROTECT study.



Health Research Authority

NRES Committee London - London Bridge

Health Research Agency

Skipton House

80 London Road

London

SE1 6LH

Telephone: 020 7972 2582

29 November 2013

Professor Clive Ballard
Professor of Age-Related Diseases
King's College London
Wolfson Centre for Age-Related Diseases
Guys' Campus, King's College London
London
SE1 1UL

Dear Professor Ballard

Study title:	Understanding the impact of genetic and other risk factors on cognition in a cohort of people over 50
REC reference:	13/LO/1578
IRAS project ID:	136118

Thank you for your letter of 08 November 2013, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the Co-ordinator Stephanie Hill, nrescommittee.london-londonbridge@nhs.net.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database within 6 weeks of recruitment of the first participant (for medical device studies, within the timeline determined by the current registration and publication trees).

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non clinical trials this is not currently mandatory.

If a sponsor wishes to contest the need for registration they should contact Catherine Blewett (catherineblewett@nhs.net), the HRA does not, however, expect exceptions to be made. Guidance on where to register is provided within IRAS.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Covering Letter		
Evidence of insurance or indemnity		24 September 2013
Investigator CV		24 September 2013
Participant Consent Form	4	08 November 2013
Participant Information Sheet	6	08 November 2013
Protocol	3	22 August 2013
REC application	136118/5051 72/1/104	24 September 2013
Referees or other scientific critique report		15 August 2013
Response to Request for Further Information		08 November 2013

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

13/LO/1578 Please quote this number on all correspondence
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We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://www.hra.nhs.uk/hra-training/>

With the Committee's best wishes for the success of this project.

Yours sincerely

Professor David Bartlett Chair

Email:nrescommittee.london-londonbridge@nhs.net

Enclosures: "After ethical review – guidance for researchers" [SL-AR2]

Copy to: Mr Keith Brennan, King's College London
Ms Jennifer Leibscher, South London and Maudsley NHS
Foundation Trust

Appendix 2: Consultation materials

2.1. Recruitment poster for focus group.



Are you aged 65+ and use social media?

What is this about?

We would like to conduct a focus group with **people aged 65 or older** who use social media (e.g. Facebook, Twitter) in order to understand how adults aged 65+ use social media.

This focus group will form the first stage of our project to develop a measure to examine social media use in older adults, in order to better understand how social media impacts on social relationships in later life. This measure is part of a wider incentive to understand the factors that impact on healthy brain ageing, as part of a study called PROTECT, run by researchers at Kings College London and Exeter University.

Will I be paid?

You will be paid **£12** for your time.

What will I have to do?

You will be asked to discuss your motivations for using social media, how you use social media, and how you think older adults in general use social media. There are no right or wrong answers – we are simply interested in your experience. The session will be audio recorded in order to retain the information from the session. I will also collect data on demographics (e.g. age, gender) and what social media sites you use.

How long will it take?

Between 1 - 1.5 hours.

When and where?

The focus group will take place on **Thursday 29th June at 2pm** at UCL campus (1-19 Torrington place, WC1E 7HB). UCL is served by many bus routes (including routes 10, 14, 24, 29, 73, 134, 390) and nearest tube stations are Goodge Street & Warren Street.

What will happen to my data?

- 1) All data (including audio recording) will be stored securely. Your data will not be published in any way that is identifiable.
- 2) The next part of this study will be to consult with experts in the field about some of the things that came up in the focus group. No identifiable informant will be shared with them.

Who is involved in this study?

The study is run by Loveday Newman (Trainee Clinical Psychologist, UCL) and supervised by Dr Aimee Spector (Reader in Clinical Psychology, UCL) and Dr Anne Corbett (Senior Lecturer, Exeter University).

More questions or am interested in taking part?

Please contact me on loveday.newman.13@ucl.ac.uk (Trainee Clinical Psychologist, Department of Clinical, Educational and Health Psychology, UCL). I look forward to hearing from you.

2.2 Participant information sheet for focus group.

Information Sheet

Title of project: Development of a measure to examine psychosocial motivations for social media use in older adults.

Study approval: This study has been approved by UCL Research Department's Ethics Chair [Project ID No: CEHP_2017_558].

Name, address and contact details of investigators:

Dr Aimee Spector, Reader in Clinical Psychology
Department of Clinical, Educational and Health Psychology, UCL, Room 442, 1-19 Torrington Place,
London, WC1E 7HB
a.spector@ucl.ac.uk

Loveday Newman, Trainee Clinical Psychologist
Department of Clinical, Educational and Health Psychology, UCL, 1-19 Torrington Place, London,
WC1E 7HB
loveday.newman.13@ucl.ac.uk

Overview of study

We would like to invite you to participate in this research project directed by researchers at UCL and Exeter University. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

What is the purpose of the research study?

