Master Thesis

GO FOR (G)OLD

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Reducing loneliness among elderly with ICT

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Research question

To what extent can ICT support the elderly to reduce loneliness?

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ABSTRACT

Purpose: Many elderly are lonely and this has various mental and physical consequences. At the time of writing this master thesis, loneliness is an even more relevant problem because the COVID-19 pandemic forces many elderly to stay alone at home. Several studies show that Information and Communication Technologies (ICT) can prevent and reduce loneliness among the elderly. The present research looks at the important variables demographics, personal characteristics, and ICT usage to reduce loneliness among the people aged 55 and over (elderly).

Method: A survey was conducted to examine, with structural equation modelling, the direct and indirect effects of demographics, personal characteristics, and ICT usage on loneliness among the elderly.

Results: The results show that ICT skills, age, gender, marital status, living situation, extraversion, agreeableness, and neuroticism were important predictors of emotional and social loneliness. Additionally, the social loneliness among the elderly was higher than the emotional loneliness. To reduce loneliness with ICT, the determinants of ICT usage were also studied. The results show that age, openness to experience, neuroticism, and living situation are important predictors of ICT usage.

Conclusion: Overall, an important outcome of the present research is that loneliness is explained by a unique set of determinants. From previous research, it is known that demographics, personal characteristics, and ICT usage have an influence on loneliness. The present research adds value by dividing loneliness into emotional loneliness and social loneliness . Furthermore, the results substantiate that loneliness among the elderly can be reduced by using ICT as a tool. Elderly could use ICT to schedule offline appointments with friends and inform themselves about activities for lonely elderly.

Keywords: elderly, ICT usage, loneliness, big five personality traits

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1 INTRODUCTION

"I am alone all day. My children live far away. I have no friends here. That is sometimes difficult. You no longer hear your voice, only your thoughts." (van der Klauw, 2019, p.1). Joke van der Klauw is lonely. And she is not the only one. In the Netherlands, more than half of the elderly (people aged over 55 years) indicate that they feel lonely (Volksgezondheidenzorg, 2016). Among other things, they often miss close friends, experience an emptiness, lack socializing and someone to feel connected to. Loneliness usually does not arise overnight. It is a creeping process. Loneliness can happen to anyone: rich or poor, living in a big city or village, married or single (Ouderenfonds, 2019).

Chen & Schulz (2016) describe loneliness as the feeling of being alone and being isolated from 'the others'. Weiss' (1973) relational theory of loneliness divides the feeling of loneliness into emotional loneliness (e.g. experience a general sense of emptiness) and social loneliness (e.g. counting on friends). The consequences of loneliness can be disastrous. Loneliness increases blood pressure, stress level and the chance of depression (Ouderenfonds, 2019). Moreover, lonely elderly appear to be 14 percent more likely to die early than the average elderly. This means that the chance of early death in loneliness is twice as high as that of overweight (Volksgezondheidenzorg, 2016). Chen & Schulz (2016) suggest that Information Communication Technology (ICT) can be used to reduce loneliness. The Internet is able to overcome time and spatial restrictions, thus providing the opportunity for lonely people to improve their social networks (Bargh, McKenna, & Fitzsimons, 2002; Sum, Mathews, Pourghasem, & Hughes, 2008).

Much research about the relationship between loneliness among elderly and ICT has been conducted. Chen & Schulz (2016) performed a systematic review that included 25 relevant studies published between 2002 and 2015. This systematic review is used as the main input for the present research. All studies in this review involved reducing loneliness among elderly with ICT and included people aged 55 years or older. The review stated that the most predictive variables of loneliness are demographics (e.g. age, gender, living situation and education) and ICT usage (e.g. ICT skills and frequency of use). However, the used variables and the characteristics of the elderly (e.g. age categories) vary a lot among the reviewed studies, which caused different results for the effect on loneliness. Chen & Schulz (2016) concluded that ICT, in general, is a promising tool for tackling loneliness among the elderly, but it is not for every elderly. They proposed that additional research is required to identify which elderly can benefit the most from ICT. This would lead to the maximized effect of ICT on loneliness. In addition, Barnett, Pearson, Pearson, & Kellermanns (2015) stated in their research that ICT usage is linked to personal characteristics. Similarly, Barnet et al. (2015) proposed and included the big five personality traits as predictors of ICT usage. Also, studies showed that these personal traits (personal characteristics) are also linked to loneliness (Atak, 2009; Panda, 2016; Kao, 2012). Based on these studies, it is expected that demographics, ICT usage and personal characteristics have an influence on loneliness among the elderly.

The power of the present research is that the three important variables (demographics, ICT usage, and personal characteristics) influencing loneliness are included. Although much research about the relationship between loneliness among elderly and ICT has been done, to my knowledge, no research has been conducted which includes the three independent variables demographics, ICT usage and personal characteristics. Moreover, to my knowledge, no research takes into account the two different types of loneliness among the elderly: emotional and social loneliness. Thus, the present research adds value to offer insight into the most important variables influencing the two different types of loneliness.

The main goal of the present research is to find out to what extent ICT can support the elderly to reduce their loneliness. Based on this, the main research question is defined as follows: '*'To what extent can ICT support the elderly to reduce loneliness?*'' From an academic point of view, the present research is relevant because it offers a complete overview of all connections between the use of ICT and

the demographics and personal characteristics of the elderly. Below follows the theoretical framework. This section provides an overview on the different theories, concepts, and resulting hypotheses. In order to answer the research question, a quantitative study was performed, for which a survey was conducted.

2 THEORETICAL FRAMEWORK

Loneliness is the feeling of being alone and being isolated from other people (Weiss 1973). According to Weiss' (1973) relational theory of loneliness, there are two types of loneliness: emotional loneliness (e.g. experience a general sense of emptiness) and social loneliness (e.g. counting on friends). Distinguishing between these two different types of loneliness is important because someone who is socially lonely is not necessarily emotionally lonely. For example, a person can have a lot of friends he can count on, but he still feels lonely because he cannot have a deep conversation with his friends. In this case, the person is emotionally lonely and not socially lonely. However, to my knowledge, too little research has been done to propose hypotheses in this study on social and emotional loneliness. Thus, this theoretical framework studies loneliness in general and the analysis part of the present research divides loneliness into social and emotional loneliness.

To answer the research question, the outline of this theoretical framework consists of three parts. In the first part, the effect of ICT usage on loneliness is investigated. In the second part, the relationship between demographical aspects, ICT usage and loneliness is mapped. In the third part, the relation of personal characteristics, ICT usage and loneliness is investigated. Together, these three parts make a comprehensive research design.

2.1 ICT USAGE AND LONELINESS

The systematic review by Chen & Schulz (2016) was used as the main input for the theoretical framework. The review of Chen & Schulz (2016) included 25 relevant studies published between 2002 and 2015 that analysed the relationship of ICT and loneliness among people of 55 years and older. They were conducted in 12 countries (Austria, Canada, Finland, Israel, Netherlands, New Zealand, Norway, Slovenia, Sweden, Taiwan, United Kingdom, and the United States) with the highest number coming from the United States (N=9). The systematic review analysed the different types of ICT and the demographics of the elderly and their effect on loneliness. Although all 25 studies research the same relationship, the definition of the concept of loneliness varies substantially. For example, Heo, Chun, Lee, Lee, & Kim (2015) only studied social loneliness and Kahlbaugh, Sperandio, Carlson, & Hauselt (2011) linked loneliness to “not being connected with family, friends, and existing contacts.” In order to get a fuller understanding of loneliness, it was decided to use the definition of loneliness that includes both social and emotional loneliness.

This first part of the theoretical framework will focus on the effect of ICT usage on loneliness. Research about the effect of demographics on loneliness can be found in paragraph 2.2. Most of the reviewed studies by Chen & Schulz (N=20) focus on one specific type of ICT (e.g. search, email, online chat rooms, videoconferencing, social networking apps, and Web-based telehealth systems). Besides these studies focused on different types of ICT, the general conclusion was that elderly needed to have a solid base of ICT skills to use the ICT. Also, the reviewed studies concluded that the frequency of ICT use is related to loneliness. Namely, to eventually combat loneliness among the elderly with ICT, they require to have ICT skills so they know how to use the ICT. Also, to maintain relationships, Chen and Schulz (2016) suggest that the elderly have to use ICT frequently (Chen & Schulz, 2016). Thus, ICT skills and ICT frequency of use are important variables to predict loneliness among the elderly.

2.1.1 Skills

Knowing how to use ICT is of great value for the elderly. Having ICT skills enables the elderly to use ICT and ensures that they are less lonely, bored, helpless and it will help to increase their mental skills (Locher et al., 2005). Therefore, the success of ICT depends on the user's skills. According to Chen & Schulz (2016), ICT skills is the level of knowledge a person has about ICT. This knowledge involves, for example, that the person knows how to add contacts on his phone or how to send messages to a friend. The systematic review by Chen & Schulz (2016) concludes that ICT can be helpful for the elderly to reduce their loneliness if they have knowledge of how to use it.

Hypothesis 1: Higher ICT skills is negatively related to loneliness among the elderly.