We would like to conduct a focus group with around **five people aged 65 or older** who use social media (e.g. Facebook, Twitter) in order to understand how adults aged 65+ use social media. This focus group will form the first stage of our project to develop a measure to examine social media use in older adults. The purpose of this measure will be to better understand how social media impacts on social relationships in later life. This measure is part of a wider incentive to understand the factors that impact on healthy brain ageing, as part of a study called PROTECT, run jointly by Kings College London and Exeter University.

What will happen if I take part and what do I have to do?

If you consent, you will be asked to discuss your motivations for using social media, how you use social media, and how you think older adults in general use social media. There are no right or wrong answers – we are simply interested in your experience. In total this will take approximately 1-1.5 hours, with a break in the middle.

An audio recording will be taken of the group, in order to retain the material that was discussed. All data will be handled according to the Data Protection Act 1998 and will be kept anonymous. Only UCL researchers working with Dr Aimee Spector will analyse this data.

You would be paid via bank transfer. This means that I will collect some of your personal details to be able to pay you, but this will be kept secure and separate to any data you provide.

It is up to you to decide whether or not to take part. If you decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.

2.3 Participant consent form for focus group.

Informed Consent Form

Participant's Statement

Iagree that I have

- Read the information sheet and/or the project has been explained to me orally;
- Had the opportunity to ask questions and discuss the study; and
- Received satisfactory answers to all my questions or have been advised of an individual to contact for answers to pertinent questions about the research and my rights as a participant and whom to contact in the event of a research-related injury.
- I understand that the information I have submitted will be published as a report and I will be able to request a copy via Email should I wish to do so.
- Confidentiality and anonymity will be maintained, and it will not be possible to identify me from any publications.
- I understand that some of my personal details will be passed to Loveday Newman (study administrator) due to the payment I received. These details will be kept secure and separate to my data and will be destroyed after I have received my payment.

I understand that I am free to withdraw from the study without penalty if I so wish, and I consent to the processing of my personal information for the purposes of this study only and that it will not be used for any other purpose. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

Signed:

Date:

Investigator's Statement

I.....confirm that I have carefully explained the purpose of the study to the participant and outlined any reasonably foreseeable risks or benefits (where applicable).

2.4 Email sent to researchers in field.

Dear [NAME],

I am a Trainee Clinical Psychologist at University College London, UK, supervised by Dr Aimee Spector (Reader in Clinical Psychology). I am getting in touch because I have read your work [on measure development for examining social media use] [on social media use and older adults] [on social media use] and was hoping you might be able to help me.

In collaboration with researchers at Kings College London and Exeter University, we are developing a measure of social media use for older adults, in the context of trying to better understand the relationship of social media use to social relationships in later life.

The measure will focus on reasons for social media use amongst older adults (aged 65+). The content of the measure is based on recent interviews with older adults aged 65-89 and from the literature.

As part of the measure development process, we would really like to get your views and comments in order to inform and shape the measure.

With this in mind, we would really appreciate it if you could take the time to review the attached measure and comment on:

- 1) Whether you think the themes and items adequately capture older adults' reasons for of social media use (e.g. anything missing? Anything you would take away?)
- 2) Wording of the items (e.g. anything ambiguous or unclear?)
- 3) Any other general comments, guidance or feedback would also be welcomed.

Because of the short time scale of my project, it would be great if you could get back to me by **Monday 14th August**.

Many thanks in advance for your help – if you have any further questions, please do not hesitate to contact me.

Appendix 3: Additional pilot data

3.1. Characteristics of participants in pilot study (n = 73).

Description	% (n)
Age	
Mean (range)	69.1 (65 - 84)
65-69	68.5% (50)
70-79	28.8% (21)
80+	2.8% (2)
Gender	
Female	79.5% (58)
Male	20.5% (15)
Ethnicity	
White British	90.4%
Asian/Asian British: Chinese	2.7%
White European	2.7%
Asian/Asian British: Indian	1.4%
Mixed White and Asian	1.4%
White Irish	1.4%
Partner status	
Married	61.6%
Divorced	16.4%
Widowed	13.7%
Single	4.1%
Co-habiting	2.7%
Separated	1.4%
Education	
Secondary (GCSEs)	26%
Post-secondary (A-levels, College)	15.1%
Vocational (e.g. diploma)	23.3%
Undergraduate	19.2%
Postgraduate	13.7%
Doctorate	2.7%
Employment	
Retired	89%
Employed	6.8%
Self-employed	4.1%