2.1.2 Frequency

Elderly that frequently use ICT are less lonely. Chen & Schulz (2016) define the frequency of ICT use as the number of hours or days elderly spend on using a certain ICT. Cotten, Anderson, & McCullough (2013) analysed the effect of frequency of ICT use on the state of loneliness among the elderly. The results reveal that the frequency of using ICT has a negative influence on loneliness. Additionally, Nimrod (2010) stated that online relationships among the elderly are perceived as more shallow than relationships created in real life. However, online relationships will become more close and personal if the frequency of ICT use increases. Creating and/or maintaining close and personal online relationships will alleviate loneliness among the elderly (Nimrod, 2010). Hence, elderly who are frequently using ICT are less lonely.

Hypothesis 2: The frequency of ICT use is negatively related to loneliness among the elderly.

2.2 PREDICTORS OF ICT USAGE AND LONELINESS

In the second part of this framework, the effect of the demographics of the elderly on loneliness is investigated. The systematic review by Chen & Schulz (2016) is used as the main input for this part. The review by Chen & Schulz (2016) analysed different types of ICT (e.g. search, email, online chat rooms, videoconferencing, social networking apps, and Web-based telehealth systems) and the demographics of the elderly and their combined effect on loneliness. As the effect of ICT on loneliness is discussed in the previous part of this framework, this part will focus on the effect of demographics on loneliness.

Age, gender, marital status, living situation, and education are the demographics influencing loneliness among the elderly. Most demographic variables used in the present research are the ones proposed by Chen & Schulz (2016). The variable that Chen & Schulz (2016) used and will not be used in the present research is nationality. This is because this study will only be focused on Dutch-speaking elderly living in the Netherlands. All of the 25 reviewed studies by Chen & Schulz (2016) included the demographics age and gender. The use of the other demographics in the reviewed studies by Chen & Schulz (2016) varied. For example, only one study included educational level (Aarts, Peek, & Wouters, 2014). Also, Chen & Schulz did not mention marital status in their research. However, Rokach, Matalon, Rokach & Safarov (2007) stated that marital status has an influence on loneliness. Also, it is very logical to include this variable in the present research because it can be argued that the elderly in a relationship will be less likely to feel lonely since they are connected to at least one person. Thus, the variable marital status is added to the variables age, gender, living situation, and education used by Chen & Schulz (2016) and is expected to influence loneliness among the elderly.

2.2.1 Age

Loneliness increases with age. Yang & Victor (2011) stated that the relationship between age and loneliness is very clear. They explored the prevalence of loneliness across different age groups in 25 European nations, with a focus on the elderly. Their results suggest that the prevalence of loneliness does increase with age. Subsequently, according to Volksgezondheidenzorg (2016), 51 percent of the people with the age of 55 and over in the Netherlands feel lonely. This rises to 53 percent from the age

of 75 and from the age of 85 to almost 63 percent. Thus, the age of the elderly has an influence on their state of loneliness.

Hypothesis 3: Age of the elderly is positively related to loneliness.

The general opinion is that elderly have less ICT skills than the younger generation, as elderly did not have had exposure to ICT throughout their entire life (Chen & Schulz, 2016; Van Deursen, Van Dijk, & Peters, 2011). This will also affect their frequency of use. Less skilled elderly will use ICT less frequently because, in their case, communication via technology takes more effort than personal communication (Chen & Schulz, 2016). Thus, age negatively influences the ICT skills and ICT frequency of use of the elderly.

Hypothesis 4: Age of the elderly is negatively related to ICT skills.

Hypothesis 5: Age of the elderly is negatively related to ICT frequency.

2.2.2 Gender

Women are more lonely than men. According to Rokach, Matalon, Rokach, & Safarov (2007), elderly women typically have higher loneliness rates. Locher et al. (2005) confirms this result and adds that in terms of self-labelling, the elderly women more frequently than the elderly men admit being lonely. Of one of the different possible explanations of this difference in self-labelled loneliness, Locher et al. (2005) assume that social influence processes play a crucial role. They conducted an experiment, in which participants were presented with a case of a lonely person, which varied only the target person's sex. The participants were more rejecting of a lonely man than of a lonely woman. The researchers stated that the results support the view that women are more capable to acknowledge their loneliness than men because the negative consequences of admitting loneliness are less for women.

Hypothesis 6: Elderly women are more lonely than elderly men.

Elderly men have higher ICT skills than elderly women. Besides the fact that the elderly men and women do not differ extremely in their ICT abilities, research shows that the elderly men self-label their skills levels significantly higher than the elderly women (Hargittai & Shafer, 2006). Subsequently, elderly women are more likely to feel lonely and solve this by communicating with others online (Chen & Schulz, 2016). Thus, although women have lower ICT skills than men, they use ICT more frequently.

Hypothesis 7: Elderly men have higher ICT skills than elderly women.

Hypothesis 8: Elderly women have higher ICT frequency of use than elderly men.

2.2.3 Marital status

Unmarried elderly are more lonely than married elderly. According to Volksgezondheidenzorg (2016), 50 percent of the unmarried elderly are lonely and only 37 percent of the married elderly are lonely. Rokach et al. (2017) studied the feeling of loneliness among married and unmarried elderly. The results of Rokach et al. (2017) confirmed that married elderly are less lonely than unmarried elderly. Rokach et al. (2017) add that, despite the quality of the relationship, married elderly have a connection to someone and are not alone all the time. Thus, married elderly are less lonely than unmarried elderly.

Hypothesis 9: Married elderly are less lonely than unmarried elderly.

2.2.4 Living situation

The living situation has an influence on loneliness among the elderly. According to Chen & Schulz (2016), the elderly with an increased risk of becoming lonely include the elderly in a retirement home, at a supported accommodation, and residents of a care home. Locher et al. (2005), merges these different living situations and ultimately distinguishes between two groups of living situation: people in assisted living and people not in assisted living. The findings of Locher et al. (2005) confirm Chen & Schulz (2016) and conclude that elderly in assisted living are more likely to feel lonely than elderly not living in assisted living.

Hypothesis 10: Elderly in assisted living are more likely to feel lonely than elderly not living in assisted living.

2.2.5 Education

There is more loneliness among elderly with a low level of education. Aarts, Peek, & Wouters, (2014) studied the influence of educational level and the state of loneliness among the elderly. Their results show that the lower educated elderly (e.g. primary education, secondary education) are more lonely than the higher educated elderly (e.g. university). Also, according to Volksgezondheidenzorg, 2016), 63 percent of the low educated elderly are lonely, compared to 36 percent of the highly educated elderly (Volksgezondheidenzorg, 2016). Thus, lower educated elderly are more lonely than higher educated elderly.

Hypothesis 11: Greater loneliness among the elderly is associated with lower educational level.

Research explains that higher level of education results in a higher level of ICT skills (Hagittai, 2010; Van Deursen & Van Dijk, 2011; Gui & Argentin, 2011; Padilla-Góngora et al., 2017). Also, a higher educational level results in more potential of having a job in which ICT is used (Chen & Schulz, 2016). Habitat to frequently use ICT can be created during the working-life of the elderly. Thus, higher educated elderly are more likely to have or had a job in which they used ICT frequently and therefore created a habitat to communicate via ICT (Padilla-Góngora et al., 2017; Boss, Kang, & Branson, 2015). Thus, higher educated elderly have higher ICT skills and a higher ICT frequency of use than the lower educated elderly.

Hypothesis 12: A higher level of education of the elderly is positively related to ICT skills.

Hypothesis 13: A higher level of education of the elderly is positively related to ICT frequency.

2.3 PERSONAL CHARACTERISTICS

The third and last part of this theoretical framework focuses on the influence of personal characteristics on ICT usage and loneliness. The Big Five personality theory is the most widely used and best-researched personality theory to define personal characteristics (Kao, 2012). Years of worldwide psychological research shows that someone's personality can be described through five dimensions, the so-called Big Five (Atak, 2009). These five dimensions are Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (OCEAN). People can score high, low or somewhere in between per dimension (Atak, 2009). Combined, these five dimensions represent the personality of someone.

To my knowledge, no research has been done that investigates the relationships between personal characteristics and loneliness among the elderly. However, relevant research regarding this relationship has been done among other target groups. Table 1 provides an overview of the results of the studies investigating the relationship between the Big Five personality traits and loneliness. Unfortunately, the results of these studies vary a lot. This variation could exist because of different target groups and timeframes among the studies. Three relevant studies are used to propose hypotheses about the relationship between personal characteristics and loneliness. In the first research, Atak (2009) examined the association between the Big Five personality traits and loneliness among Turkish emerging adults (adults between the ages of 18 and 25). In the second research, Panda (2016) examined the personality traits and the feeling of loneliness among post-graduate university students. In the third and last research, Kao (2012) explored the relationships between personality traits, loneliness, and university students' EFL (English as a foreign language) achievement. Although there is variation in the results of the three different studies, there are also some confirming results, for example, the negative effect of agreeableness on loneliness.

Table 1
Results different studies of Big Five personality traits on loneliness

	Atak (2009)	Panda (2016)	Kao (2012)
Openness		-	
Conscientiousness		-	-
Extraversion	-		-
Agreeableness	-	-	-
Neuroticism	+		

Note: A '-' indicates a negative influence on loneliness and a '+' indicates a positive influence.