3.2. *Pilot descriptive statistics SNS use (n = 73).*

Description	%
Social media used last 6 months^a	
Facebook	83.6%
Twitter	21.9%
Instagram	19.2%
LinkedIn	11%
Snapchat	-
Tumblr	-
Quora	-
WhatsApp	63%
Other SNS	5.5%
Main social media	
Facebook	63%
Twitter	5.5%
LinkedIn	1.4%
WhatsApp	27.4%
Other SNS	2.7%
Frequency of use	
Less than once a month	1.4%
1-3 times per month	4.1%
once a week	2.7%
several times a week	17.8%
once a day	16.4%
2-3 times a day	43.8%
more than 3 times a day	13.7%
Length of time per day	
Less than 10 min	28.8%
10-30 min	50.7%
31-60 minutes	13.7%
1-2 hours	4.1%
2-3 hours	1.4%
more than 3 hours	1.4%
Social media network^a	
Family	91.8%
Friends	90.4%
Acquaintances (met at least once)	37%
Colleagues (current/past)	45%
People never met in person	12.3%
Other	8.2%

Notes: a = more than one response possible.

Appendix 4: Empirical study materials

4.1. Invite email to participants for the main (empirical) study.

Dear [PARTICIPANT NAME],

We are writing to let you know about a new “Social Media” questionnaire that will be appearing in PROTECT shortly which we would like to invite you to complete.

The questionnaire aims to help us understand how using social media relates to social relationships during later life and we are inviting only people who indicated they use social media in a previous PROTECT questionnaire.

For more information about the questionnaire please visit <http://www.ProtectStudy.org.uk/SocialMediaQuestionnaire>.

Please look out for an email popping into your inbox in the next week or so asking you to complete this.

Please note some people may be randomly selected to repeat some of the questions approximately a week later, this is not a test but is to help ensure the questionnaire we use is reliable!

If you have any other questions please contact our Help Desk on 0207 848 8183 or admin@protectstudy.org.uk.

We very much appreciate your participation and ongoing support for the PROTECT study.

Warmest regards,

The Protect Study Team

4.2. Participant information for the main (empirical) study.

You have been contacted because you indicated that you use social media in a prior set of questions from the PROTECT study (e.g. Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, WhatsApp).

A body of research has looked at how social relationships may affect the brain in later life. With this in mind, we would like to understand how using *social media* relates to social relationships during later life.

To help us understand this better, we have developed a new questionnaire and would like to invite you to complete it. This questionnaire investigates how and why older people use social media and also how they feel when they are using it. There are also a few general questions about your use of social media and the Internet (e.g. how often you use it) to help us put your answers into context. In addition, there are some questions about your social relationships.

Because this is a new questionnaire, we would like to ask you to complete an additional measure about how you see yourself as a person. This is in order to help us ensure we have developed a sound questionnaire. To be more specific, when new questionnaires are developed, we need to make sure our *new questionnaire* relates to *other questionnaires* in the way we would expect. We base this on what has been done in prior research.

You will also have the opportunity to tell us your views on the questionnaire.

In summary then, we would like to ask you about:

- Your use of social media (how often etc)
- Your reasons for using social media
- How you may feel when you use social media
- Your social relationships
- How you see yourself as a person
- Your views on the questionnaire

Altogether, this should take approximately **20-30 minutes**.

Some participants will be *randomly selected* to complete **some** of these questions again in a week's time, which will only take 5-10 minutes. This is *not* a test! It is to help us ensure our questionnaire is reliable.

If you have any further questions about completing this questionnaire, please contact our Help Desk on 0207 848 8183 or admin@protectstudy.org.uk. We will be happy to answer any questions you may have.

4.3. Participant email for test-retest study.

Dear [PARTICIPANT NAME],

A week ago, you completed a questionnaire on your social media use, alongside some other questions. You might remember that some participants would be randomly selected and invited to complete **some** of these questions a week later.

As such, we would like to invite you to answer some of our questions again. This is not a test but is to help ensure the questionnaire we use is reliable!

This should take approximately **5-10 minutes**.

For more information about the questionnaire please visit <http://www.ProtectStudy.org.uk/SocialMediaQuestionnaire>

If you have any other questions please contact our Help Desk on 0207 848 8183 or admin@protectstudy.org.uk.

We very much appreciate your participation and ongoing support for the PROTECT study.

Warmest regards,

The Protect Study Team

Appendix 5: Overview of all items during the measure development process

No.	Item description	Pilot ^a	Excluded > Pilot analysis ^b	Excluded > pilot analysis (reason) ^c	Wording modified Pilot ^d	Added > pilot ^e	Main study ^f	Excluded > main analysis ^g	Excluded > main analysis (reason) ^h	Final Scale ⁱ
1	I use social media to look at family or good friends' photos					Y	Y			Y
2	I use social media to share my news with family and good friends	Y			Y		Y			Y
3	I use social media to know what family or good friends are up to	Y					Y	Y		Y
4	I use social media to share things (e.g. articles, photos) with family or good friends	Y			Y		Y			Y
5	I use social media to keep in touch with family or good friends	Y					Y			Y
6	I use social media to communicate with people I haven't seen in a while	Y					Y			Y
7	I use social media to stay connected with current or former work colleagues					Y	Y			Y
8	I use social media to reconnect with people I've lost contact with	Y					Y			Y
9	I use social media to browse around people I used to know	Y					Y			Y
10	I use social media to check out the posts (e.g. photos, links, notes) of people I used to know	Y					Y			Y
11	I use social media to pass the time when I'm bored	Y					Y			Y
12	I use social media to relax or unwind	Y					Y			Y

Appendix 5 (continued)

No.	Item description	Pilot ^a	Excluded > Pilot analysis ^b	Excluded > pilot analysis (reason) ^c	Wording modified Pilot ^d	Added > pilot ^e	Main study ^f	Excluded > main analysis ^g	Excluded > main analysis (reason) ^h	Final Scale ⁱ
13	I use social media to keep myself occupied	Y					Y			Y
14	I use social media to update my profile and/or status	Y					Y			Y
15	I feel alert when I use social media	Y					Y			Y
16	I feel attentive when I use social media	Y					Y			Y
17	I feel enriched when I use social media					Y	Y			Y
18	I feel irritated when I use social media					Y	Y			Y
19	I feel ambivalent when I use social media					Y	Y			Y
20	I use social media to keep up with changes in the way people communicate	Y			Y		Y	Y	Loading <.4 (EFA)	
21	I use social media to connect with the local community					Y	Y	Y	Loading <.4 (EFA)	
22	I use social media to get information or answers to my questions					Y	Y	Y	Loading <.4 (EFA)	
23	I feel amazed when I use social media					Y	Y	Y	Loading <.4 (EFA)	
24	I use social media to keep up to date with what's going on in the world	Y					Y	Y	Multicollinearity	
25	I use social media to learn from people who share the same interests as me	Y					Y	Y	Multicollinearity	
26	I use social media to let all of my online network know what I am up to	Y					Y	Y	Multicollinearity	
27	I use social media to 'follow' groups or individuals that reflect my interests	Y			Y		Y	Y	Multicollinearity	
28	I use social media to explore my interests and/or hobbies	Y					Y	Y	Multicollinearity	

Appendix 5 (continued)

No.	Item description	Pilot ^a	Excluded > Pilot analysis ^b	Excluded > pilot analysis (reason) ^c	Wording modified Pilot ^d	Added > pilot ^e	Main study ^f	Excluded > main analysis ^g	Excluded > main analysis (reason) ^h	Final Scale ⁱ
29	I use social media to share things of personal interest or amusement with all of my online network	Y					Y	Y	Multicollinearity	
30	I use social media for a bit of entertainment	Y			Y		Y	Y	Multicollinearity	
31	I use social media to communicate with acquaintances or casual friends	Y					Y	Y	Multicollinearity	
32	I use social media to share information or ideas with all of my online network	Y			Y		Y	Y	Multicollinearity	
33	I use social media to keep up with news and current affairs	Y					Y	Y	Multicollinearity	
34	I use social media to strengthen ties with acquaintances or casual friends	Y					Y	Y	Multicollinearity	
35	I feel interested when I use social media	Y					Y	Y	Multicollinearity	
36	I feel enthusiastic when I use social media	Y					Y	Y	Multicollinearity	
37	I feel inspired when I use social media	Y					Y	Y	Multicollinearity	
38	I feel amused when I use social media					Y	Y	Y	Multicollinearity	
39	I feel connected when I use social media					Y	Y	Y	Multicollinearity	
40	I feel curious when I use social media					Y	Y	Y	Multicollinearity	
41	I feel pleasure when I use social media					Y	Y	Y	Multicollinearity	
42	I use social media to keep up to date with groups					Y	Y	Y	Multicollinearity	
43	I use social media to express what I am thinking or feeling	Y					Y	Y	>60% 'not at all'	
44	I feel bored when I use social media					Y	Y	Y	>60% 'not at all'	
45	I feel concerned when I use social media					Y	Y	Y	>60% 'not at all'	