2.3.1 Openness to experience

There appears to be a negative relationship between loneliness and openness to experience (Panda, 2016). An individual who is high in openness to experience is likely someone who likes meeting new people (Atak, 2009). Panda (2016) adds to this that people who are high in loneliness generally tend to be critical of new experiences. Those low in openness to experience prefer routine over variety and stick to what he or she knows, which is why people scoring low on openness to experience tend to be high on the loneliness scale (Atak, 2009; Panda, 2016). Thus, people low in openness to experience are more lonely than people high in openness to experience.

Hypothesis 14: Openness is negatively related to loneliness among the elderly.

Openness to experience concerns people's willingness to try new things, their ability to be vulnerable, and their capability to think outside the box. Openness is connected to a strong motivation to learn, and with a learning goal orientation (Payne, Youngcourt, & Beaubien, 2007). Individuals scoring high on openness to experience are also more eager to engage in new and learning-oriented experiences (Laidra, Pullmann, & Allik, 2007). Because ICT often requires active learning, people with more openness to experience have more ICT skills because they are more willing to learn (Barnet et al., 2015). McElroy et al. (2007) add that people high in openness to experience have a high frequency of ICT use because they are more entrepreneurial and will use ICT more often. Thus, people high in openness to experience have more ICT skills and use ICT more frequently than people low in openness to experience.

Hypothesis 14: Openness is positively related to ICT skills of the elderly.

Hypothesis 16: Openness is positively related to ICT frequency of the elderly.

2.3.2 Conscientiousness

There is evidence that there is a negative relationship between loneliness and conscientiousness (Panda, 2016; Kao, 2012). Conscientiousness is the personality trait of being careful, or diligent. Conscientious people are very careful in creating new connections and they are also very good at maintaining them (Thompson, 2008). People low in loneliness are often very good at maintaining close relationships (Atak, 2009). Thus, conscientious people are less likely to be lonely.

Hypothesis 17: Conscientiousness is negatively related to loneliness among the elderly.

Conscientious people excel in their ability to delay gratification, work within the rules, and plan and organize effectively (Atak, 2009). Conscientiousness involves thoroughness, dependability, responsibility, and achievement orientation. The results of research conducted by Hurtz & Donovan (2000) showed a relationship between conscientiousness and task proficiency in a different context. He stated that individuals who have high conscientiousness generally perform better. Also, according to Major Turner & Fletcher (2006), conscientiousness is linked to the motivation to learn. They explain this by the fact that a conscientious individual will set clear goals to perform certain behaviour that will help them succeed, and this is related to a higher ICT skills (Barnet et al., 2015). Subsequently, because conscientious people are high in consistency, they will have a higher frequency of ICT use. Conscientious people will use ICT more often than non-conscientious people the chance that

conscientious people turn ICT into a habit (which increases the frequency of use) is greater because they are consistent and self-disciplined (Barnet et al., 2015).

Hypothesis 18: Conscientiousness is positively related to ICT skills of the elderly.

Hypothesis 19: Conscientiousness is positively related to ICT frequency of the elderly.

2.3.3 Extraversion

Extraversion is negatively correlated with loneliness (Atak, 2009; Kao, 2012). An extrovert person is often known as more enthusiastic than a non-extrovert person. Generally, extroverts draw energy from or recharge by interacting with other people, while introverts get tired from interacting with others and replenish their energy with solitude (Kao, 2012). People high in extraversion tend to seek out opportunities for social interaction (Atak, 2009). This means that extroverted people will get in touch and stay in touch with people more often. Therefore, extraverted are less lonely (Kao, 2012).

Hypothesis 20: Extraversion negatively correlates with loneliness among the elderly.

Sociability, assertiveness, and gregariousness are characterized by extraversion (Barnett et al., 2015). According to Payne et al. (2007), extraversion has assertive characteristics and is associated with the motivation to learn and learning goal orientation. They added that extraverts are more likely to gain access to different information sources and ask for help when needed, and this will further increase their ICT skills. Also, extroverts draw energy from or recharge by interacting with others while introverts get tired from interacting with others and replenish their energy with solitude (Atak, 2009; Panda, 2016). Therefore, extraverted people will have a higher frequency of ICT usage.

Hypothesis 21: Extraversion is positively related to ICT skills of the elderly.

Hypothesis 22: Extraversion is positively related to ICT frequency of the elderly.

2.3.4 Agreeableness

There is some evidence that loneliness is negatively related to agreeableness (Atak, 2009; Panda, 2016; Kao, 2012). Agreeable individuals attach many values to getting along with others (Panda, 2016). Also, agreeable people have an optimistic view of human nature (Kao, 2012). Agreeable people are better liked than disagreeable people (Panda, 2016). Since agreeable people have an optimistic view of others, they are generally less lonely than disagreeable people.

Hypothesis 23: Agreeableness negatively correlates with loneliness among the elderly.

Agreeableness is characterized by kindness, good-naturedness, trust, and tolerance (Barnett et al., 2015). Besides the fact that agreeableness is associated with a learning goal orientation, Payne et al. (2007) state that agreeableness seems not to contribute to a stronger motivation to learn. Also, previous research (McElroy et al., 2007; Svendsen et al., 2013) have not found that agreeableness significantly impacts ICT frequency of use. As a result, because agreeableness does not appear to foster a strong motivation to learn and there seems to be no relationship to ICT frequency of use, a relationship between agreeableness and ICT skills / ICT frequency is not hypothesized.

2.3.5 Neuroticism

Neuroticism positively correlates with loneliness. Individuals who score high on neuroticism are more likely than average to be moody and to experience such feelings as anxiety, worry, fear, anger, frustration, envy, jealousy, guilt, depressed mood, and loneliness (Thompson, 2008). Because those high in neuroticism are less likely to feel confident, they are less likely to search for new connections. Also, because neuroticism involves jealousy, moodiness and oversensitivity, people high in neuroticism are more likely to fight with their friends and family. These quarrels can break relationships, which increases loneliness (Atak, 2009). Thus, people high in neuroticism are more lonely than people low in neuroticism.

Hypothesis 24: Neuroticism is positively related to loneliness among the elderly.

According to Barnett et al. (2015), neuroticism is the extent to which a person is anxious, angry, depressed, worried, embarrassed, emotional, and insecure. Major et al. (2006) state that a neurotic individual is not expected to seek out opportunities to learn new things, because of their commonly negative influence and expectations. Thus, those high in neuroticism will have lower ICT skills. Devaraj, Easley, & Crant (2008) add to this that neurotic individuals view technology as threatening and stressful, and to have commonly a negative thought when considering using it. This will cause people high in neuroticism to have a lower frequency of ICT use than people low in neuroticism.

Hypothesis 25: Neuroticism is negatively related to ICT skills of the elderly.

Hypothesis 26: Neuroticism is negatively related to ICT frequency of the elderly.

2.4 RESEARCH DESIGN

In conclusion, the most important aspects influencing loneliness are (1) ICT usage (ICT skills and ICT frequency), (2) demographics (age, gender, marital status, living situation and education), and (3) personal characteristics (openness, conscientiousness, extraversion agreeableness, and neuroticism). In line with the existing literature, the effect of these three aspects is examined. In order to clarify the theoretical framework, Figure 1 gives an impression of the relationship between the different variables of the present research, including the hypotheses.

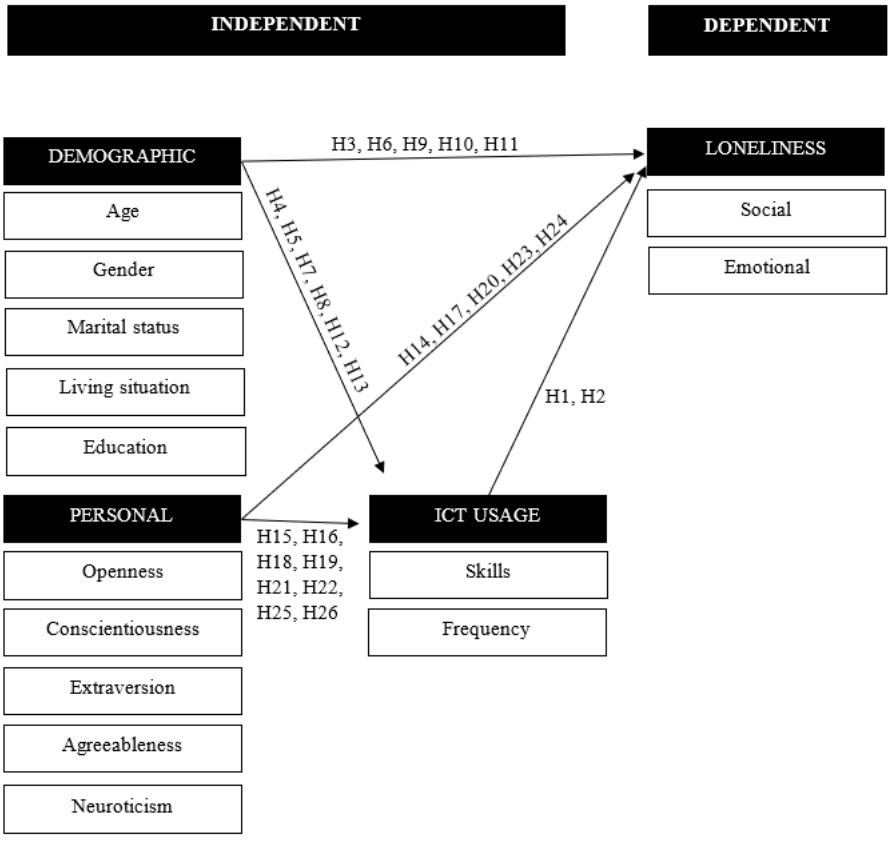

Figure 1 Research model

3 METHOD SECTION

In this chapter, the methods of the present research will be clarified. The participants and the procedure will be described followed by the measures of the variables used in the present research and the description of the analysis.