Appendix 5 (continued)

No.	Item description	Pilot ^a	Excluded > Pilot analysis ^b	Excluded > pilot analysis (reason) ^c	Wording modified Pilot ^d	Added > pilot ^e	Main study ^f	Excluded > main analysis ^g	Excluded > main analysis (reason) ^h	Final Scale ⁱ
46	I feel disappointed when I use social media					Y	Y	Y	>60% 'not at all'	
47	I feel envious when I use social media					Y	Y	Y	>60% 'not at all'	
48	I feel frustrated when I use social media					Y	Y	Y	>60% 'not at all'	
49	I feel left out when I use social media					Y	Y	Y	>60% 'not at all'	
50	I feel puzzled when I use social media					Y	Y	Y	>60% 'not at all'	
51	I feel sad when I use social media					Y	Y	Y	>60% 'not at all'	
52	I feel vulnerable when I use social media					Y	Y	Y	SD < 0.4	
53	I use social media to play games					Y	Y	Y	>60% 'not at all'	
54	I use social media to satisfy my curiosity about people who I don't know that well	Y	Y	>60% 'not at all'						
55	I use social media to share personal news with all of my online network	Y	Y	Similarity ratings						
56	I use social media to know what family or good friends are talking about	Y	Y	Similarity ratings						
57	I use social media to find people I haven't seen in a while	Y	Y	Similarity ratings						
58	I use social media to browse around people I don't know that well	Y	Y	>60% 'not at all'						
59	I use social media to have fun	Y	Y	Similarity ratings						
60	I use social media to get to know new people	Y	Y	SD < 0.4						
61	I use social media to find people with shared interests	Y	Y	>60% 'not at all'						
62	I use social media to discuss and debate with people who have similar interests to me	Y	Y	>60% 'not at all'						

Appendix 5 (continued)

No.	Item description	Pilot ^a	Excluded > Pilot analysis ^b	Excluded > pilot analysis (reason) ^c	Wording modified Pilot ^d	Added > pilot ^e	Main study ^f	Excluded > main analysis ^g	Excluded > main analysis (reason) ^h	Final Scale ⁱ
63	I use social media to check out the posts (e.g. photos, links, notes) of people who I don't know that well	Y	Y	>60% 'not at all'						
64	I use social media to learn about subjects I have an interest in	Y	Y	Similarity ratings						
65	I use social media to distract myself	Y	Y	>60% 'not at all'						
66	I use social media to strengthen ties with people I haven't seen in a while	Y	Y	Similarity ratings						
67	I use social media to say what's on my mind	Y	Y	>60% 'not at all'						
68	I use social media to get to know like-minded people	Y	Y	>60% 'not at all'						
69	I use social media to satisfy my curiosity about people who I used to know	Y	Y	>60% 'not at all'						
70	I use social media to know what's going on in my local area	Y	Y	Similarity ratings						
71	I use social media to keep in touch with family or good friends who I don't get to see very often	Y	Y	Similarity ratings						
72	I feel distressed when I use social media	Y	Y	>60% 'not at all'						
73	I feel excited when I use social media	Y	Y	>60% 'not at all'						
74	I feel upset when I use social media	Y	Y	>60% 'not at all'						
75	I feel strong when I use social media	Y	Y	>60% 'not at all'						
76	I feel guilty when I use social media	Y	Y	SD< 0.4						
77	I feel scared when I use social media	Y	Y	SD< 0.4						
78	I feel hostile when I use social media	Y	Y	SD< 0.4						

Appendix 5 (continued)

No.	Item description	Pilot ^a	Excluded > Pilot analysis ^b	Excluded > pilot analysis (reason) ^c	Wording modified Pilot ^d	Added > pilot ^e	Main study ^f	Excluded > main analysis ^g	Excluded > main analysis (reason) ^h	Final Scale ⁱ
79	I feel proud when I use social media	Y	Y	>60% 'not at all'						
80	I feel irritable when I use social media	Y	Y	>60% 'not at all'						
81	I feel ashamed when I use social media	Y	Y	SD < 0.4						
82	I feel nervous when I use social media	Y	Y	SD < 0.4						
83	I feel determined when I use social media	Y	Y	>60% 'not at all'						
84	I feel jittery when I use social media	Y	Y	SD < 0.4						
85	I feel active when I use social media	Y	Y	>60% 'not at all'						
86	I feel afraid when I use social media	Y	Y	SD < 0.4						

Notes:

Items were randomised (within motive and affect sections).

a = item included in pilot study (n = 63).

b = item excluded during analysis on pilot data (n = 33).