3.1 PARTICIPANTS AND PROCEDURE

The survey in the present research is aimed at a broad ranch of elderly with the age of 55 and older via three different procedures. The different distribution procedures of the survey have ensured that a broad group of elderly is reached. First, the survey was promoted through calls in various Facebook groups. These groups were mainly supply and demand groups, such as Weggeefhoek038 and MarktplaatsvanhetOosten. This resulted in mostly participants with high ICT usage and an age between 55 and 65 years. Second, the survey was distributed via email in cooperation with Seniorweb.nl. This distribution was aimed at people with the age of 65 and older. Because Seniorweb.nl knew the ICT skills of their participants, they were able to aim the distribution of the survey on people with lower ICT skills. Last, the survey was distributed to people living in retirement homes or at a supported accommodation (assisted living). Due to the COVID-19 pandemic, it was not possible to visit these group participants. It was therefore chosen to print out the surveys and deliver them to the participants via their letterbox. Respondents were then able to return their completed surveys to a familiar address nearby. This method was also used to reach respondents without any online experience. Together, these three distribution procedures resulted in a broad range of participants.

The survey was distributed from March 27 to April 15. The survey started with asking for approval for taking the survey and validation to determine that the participant is 55 years or older. Answering these two questions with 'yes' was required to participate in this survey. The survey consisted of three parts. In the first part, questions about the demographics and the ICT use of the participants was asked. In the second part, questions were asked about their personal characteristics. Because these questions consisted of 30 items, this part was divided into 3 subparts, to keep the respondent's attention. In the third part, questions were asked to determine the state of loneliness of the participant. After completing the third part, the participant was able to leave his email address or phone number to have a chance to win one of the five vouchers of 20 euros that were raffled among the respondents.

In total, 281 participants filled in the survey. With 53 percent, the majority (N=149) of respondents were male and the rest (N=132) were female. The age of the respondents varied from 55 to 100 years, with a mean age of 71 years (SD=9.61). Table 2 represents an overview of the participants' living situation, their mean age, and their mean ICT skills per survey distribution method. The table confirms that participants approached via Facebook have a lower age than the other distribution methods. Participants approached via Seniorweb.nl have a higher age than the other survey distributions and lower ICT skills. Also, participants approached via their letterbox mainly live in assisted living. Thus, the three distribution procedures ensured to reach a specific group of elderly to create a broad range of participants.

Table 2
Participants per distribution procedure

Survey distribution	Participants (N)	Living situation	Mean age	Mean ICT skills
Facebook	121	Own home (N=117)	62 (SD= 7.91)	23.89 out of 25 (SD=3.23)
Seniorweb.nl	129	Own home (N=126)	76 (SD=8.24)	16.21 out of 25 (SD=6.21)
Letterbox	31	Assisted living (N=21)	83 (SD=9.34)	19.24 out of 25 (SD=6.11)

3.2 MEASURES

This paragraph describes the measurements of the variables of the present research. The variables of the present research were measured with a Dutch survey, which is enclosed in Appendix II. Table 3 provides an overview of the used variables, their measurement and the number of items with the Cronbach's Alpha.

Demographic

The demographic variables age, gender, marital status, living situation, and education are measured on the basis of a combination of open and multiple-choice questions.

ICT usage

The variable ICT usage consists of ICT skills and ICT frequency. Both variables are measured on a 5-point Likert Scale. ICT skills is measured with five statement questions proposed by van Deursen, Helsper, & Eynon (2015) to measure Internet communication skills. ICT frequency is the mean of eight statement questions asking about the frequency of use of the following ICT: Social media, SMS, Whatsapp, Email, videocall, calling, online games and online chatting.

Personal characteristics

The personal characteristics Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism are measured with the Quick Big Five (QBF) on the basis of the 5-point Likert Scale (Vermulst & Gerris, 2005). The QBF is a self-report questionnaire. This questionnaire contains 30 adjectives nouns, six for each Big Five trait (Vermulst & Gerris, 2005).

Loneliness

The state of the dependent variable loneliness of the elderly is measured with the De Jong Gierveld Loneliness Scale (de Jong Gierveld & van Tilburg, 1999). The scale consists of 11 items; six are formulated negatively and five are formulated positively. As de Jong Gierveld & van Tilburg (1999) suggested, the variables are measured on a 5-point Likert Scale. The use of this model enables to divide loneliness into social and emotional loneliness, based on the matching items. The De Jong Gierveld Loneliness Scale has a maximum score of 11, with higher scores indicating greater loneliness (De Jong Gierveld & Van Tilburg, 1999). The maximum score for emotional loneliness is 6 and the maximum score for social loneliness is 5.

Table 3
Measured variables and constructs

Variable	Measurement	Example item	Total items (N)	Mean (SD)	Range	Cronbach's Alpha
ICT						
Skills	5-point Likert Scale	I know how to remove friends from my contact lists	5	19.18 (3.56)	15	.91
Frequency	5-point Likert Scale	How often do you use the following ICT?	8	24.57 (6.23)	28	.69
Demographic						
Age	Open question / in years	How old are you?	-	71.11 (9.61)	45	-
Gender	Female / male	What is your gender?	-	-		-
Marital status	Multiple-choice	What is your marital status?	-	-		-
Living situation	Multiple-choice	Where do you live?	-	-		-
Education	Multiple-choice	What is your highest educational level?	-	-		-
Personal						
Openness	5-point Likert Scale	I am someone who comes up with new ideas.	6	19.83 (3.58)	18	.74
Conscientiousness	5-point Likert Scale	I am someone who does things efficiently.	6	20.80 (3.85)	19	.83
Extraversion	5-point Likert Scale	I am someone who has been held back	6	20.47 (3.16)	17	.85
Agreeableness	5-point Likert Scale	I am someone who argues quickly	6	23.03 (2.93)	16	.83
Neuroticism	5-point Likert Scale	I am somebody down.	6	13.05 (3.23)	15	.84
Loneliness						
Emotional	5-point Likert Scale	I often feel rejected	6	1.66 (1.80)	6	.81
Social	5-point Likert Scale	There are enough people I feel close to	5	2.34 (1.75)	5	.86

Note: Items were asked in Dutch

The constructs in Table 3 confirm sufficient internal consistency. This experiment consisted of nine constructs: emotional loneliness, social loneliness, openness, conscientiousness, extraversion, agreeableness, neuroticism, ICT skills, and ICT frequency. To confirm internal consistency, the Cronbach's Alpha of the constructs was calculated in Table 3. A construct is reliable if the alpha is .70 or higher. The table with the Cronbach's Alpha for each of the nine constructs is enclosed in Appendix I. These constructs have an alpha varying from .69 to .91. Because all the Alpha scores are higher than or very close (α = .69) to .70, it confirms sufficient internal consistency.

3.3 ANALYSE

The analysis of the data was done after the survey had a sufficient amount of completes. Structural equation modelling using IBM SPSS Amos 20.0 was applied to test the hypotheses and the relations presented in the conceptual model. According to Hair (2006), a multivariate data analysis includes the following indices of the fit: the X^2statistic, the ratio of X^2 to its degree of freedom X^2 /df), the standardized root mean residual (SRMR), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). These indices were used to confirm the fit of the model. To achieve an acceptable model fit, the following items were included: X^2 -statistic, the ratio of $x^2$to its degree of freedom (x^2 /df), the standardized root mean residual (SRMR < .08), the Tucker-Lewis index (TLI > .90), comparative fit index (CFI > .95), and the root mean square error of approximation (RMSEA < .06; Hair, 2006).

4 RESULTS

Within this section of this paper, the results of the research are shown. First, a model is shown that fits the data. Afterwards, the hypothesis will be analysed and conclusions will be drawn.

4.1 PATH MODEL

Before testing the hypothesizes paths, covariates among and between the demographic and personal variables were added. The original conceptual model, which was presented in Figure 1 (paragraph 2.4), did not fit the results: CMIN = 133.86, *df* = 32, $p < .001$, CMIN/DF = 4.18; TLI = .570; CFI = .85; LO 90 = .09; HI 90 = .126; RMSEA = .11. The model has been modified by adding paths between the independent variables:

- age and marital status
- gender and marital status
- neuroticism and marital status
- age and living situation
- gender and living situation
- education and openness
- education and gender

The adapted model is presented in Figure 2. The striped lines are the seven correlations that have been added to the original conceptual model to achieve an extensive model fit. Although there were no hypotheses composed about the correlations presented in the adapted model, these correlations are valuable to add. For example, it is likely that elderly living in assisted living have a higher age than the elderly not living in assisted living. Besides these correlations not directly answer the research question of the present research, they give an overview of all the relations in this model.