c = reason for item exclusion during analysis on pilot data: 1) standard deviation less than .4 ('SD < 0.4'); 2) More than 60% of participants did not endorse the item at all ('< 60% not at all'); 3) items were rated as highly similar by raters, in response to participant feedback that items were repetitive ('similarity ratings').

d = Wording modified based on feedback from participants/raters (n = 6). Original wording was: Item 2) To share news with family and good friends; Item 4) To share things (e.g. articles, pictures) with family or good friends; Item 20) To keep up with changes in the way the world and people communicate; Item 27) To follow groups or individuals that reflect my interests; Item 30) To be entertained; Item 32) To share my knowledge or opinions with all of my online network.

e = items added to measure for main study based on qualitative feedback from pilot participants (n = 23).

f = item included in main study (n = 53).

g = item excluded during analysis on main study data (n = 35).

h = reason for item exclusion during analysis on main study data: 1) standard deviation less than .4 ('SD < 0.4'); 2) More than 60% of participants did not endorse the item at all ('< 60% not at all'); 3) item contributing to multicollinearity in the data ('multicollinearity'); 4) Item loaded less than 0.4 in Exploratory Factor Analysis, indicating non-substantive loading ('Loading < 0.4, EFA')

i = item included in main study (n = 19).

Appendix 6: Final questionnaire including all measures

Notes:

-UCLA Loneliness, Social Isolation Index and Mini-IPIP labels omitted for participants.

-The format in which questionnaire appeared differed to that presented here as it was uploaded onto the PROTECT study platform.

Introduction

The following questionnaire is aimed at those people who use social media (e.g. Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, WhatsApp.....).

The following are **not** included under our definition of social media: Email, texting, or Skype.

If you do not use social media, you do not need to fill in this questionnaire

Part A: Internet and Email

We would like to ask you some questions about your use of the Internet and email.

1) On average, **how often** do you use the Internet or email?

- Less than once a month
- 1–3 times per month
- Once a week
- Several times a week
- Once a day
- 2-3 times a day
- More than 3 times a day

2) For which of the following activities did you use the Internet in the last 3 months? Tick all that apply

- Sending/receiving e-mails
- Telephoning over the Internet/video calls (via webcam)
- Searching for information for learning, research, fact finding
- Finances (banking, paying bills)
- Shopping/ buying goods or services
- Selling goods or services over the Internet
- Use social networking sites (Facebook, Twitter, Myspace)
- Creating, uploading or sharing content (Youtube, blogging or Flickr)
- News/ newspaper/ blog websites
- Streaming/ downloading live or on demand TV/radio (BBC iplayer, 4OD, ITV player, Demand 5) music (iTunes, Spotify), or ebooks
- Games

- Looking for a job or sending a job application
- Other
- None of the above

2b).....if 'Other', please specify here:

Part B: Social media use

We would like to ask you some questions about your use of **social media** (e.g. *Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, WhatsApp.....*).

1) What social media sites have you used in the last 6 months? Tick **all** that apply.

- Facebook
- Twitter
- Instagram
- LinkedIn
- Snapchat
- Tumblr
- Quora
- WhatsApp
- Other

1b)if 'Other', please specify here:

2) On average, **how often** do you use social media sites? (e.g. *Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, WhatsApp.....*)

- Less than once a month
- 1–3 times per month
- Once a week
- Several times a week
- Once a day
- 2-3 times a day
- More than 3 times a day

3) On average, **how long** do you spend on social media sites **per day**?

- Less than 10 minutes
- 10-30 minutes
- 31-60 minutes
- 1-2 hours
- 2-3 hours
- More than 3 hours

4) And which is your **main** social media site, the one you use **most** often?

- Facebook

- Twitter
- Instagram
- LinkedIn
- Snapchat
- Tumblr
- Quora
- WhatsApp
- Other

4b).....if 'Other', please specify here:

5) And **who** is part of your network on social media? (i.e. 'Friends', people you 'follow', 'connections'....). Tick **all** that apply.

- Family
- Friends (who I meet in person)
- Acquaintances (people I have met in person at least once)
- Current or past work colleagues
- People I have never met in person
- Members of groups I belong to
- Other

5b)if 'Other', please specify here:

Part C: Motives for using social media

INSTRUCTIONS: A number of statements are given below which describe people's reasons for using social media. Please think about **your reasons for using social media in the last month**. Please tick the appropriate statement, indicating **how much** you use social media for that reason. For example, if you use it 'Very much' for that reason, then you should tick 'Very much'.

Examples of social media include *Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, WhatsApp*.....