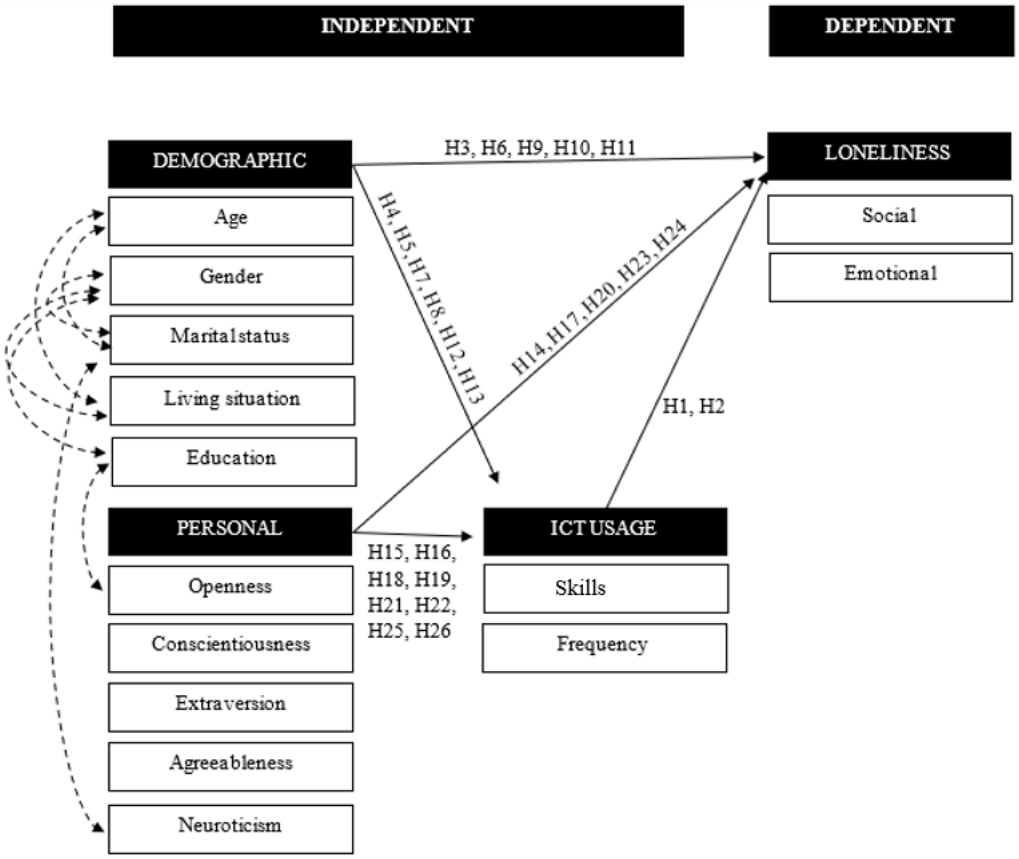

Figure 2 Adapted model

The fit results of the adapted model are as follows: CMIN = 37.08, *df* = 25, $p < .057$, CMIN/DF = 1.48; TLI = .935; CFI = .982; LO 90 = .00; HI 90 = .07; RMSEA = .04; SRMR = 0.05. Table 4 presents the correlations between the variables. Figure 3 is based on the conceptual model and provides the path models with the indicated coefficients and the R-squared.

Table 4
Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Skills	-	.54*	-.42*	.10	-.10	-.32*	-.01	.27*	.01	.14*	.18*	-.23*	-.08	-.07
2. Frequency	-	-	-.54*	.19*	-.08	-.30*	-.02	.20*	-.06	.13*	.13*	-.03	-.03	-.16*
3. Age	-	-	-	-.35*	.16*	.30*	.03	-.07	.00	-.19*	-.15*	.08	.03	.25*
4. Gender	-	-	-	-	.27*	.08	-.07	.10	-.02	.09	.22*	-.02	.07	-.24*
5. Marital status	-	-	-	-	-	-.06	.02	.03	.16*	.01	-.01	.16*	-.21*	-.09
6. Living situation	-	-	-	-	-	-	.08	-.04	0.1	-.07	-.03	-.03	.01	-.05
7. Education	-	-	-	-	-	-	-	.23*	.00	.07	-.06	-.11	-.07	-.01
8. Openness	-	-	-	-	-	-	-	-	.07	.11	.26*	-.07	-.10	-.12*
9. Conscientiousness	-	-	-	-	-	-	-	-	-	-.11	.15*	.06	.04	-.08
10. Extraversion	-	-	-	-	-	-	-	-	-	-	.10	-.44*	-.28*	-.30*
11. Agreeableness	-	-	-	-	-	-	-	-	-	-	-	-.09	-.13*	-.29*
12. Neuroticism	-	-	-	-	-	-	-	-	-	-	-	-	.25*	.23*
13. Emotional	-	-	-	-	-	-	-	-	-	-	-	-	-	.55*
14. Social	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: correlations are significant at $p < .05$ level and indicated with *.

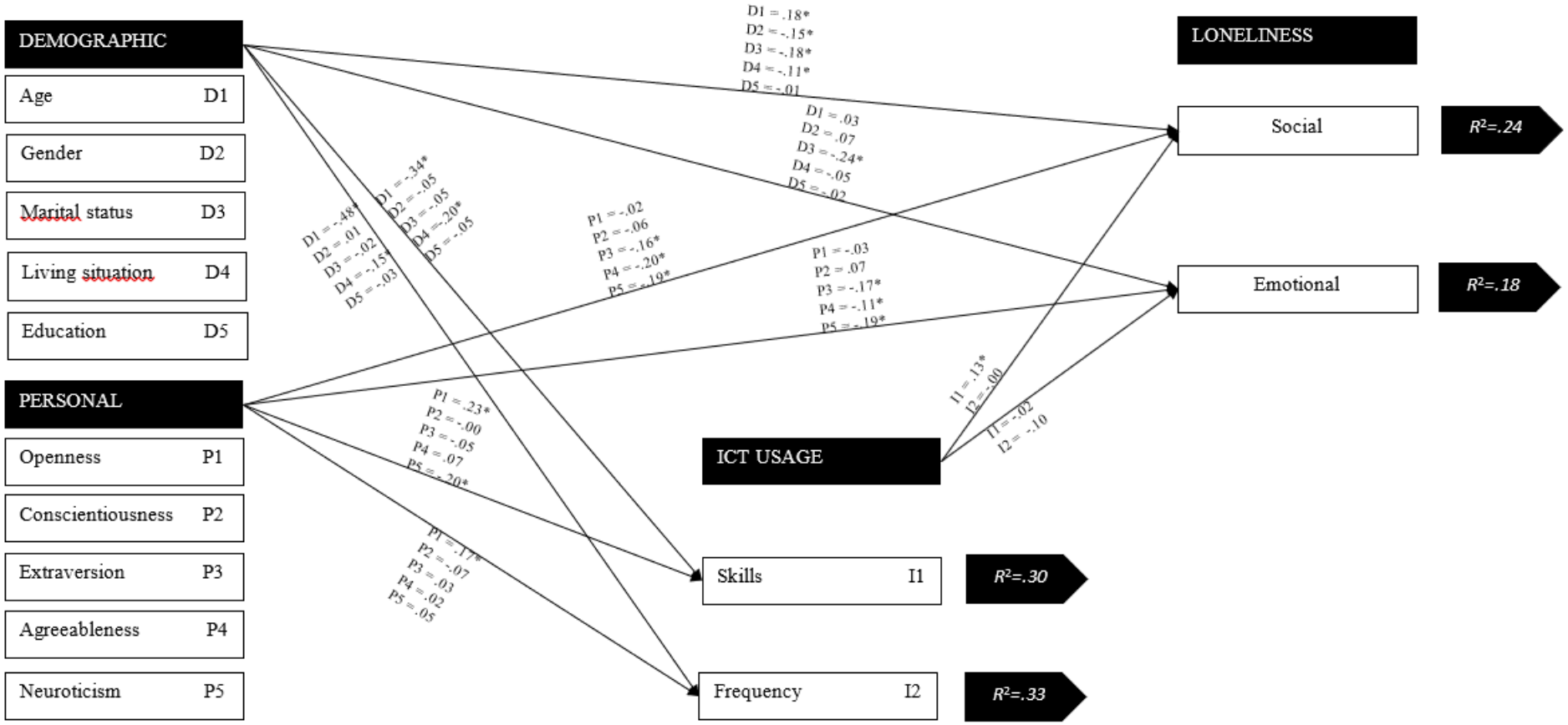

Figure 3. *Results for the research model with path coefficients.* Note: effects are significant at $p < .05$ level and indicated with *. The dotted lines are non-significant paths.

4.2 HYPOTHESES ANALYSIS

The standardized path coefficients in Figure 3 explain various significant direct and indirect effects between demographics, personal characteristics, ICT usage and loneliness. Tables 5 and 6 give an overview of the validation of the hypotheses.

As can be seen in Table 5, five out of thirteen hypotheses are (partly) confirmed. It was expected that ICT skills negatively influences loneliness. Therefore, hypothesis 1 is rejected because it showed that ICT skills positively influences social loneliness. Influence of ICT frequency on loneliness was not found, thus rejecting hypothesis 2. Age has a direct positive influence on social loneliness. This means that the oldest elderly are more socially lonely than the youngest elderly. However, age has a negative indirect effect via ICT skills on social loneliness. This means that the oldest elderly with higher ICT skills are less socially lonely than the youngest elderly with lower ICT skills. These results partly confirmed hypothesis 3. Subsequently, age has a negative influence on ICT skills and ICT frequency, thus confirming hypothesis 4 and 5. Hypothesis 6 is partly confirmed because gender only showed a negative influence on social loneliness. Gender does not have an influence on both ICT skills and ICT frequency. Hypotheses 7 and 8 are therefore rejected. Hypothesis 9 is confirmed: marital status negatively influences emotional and social loneliness. Living situation negatively influences social loneliness directly and indirectly. However, it was hypothesized that people in assisted living would be more lonely than people not living in assisted living. Thus, hypothesis 10 is rejected. The educational level does not have an influence on loneliness, ICT skills and ICT frequency. Hypothesis 11, 12, and 13 are therefore rejected.