0	1	2	3	4
Not at all	A little	Moderately	Quite a bit	Very much

- 1) I use social media to communicate with people I haven't seen in a while
- 2) I use social media to look at family or good friends' photos
- 3) I use social media to share my news with family and good friends
- 4) I use social media to 'follow' groups or individuals that reflect my interests
- 5) I use social media to keep up with changes in the way people communicate
- 6) I use social media to stay connected with current or former work colleagues
- 7) I use social media to reconnect with people I've lost contact with

- 8) I use social media to browse around people I used to know
- 9) I use social media to know what family or good friends are up to
- 10) I use social media to share things (e.g. articles, photos) with family or good friends
- 11) I use social media to keep up to date with what's going on in the world
- 12) I use social media to let all of my online network know what I am up to
- 13) I use social media to explore my interests and/or hobbies
- 14) I use social media to play games
- 15) I use social media to share things of personal interest or amusement with all of my online network
- 16) I use social media to strengthen ties with acquaintances or casual friends
- 17) I use social media for a bit of entertainment
- 18) I use social media to pass the time when I'm bored
- 19) I use social media to express what I am thinking or feeling
- 20) I use social media to connect with the local community
- 21) I use social media to relax or unwind
- 22) I use social media to keep myself occupied
- 23) I use social media to keep up with news and current affairs
- 24) I use social media to communicate with acquaintances or casual friends
- 25) I use social media to get information or answers to my questions
- 26) I use social media to keep in touch with family or good friends
- 27) I use social media to keep up to date with groups
- 28) I use social media to share information or ideas with all of my online network
- 29) I use social media to check out the posts (e.g. photos, links, notes) of people I used to know
- 30) I use social media to update my profile and/or status
- 31) I use social media to learn from people who share the same interests as me

Part D: Feelings when using social media

INSTRUCTIONS: A number of statements are given below which describe how people may **feel** when they use social media. Please tick the appropriate statement, indicating **how much you feel this way when you use social media**. For example, if you feel 'Very much' that way when you use social media, then you should tick 'Very much'.

Examples of social media include *Facebook, Twitter, Instagram, LinkedIn, Snapchat, Tumblr, Quora, WhatsApp.....*

0	1	2	3	4
Not at all	A little	Moderately	Quite a bit	Very much

- 1) I feel amused when I use social media
- 2) I feel envious when I use social media
- 3) I feel interested when I use social media
- 4) I feel alert when I use social media
- 5) I feel frustrated when I use social media
- 6) I feel connected when I use social media
- 7) I feel pleasure when I use social media
- 8) I feel disappointed when I use social media
- 9) I feel attentive when I use social media
- 10) I feel curious when I use social media
- 11) I feel irritated when I use social media
- 12) I feel vulnerable when I use social media
- 13) I feel bored when I use social media
- 14) I feel inspired when I use social media
- 15) I feel puzzled when I use social media
- 16) I feel sad when I use social media
- 17) I feel enthusiastic when I use social media
- 18) I feel amazed when I use social media
- 19) I feel ambivalent when I use social media
- 20) I feel left out when I use social media
- 21) I feel concerned when I use social media
- 22) I feel enriched when I use social media

Part E (UCLA Loneliness scale)

Notes: *R = Reverse score*

INSTRUCTIONS: The next questions are about how you feel about different aspects of your life. For each one, please say how often you feel that way.

0	1	2	3
Never	Rarely	Sometimes	Often

- 1) How often do you feel that you are "in tune" with the people around you? (R)
- 2) How often do you feel that you lack companionship?
- 3) How often do you feel that there is no one you can turn to?
- 4) How often do you feel alone?
- 5) How often do you feel part of a group of friends? (R)
- 6) How often do you feel that you have a lot in common with the people around you? (R)
- 7) How often do you feel that you are no longer close to anyone?
- 8) How often do you feel that your interests and ideas are not shared by those around you?
- 9) How often do you feel outgoing and friendly? (R)
- 10) How often do you feel close to people? (R)
- 11) How often do you feel left out?
- 12) How often do you feel that your relationships with others are not meaningful?
- 13) How often do you feel that no one really knows you well?
- 14) How often do you feel isolated from others?
- 15) How often do you feel you can find companionship when you want it? (R)
- 16) How often do you feel that there are people who really understand you? (R)
- 17) How often do you feel shy?
- 18) How often do you feel that people are around you but not with you?
- 19) How often do you feel that there are people you can talk to? (R)
- 20) How often do you feel that there are people you can turn to? (R)

Part F (Social Isolation Index)

The next questions are about your relationships.

- 1) Do you have a husband, wife or partner with whom you live?
 - Yes
 - No

2) Do you have any children?

- Yes
 No

If you answered 'No', skip the rest of this question.

5a) On average, how often do you do each of the following with your children, not counting any who live with you?

- i. Meet up (include both arranged and chance meetings)
- ii. Speak on the phone
- iii. Write or email
- iv. Send or receive text messages

0	1	2	3	4	5
Three or more times a week	Once or twice a week	Once or twice a month	Every few months	Once or twice a year	Less than once a year or never

3) Do you have any other immediate family, for example, any brothers or sisters, parents, cousins or grandchildren?

- Yes
 No

If you answered 'No', skip the rest of this question.

6a) On average, how often do you do each of the following with any of these family members, not counting any who live with you?

- i. Meet up (include both arranged and chance meetings)
- ii. Speak on the phone
- iii. Write or email
- iv. Send or receive text messages

0	1	2	3	4	5
Three or more times a week	Once or twice a week	Once or twice a month	Every few months	Once or twice a year	Less than once a year or never

4) Do you have any friends?

- Yes
 No

If you answered 'No', skip the rest of this question.

7a) On average, how often do you do each of the following with any of your friends, not counting any who live with you?

- i. Meet up (include both arranged and chance meetings)
- ii. Speak on the phone

- iii. Write or email
- iv. Send or receive text messages

0	1	2	3	4	5
Three or more times a week	Once or twice a week	Once or twice a month	Every few months	Once or twice a year	Less than once a year or never

5) Are you a member of any of these organisations, clubs or societies?

Tick all that apply

- Political party, trade union or environmental groups
- Tenants groups, resident groups, Neighbourhood Watch
- Church or other religious groups
- Charitable associations
- Education, arts or music groups or evening classes
- Go to Social clubs
- Sports clubs, gyms, exercise classes
- Any other organisations, clubs or societies
- No, I am not a member of any organisations, clubs or societies

Part G (Mini IPIP & Sociability Scale)

Notes: E = extraversion; A = agreeableness; C = conscientiousness; N = neuroticism; I = intellect; S = sociability; R = Reverse score.

How would you describe yourself?

INSTRUCTIONS: The next questions are about how you would describe yourself. Please describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. For example, if you think the statement is a 'very accurate' description of you, then you should tick 'Very accurate'.

0	1	2	3	4
Very inaccurate	Moderately inaccurate	Neither accurate nor inaccurate	Moderately accurate	Very accurate

- 1) Am the life of the party. (E)
- 2) Sympathize with others' feelings (A)
- 3) Get chores done right away. (C)

- 4) Have frequent mood swings. (N)
- 5) Have a vivid imagination. (I)
- 6) Don't talk a lot. (E, R)
- 7) Am not interested in other people's problems. (A, R)
- 8) Often forget to put things back in their proper place. (C, R)
- 9) Am relaxed most of the time. (N, R)
- 10) Am not interested in abstract ideas. (I, R)
- 11) Talk to a lot of different people at parties. (E)
- 12) Feel others' emotions. (A)
- 13) Like order. (C)
- 14) Get upset easily. (N)
- 15) Have difficulty understanding abstract ideas. (I) (R)
- 16) Keep in the background. (E) (R)
- 17) Am not really interested in others. (A, R)
- 18) Make a mess of things. (C, R)
- 19) Seldom feel blue. (N, R)
- 20) Do not have a good imagination. (I, R)
- 21) Like to be with people (S)
- 22) Welcome the opportunity to mix socially with people (S)
- 23) Prefer working with others rather than alone (S)
- 24) Find people more stimulating than anything else (S)
- 25) Would be unhappy if I were prevented from making many social contacts (S)

Part H (Feedback)

Thank you for filling in this questionnaire. In order to improve the questionnaire in the future, we would now like to ask you the following **optional** questions. If you would prefer, you can skip to the next page to submit your questionnaire.

1) How easy was it to answer the questions?

- Very Difficult
- Difficult
- Neutral
- Easy
- Very Easy

Think back to Part C (motives for using social media).

2) How well did the questionnaire enable you to show a *true and complete picture* of your reasons for using social media?

- Not at all
- A little
- Moderately
- Quite a bit
- Very much

3) Do you have any other reasons for using social media that were *not* mentioned here?

Think back to Part D (feelings when social media use).

4) How well did the questionnaire enable you to show a *true and complete picture* of the feelings you experience when you use social media?

- Not at all
- A little
- Moderately
- Quite a bit
- Very much

5) Were there any other emotions or feelings that you experience during social media use that were *not* mentioned here?

5) If there is anything else you would like to tell us, please write in the space below. We will be very interested to read what you have to say.