As can be seen in Table 6, six out of thirteen hypotheses are confirmed. Openness to experience does not have an influence on loneliness, thus hypothesis 14 is rejected. However, Openness to experience does have a positive influence on ICT skills and ICT frequency. These results confirmed hypothesis 15 and 16. Conscientiousness does not influence any of the hypothesized variables: loneliness, ICT skills and ICT frequency. Thus, hypotheses 17, 18, and 19 are rejected. The results showed that the more extravert a person is, the less lonely he will be. Because extraversion has a negative influence on both social and emotional loneliness, hypothesis 20 is confirmed. However, extraversion does not influence ICT skills and ICT frequency. These results rejected hypothesis 21 and 22. The analysis showed that the more agreeable a person is, the less lonely he will be. Thus, agreeableness negatively influences emotional and social loneliness and hypothesis 23 is confirmed. Hypothesis 25 is also confirmed because neuroticism shows a positive influence on emotional and social loneliness. Neuroticism also has an influence on ICT skills. The higher the neuroticism of a person is, the lower their ICT skills will be. Thus, hypothesis 25 is confirmed. However, neuroticism did not show an influence on ICT frequency, which rejected hypothesis 26.

Table 5

Significant direct, indirect, and total effects of ICT skills, ICT frequency, age, gender, marital status, living situation, and educational level on loneliness.

	Direct effects β	Indirect effects β	Total effects β	Conclusion
H1 | ICT skills - Loneliness				Rejected
Emotional Loneliness	-	-	-	
Social Loneliness	.13	-	.13	
H2 | ICT Frequency - Loneliness				Rejected
Emotional Loneliness	-	-	-	
Social Loneliness	-	-	-	
H3 | Age – Loneliness				Partly confirmed
Emotional Loneliness	-	-	-	
Social Loneliness	.18	-.04	.14	
H4 | Age – ICT skills	- .34	-	- .34	Confirmed
H5 | Age – ICT Frequency	- .48	-	- .48	Confirmed
H6 | Gender - Loneliness				Partly confirmed
Emotional Loneliness	-	-	-	
Social Loneliness	- .15	-	- .15	
H7 | Gender – ICT skills	-	-	-	Rejected
H8 | Gender – ICT Frequency	-	-	-	Rejected
H9 | Marital status - Loneliness				Confirmed
Emotional Loneliness	- 24	-	- 24	
Social Loneliness	- 18	-	- 18	
H10 | Living situation - Loneliness				Rejected
Emotional Loneliness	-	-	-	
Social Loneliness	- .11	-.03	- .14	
H11 | Educational level - Loneliness				Rejected
Emotional Loneliness	-	-	-	
Social Loneliness	-	-	-	
H12 | Educational level – ICT skills	-	-	-	Rejected
H13 | Educational level – ICT Frequency	-	-	-	Rejected

Note: effects are significant at $p < .05$ level.

Table 6
Significant direct, indirect, and total effects of openness, conscientiousness, extraversion, agreeableness, and neuroticism on ICT skills, ICT frequency and loneliness.

	Direct effects β	Indirect effects β	Total effects β	Conclusion
H14 | Openness - Loneliness				Rejected
Emotional Loneliness	-	-	-	
Social Loneliness	-	-	-	
H15 | Openness – ICT skills	.23	-	.23	Confirmed
H16 | Openness – ICT Frequency	.17	-	.17	Confirmed
H17 | Conscientiousness - Loneliness				Rejected
Emotional Loneliness	-	-	-	
Social Loneliness	-	-	-	
H18 | Conscientiousness – ICT skills	-	-	-	Rejected
H19 | Conscientiousness – ICT Frequency	-	-	-	Rejected
H20 | Extraversion - Loneliness				Confirmed
Emotional Loneliness	- .17	-	- .17	
Social Loneliness	- .16	-	- .16	
H21 | Extraversion – ICT skills	-	-	-	Rejected
H22 | Extraversion – ICT Frequency	-	-	-	Rejected
H23 | Agreeableness – Loneliness				Confirmed
Emotional Loneliness	-.11	-	-.11	
Social Loneliness	- .20	-	- .20	
H24 | Neuroticism - Loneliness				Confirmed
Emotional Loneliness	.19	-	.19	
Social Loneliness	.19	-	.19	
H25 | Neuroticism – ICT skills	- .20	-	- .20	Confirmed
H26 | Neuroticism – ICT Frequency	-	-	-	Rejected

Note: effects are significant at $p < .05$ level.

5 DISCUSSION

The final section of the present research contains the discussion, which reflects on the present research and it provides suggestions for follow-up research.

5.1 DISCUSSION

The present research investigated how ICT can reduce loneliness among the elderly. The academic relevance of this research can be found in its usage of multiple important variables. It focussed on how demographics, ICT usage and personal characteristics influence emotional and social loneliness among the elderly. This research reasons which elderly are more lonely and which elderly are better able to use ICT to reduce their loneliness.

It was found that ICT skills, age, gender, marital status, living situation, extraversion, agreeableness, and neuroticism were important predictors of emotional and social loneliness. Additionally, the social loneliness among the elderly was higher than the emotional loneliness. Important predictors of ICT usage are age, openness, neuroticism and living situation.

Fit previous and present research

Not all hypotheses of the present research are supported and in line with the systematic review of Chen & Schulz (2016). For instance, it was expected that educational level has an influence on ICT usage and loneliness. In the present research, it appears to be that educational level does not have a relationship with one of the two variables. The variable educational level was measured with the highest achieved diploma of the elderly. A diploma is usually obtained around the age of 20. Elderly aged 55 years and older obtained this diploma decades ago and their level of knowledge may have changed over the years due to various circumstances (Yang, K., & Victor, 2011). This could explain why the educational level does not have a relationship with loneliness. Future research could measure the intelligence of the elderly with, for example, their IQ. Additionally, the variable living situation showed the opposite of what was expected. First, it was expected that people living in assisted living are more lonely than elderly not living in assisted living. However, the results showed the opposite: the elderly living in assisted living are less lonely than elderly not living in assisted living. Willems, Spreeuwenberg, Rietman, and de Witte (2012) explain that this could be because elderly living in assisted living have someone to talk to, such as a caregiver, and activities are often organized. Second, a relationship between ICT skills and living situation was not hypothesized. Nonetheless, the present research showed that elderly living in assisted living have fewer ICT skills and use ICT less frequently.

Previous research conflict with each other and proposed different relationships regarding the effect of OCEAN personal characteristics on loneliness and ICT usage (Panda, 2016; Atak, 2009; Kao, 2012; Laidra, Pullmann, & Allik, 2007). The findings of the present research correspond with the results of Atak (2009) and showed that only extraversion, agreeableness, and neuroticism have an influence on loneliness. Besides some inconsistencies, the present research confirms the predictors of ICT usage are age, living situation, openness to experience, and neuroticism. The predictors of loneliness are ICT skills, age, gender, marital status, living situation, extraversion, agreeableness, and neuroticism. Hence, the present research fits partially with some previous studies.

The results of the present research show that elderly with higher ICT skills are more lonely than elderly with lower ICT skills. The more knowledge an elderly person has about ICT, the more lonely he will be. This result of the present research is the opposite of what was expected. Namely, it was expected that the elderly with higher ICT skills are less lonely. In my opinion, making ICT experts of the elderly and force them to use their mobile phone for hours a day will not reduce their loneliness. Elderly are used to fulfil their loneliness offline by meeting their friends face-to-face their whole life (Yang, K., & Victor, 2011). In my opinion, an effective way to reduce the loneliness of the elderly with ICT is to use it as a tool. ICT can be used to make offline appointments and to be aware of meetings in the area.

Implications

The results of the present research show that neither the elderly's skills of ICT nor the frequency of using ICT reduce loneliness among the elderly. In my view, heavily using ICT to, for instance, connect and talk with others online will therefore not reduce loneliness among the elderly. However, ICT can be used as a tool to get in touch offline. Namely, besides most elderly have a solid base of ICT skills, they are not aware of the possibilities and do not make an appointment via ICT to meet their friends or family (Cotten, Anderson, & McCullough,2013). The elderly sometimes have friends living nearby but they can only contact them with a personal visit. ICT can be used to let the elderly easily and quickly make an appointment to meet a friend or family member offline. Marketers should make the elderly aware of the possibilities of ICT and they should encourage elderly to use ICT to meet their friends and family offline. With ICT, the elderly will be able to stay in touch with their friends and family. Contact via ICT is mainly superficial and it ensures that the elderly can mainly maintain their network (Dahlberg & McKee, 2013). Therefore, ICT will mainly reduce social loneliness among this group of elderly people (Weiss, 1973; Dahlberg & McKee, 2013).

The present research provides insight into the target group for ICT to reduce loneliness among the elderly. ICT should be aimed at a group of elderly who are, based on their demographics and personal characteristics, more likely to be lonely. Based on the results of the present research, this group consists of elderly women with a higher age, a higher ICT skills, and are not in a relationship or living in assisted living. Additionally, these women score low in extraversion, low in agreeableness and high in neuroticism. This information is valuable for social workers because they have insight into the group elderly who are more likely to be lonely. Organizations can focus on this group of elderly to reduce the loneliness among the elderly. For instance, the municipality can organize special date evenings for the lonely elderly. During these date evenings, the elderly can make new connections via various speed dates during a 15-minute conversation. This ensures that the elderly have more contact with others and they can expand their network. If the short date is a success, the elderly can exchange, for example, their telephone numbers. ICT can then ensure the elderly to keep in touch with their new friends and the elderly can arrange follow-up appointments. In this case, ICT is used as a tool to reduce loneliness among the elderly.

Additionally, various organizations that combat loneliness among the elderly are struggling to reach the elderly. For instance, SamenZwolle (2020), organizes several weekly meetings, such as bingo or lunches, to reduce loneliness among the elderly. Currently, most of the elderly who participate in such a meeting have come in through family members, friends or health care staff. It would be less time consuming and easier to get in touch with the lonely elderly via ICT. Also, the elderly can via ICT better be updated about the schedule of these events. For example, an alert can be sent by text message about the weekly bingo. These alerts motivate the elderly to meet others and they will become less lonely.

5.2 LIMITATIONS AND FUTURE RESEARCH

The present research has several limitations that need to be addressed. Most importantly, when the survey was live, the COVID-19 pandemic had an impact on society. Because of the outbreak of the coronavirus, all people were forced to stay at home and avoid contact with people. Naturally, these measures had an influence on the state of loneliness among the respondents. It is expected that the state of loneliness among the respondents has become somewhat higher than it was before the COVID-19 pandemic. Berg-Weger & Morley (2020) studied loneliness among older adults during the COVID-19 pandemic. They confirmed that older adults are lonely because of the forced isolation. It is expected that, due to the forced isolation, the state of loneliness is higher among respondent than before the COVID-19 pandemic. Besides this, the research model remains still relevant because demographics, personal characteristics and ICT usage will still affect loneliness in the same way. Also, Berg-Wege &

Morley (2020) state that the COVID-19 pandemic is an opportunity for older adults to learn new technology skills to engage with people in non-traditional ways. Video calling is the best ICT option to replace physical contact (Berg-Wege & Morley, 2020). Thus, it is expected that the ICT frequency and in particular the use of video calling among the respondents is than before the COVID-19 pandemic.

It might also be interesting to zoom in on the variable ICT frequency. For example, people using social media or WhatsApp probably send fewer text messages. In this case, social media and WhatsApp are a substitute for texting. However, in the present research, the substitutes were not taken into account. Because the use of the various ICT options has been added together when creating the variable ICT frequency, this can give a distorted picture. Thus, it might be interesting for future research to include a model that takes into account the substitutes within ICT frequency.

The previous and present research shows that age has an influence on loneliness. Elderly with a higher age are more lonely than elderly with a lower age. This relationship is logical since friends and family of these elderly are more likely to pass away because of their age. Therefore, it might be interesting to study additional variables related to age, such as a number of friends and family (Cotten, Anderson, & McCullough, 2013), physical/emotional/social limitations (Cotten, Anderson, & McCullough, 2013), a number of children (Shapira, Barak, & Gal, 2007), and positive life events (Shapira et al., 2007. Future research should study these underlying factors of the variable age.

The present research used printed surveys to research the elderly not or scarcely using ICT. However, the answers on the printed surveys could not be validated. This caused that several people accidentally forgot to fill in some questions, answered a single answer question with two answers, or answered a question with a sentence when it was asked to give a number. Subsequently, some respondents had to be deleted because their results were not sufficient. However, the data of some respondents could still be used by replacing their missing value by the mean. Also, respondents had to hand in their completed printed surveys in the mailbox of whom they had received the survey, which was always a well-known person. Although the surveys were anonymous, some participants might have had the urge to give socially-desired answers because this survey involves sensitive topics such as personality and loneliness. Note for further research is to create survey drop-off points at people the respondent does not know.

The last limitation is that this study does not contain a representative sample. Due to time restrictions, it was decided to aim the survey to a broad group of elderly with variation in demographics, personal characteristics and ICT usage. It might be interesting for future research to aim their research at a representative group in the Netherlands.

5.3 ICT as a tool

Overall, an important outcome from the present research is that loneliness is explained by a unique set of determinants. From previous research, it is known that demographics, personal characteristics, and ICT usage influence the state of loneliness. The present research divides loneliness into emotional loneliness and social loneliness. This offers new insights into the research field. The results show that the elderly are more social lonely and that social loneliness is more often influenced by the determinants demographics, personal characteristics and ICT usage than emotional loneliness. Accordingly, it can be concluded that the social loneliness among the elderly is higher than the emotional loneliness. Evidence suggest that ICT should be used as a tool to reduce social loneliness among the elderly. Elderly should use ICT to schedule offline appointments with friends and inform themselves about activities for lonely elderly. Thus, according to the present research and previous findings, loneliness can be solved with the use of ICT as a tool.

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APPENDIX I - CONSTRUCTS

Table 7a

Constructs Loneliness

Constructs	Items	Cronbach's Alpha
Emotional loneliness	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • I miss having a really close friend • I experience a general sense of emptiness • I miss the pleasure of the company of others • I find my circle of friends and acquaintances too limited • I miss having people around me • I often feel rejected	.81
Social Loneliness	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • There is always someone I can talk to about my day-to-day problems • There are plenty of people I can lean on when I have problems • There are many people I can trust completely • There are enough people I feel close to • I can call on my friends whenever I need them	.79
Loneliness	Items emotional and social loneliness.	.86

Table 7b
Constructs Personal characteristics OCEAN

Construct	Items	Cronbach's Alpha
Openness	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • Imaginative. Have imagination. • Artistic. Loving art, having a talent for art. • Creative. Like to make beautiful, new things. • Innovative. Like to try something new, come up with good ideas. • Inquiring. Like to find out how something works, like to discover new things. • Versatile. Knowing about everything, doing things, knowing a lot.	.74
Conscientiousness	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • Accurate. Always want to do very precisely. • Neat. Always tidy everything up, never make a mess. • Systematic. Always want to do things in a fixed order. • Orderly. Always have everything cleaned up. • Carefully. Be very precise. • * Sloppy. Leave everything, never clean up.	.83
Extraversion	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • * Silent. Say little or talk. • * Closed. Do not talk about your own feelings, if at all. • * Withdrawn. Don't like to meddle with other people. • * Reluctant. Difficulty or wanting to make contact with other people. • Talkative. Lots of talking and chatting. • * Shy. Being shy doesn't want to draw attention.	.85
Agreeableness	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • Enjoyable. Like to help other people. • Helping. Always ready to help other people. • Friendly. Be nice to other people. • Sympathetic. Be nice to other people. • Helpful. Like to help other people. • Pleasant. Nice to interact with other people.	.83
Neuroticism	**5-point scale (1 No! – 5 Yes!)** **To what extent do the following properties suit you?** • Anxious. Always being afraid, often feeling unsafe. • Nervous. Very difficult to handle tension, panic quickly. • Twitchy. Always tensed, always afraid that things are not going well. • Irritable. Get angry quickly. • Worried. Always be afraid that something unpleasant will happen. • Hit quickly. Be easily offended or irritated.	.84

** Indicates reverse item*

Table 7c
Constructs Personal characteristics OCEAN

Construct	Items	Cronbach's Alpha
ICT skills	**5-point scale (1 No! – 5 Yes!)** **For each of the following statements, please indicate to what extent it applies to you?** • I know which information I should and shouldn't share online • I know when I should and shouldn't share information online • I am careful to make my comments and behaviours appropriate to the situation I find myself in online • I know how to change who I share content with (e.g. friends, friends of friends or public) • I know how to remove friends from my contact lists	.91
ICT frequency	**5-point scale (1 Never – 5 Daily)** **How often do you use the following ICT?** • Social Media • Texting • WhatsApp • Email • Video call • Calling • Online chatting • Online games	.69

APPENDIX II – SURVEY

Beste,

Momenteel leven we in een hele gekke situatie, waarin we allemaal gedwongen zijn om zoveel mogelijk thuis te zitten. Hoewel enerzijds hierdoor mensen extra tijd met elkaar kunnen doorbrengen, is er anderzijds een groep die dit alleen moet doen. Voor het afstuderen van mijn Master doe ik een onderzoek naar eenzaamheid onder 55-plussers. Een onderwerp waar, vooral in deze tijd, veel aandacht aan besteed moet worden. In mijn onderzoek ga ik op zoek naar de oplossing voor eenzaamheid, waarin ik kijk naar de mogelijkheden van gebruik van ICT en persoonlijkheidseigenschappen van mensen.

Iedereen van 55 jaar en ouder kan deelnemen aan mijn onderzoek! Omdat uw inzet erg gewaardeerd wordt, **worden er 5 VVV-bonnen verloot ter waarde van €20,-.** Wilt u kans maken? Dit kan door uw gegevens aan het eind van de vragenlijst achter te laten. Indien u in de prijzen bent gevallen, zal ik persoonlijk contact met u opnemen.

Helaas is het, in verband met corona, niet mogelijk om u face-to-face te spreken en uitleg te geven over mijn onderzoek. Mocht u mee willen doen, dan kan de vragenlijst op papier ingevuld worden. Ik ben te bereiken via e-mail (kim.plantinga@live.nl) of via mobiel 06-41394455 voor vragen of opmerkingen over dit onderzoek.

Groeten,
Kim Plantinga

Gaat u akkoord met het deelnemen van dit onderzoek?

- Ja
- Nee

DEEL 1

Het eerste deel van de vragenlijst gaat over uw kennis van ICT en demografische kenmerken. Indien er wordt gesproken over **ICT** wordt hiermee bedoeld: alle communicatie technologieën zoals: social media, sms, Whatsapp, email, videogesprek, bellen, online chatting en online games.

Ik heb veel kennis van ICT?

Ja!	Ja	Min-of-meer	Nee	Nee!
O	O	O	O	O

Anderen komen bij mij over vragen van ICT

Ja!	Ja	Min-of-meer	Nee	Nee!
O	O	O	O	O

Wilt u van elk van de volgende uitspraken aangeven in hoeverre die op u van toepassing is?

	Ja!	**Ja**	**Min-of-meer**	**Nee**	**Nee!**
Ik weet welke informatie ik wel of niet kan delen op internet	O	O	O	O	O
Ik weet wanneer ik informatie wel of niet kan delen op internet	O	O	O	O	O
Ik zorg dat mijn commentaar en gedrag passen bij de situatie waarin ik mij op internet bevind	O	O	O	O	O
Ik weet hoe ik kan aanpassen met wie ik informatie deel (bv. vrienden, vrienden van vrienden, of iedereen)	O	O	O	O	O
Ik weet hoe ik vrienden uit mijn contactlijst kan verwijderen	O	O	O	O	O

Hoe vaak maakt u gebruik van de volgende ICT?

	Nooit	**Jaarlijks**	**Maandelijks**	**Wekelijks**	**Dagelijks**
Social Media (Facebook, Instagram, Twitter, LinkedIn)	O	O	O	O	O
Sms'en (SMS, iMessage)	O	O	O	O	O
WhatsApp	O	O	O	O	O
Email	O	O	O	O	O
Videogesprek (Skype, Facetime)	O	O	O	O	O
Bellen	O	O	O	O	O
Online chatting	O	O	O	O	O
Online games	O	O	O	O	O

Ik ben een

- Man
- Vrouw
- Wil ik liever niet zeggen

Wat is uw leeftijd?

Hoe oud voelt u zich?

Wat is uw hoogst afgeronde opleiding?

- Primair onderwijs (basisonderwijs, e.d.)
- Voorbereidend beroepsonderwijs (LTS, LHNO, LAO, LMO, LEAO, MAVO, MULO, Huishoudschool, e.d.)
- Middelbaar voorbereidend onderwijs (MMS, HBS, HAVO, VWO, e.d.)
- Middelbaar beroepsonderwijs (MTS, MBO e.d.)
- Hoger onderwijs (HTS, HBO e.d.)
- Universitair onderwijs
- Anders, namelijk

Wat is uw burgerlijke status?

- Ongehuwd/ single
- Ongehuwd maar wel in een relatie
- Wettig gehuwd
- Partnerschap
- Verweduwd na wettig huwelijk
- Verweduwd na partnerschap
- Gescheiden na wettig huwelijk
- Gescheiden na partnerschap
- Anders, namelijk

Indien u op dit moment in een relatie bent, welk cijfer geeft u de kwaliteit van uw relatie?

1 is heel slecht, 10 is heel goed.

- Wil ik liever niet beantwoorden

Waar woont u? (de meeste tijd)

- Eigen huis/ appartement
- Een huis/ appartement van een familielid
- Een huis/ appartement van een vriend(in)
- Daklozenopvang
- Begeleid wonen
- Pensioen gemeenschap/ bejaardentehuis/ verzorgingstehuis
- Anders, namelijk

DEEL 2

Het tweede deel gaat over uw persoonlijkheidskenmerken. Mogelijke antwoorden zijn: "ja!", "ja", "min-of-meer", "nee", "nee!". Geef een eerlijk antwoord, ook als je een eigenschap van jezelf niet zo leuk vindt. Er zijn namelijk geen goede of foute antwoorden.

Geef bij de volgende vragen aan of u vindt dat een eigenschap bij u aanwezig is.

	Ja!	**Ja**	**Min-of-meer**	**Nee**	**Nee!**
Prettig. Leuk met andere mensen kunnen omgaan.	O	O	O	O	O
Fantasierijk. Veel fantasie hebben.	O	O	O	O	O
Prikkelbaar. Snel boos worden.	O	O	O	O	O
Slordig. Alles laten liggen, nooit iets opruimen.	O	O	O	O	O
Terughoudend. Moeilijk contact kunnen of willen maken met andere mensen.	O	O	O	O	O
Onderzoekend. Graag willen uitzoeken hoe iets in elkaar zit, graag nieuwe dingen willen ontdekken.	O	O	O	O	O
Zenuwachtig. Altijd gespannen zijn, altijd bang zijn dat dingen niet goed gaan.	O	O	O	O	O
Zorgvuldig. Heel precies zijn.	O	O	O	O	O
Stil. Weinig zeggen of praten.	O	O	O	O	O
Hulpvaardig. Graag andere mensen willen helpen.	O	O	O	O	O

De volgende vragen gaan over uw persoonlijke gevoelens. Geef bij de volgende vragen aan of u vindt dat een eigenschap bij u aanwezig is.

	Ja!	Ja	Min-of-meer	Nee	Nee!
Snel geraakt. Snel beledigd of geïrriteerd zijn.	O	O	O	O	O
Ordelijk. Altijd alles opgeruimd hebben.	O	O	O	O	O
Gesloten. Praat niet of weinig over eigen gevoelens.	O	O	O	O	O
Veelzijdig. Overal wat vanaf weten, veel dingen kunnen doen, veel weten.	O	O	O	O	O
Vriendelijk. Aardig voor andere mensen zijn.	O	O	O	O	O
Nauwkeurig. Altijd heel precies willen doen.	O	O	O	O	O
Spraakzaam. Veel praten en kletsen.	O	O	O	O	O
Vernieuwend. Het leuk vinden om iets nieuws uit te proberen, met goede ideeën komen.	O	O	O	O	O
Behulpzaam. Altijd klaar staan om andere mensen te helpen.	O	O	O	O	O
Ongerust. Altijd bang zijn dat er iets vervelends gebeurt.	O	O	O	O	O

De volgende vragen gaan dieper in op uw persoonlijkheidseigenschappen. Geef bij de volgende vragen aan of u vindt dat een eigenschap bij u aanwezig is.

	Ja!	Ja	Min-of-meer	Nee	Nee!
Schuchter. Verlegen zijn, wil geen aandacht trekken.	O	O	O	O	O
Aangenaam. Het leuk vinden om andere mensen te helpen.	O	O	O	O	O
Artistiek. Het mooi vinden van kunst, aanleg hebben voor kunst.	O	O	O	O	O
Angstig. Altijd bang zijn, zich vaak onveilig voelen.	O	O	O	O	O
Netjes. Altijd alles netjes opruimen, nooit rommel maken.	O	O	O	O	O
Teruggetrokken. Zich niet graag willen bemoeien met andere mensen.	O	O	O	O	O
Systematisch. Dingen altijd volgens een vaste volgorde willen uitvoeren.	O	O	O	O	O
Sympathiek. Aardig zijn voor andere mensen.	O	O	O	O	O
Nerveus. Heel moeilijk met spanning om kunnen gaan, snel in paniek zijn.	O	O	O	O	O
Creatief. Graag mooie, nieuwe dingen willen maken.	O	O	O	O	O

DEEL 3

De laatste paar vragen gaan dieper in op uw gevoelens op dit moment. Wilt u van elk van de volgende uitspraken aangeven in hoeverre die op u van toepassing is? Kruis het antwoord aan dat op u van toepassing is. Mogelijke antwoorden zijn: "ja!", "ja", "min-of-meer", "nee", "nee!"

	Ja!	Ja	Min-of-meer	Nee	Nee!
Er is altijd wel iemand in mijn omgeving bij wie ik met mijn dagelijkse probleempjes terecht kan	O	O	O	O	O
Ik mis een echt goede vriend of vriendin	O	O	O	O	O
Ik ervaar een leegte om me heen	O	O	O	O	O
Er zijn genoeg mensen op wie ik in geval van narigheid kan terugvallen	O	O	O	O	O
Ik mis gezelligheid om me heen	O	O	O	O	O
Ik vind mijn kring van kennissen te beperkt	O	O	O	O	O
Ik heb veel mensen op wie ik volledig kan vertrouwen	O	O	O	O	O
Er zijn voldoende mensen met wie ik me nauw verbonden voel	O	O	O	O	O
Ik mis mensen om me heen	O	O	O	O	O
Vaak voel ik me in de steek gelaten	O	O	O	O	O
Wanneer ik daar behoefte aan heb kan ik altijd bij mijn vrienden terecht	O	O	O	O	O
Ik voel mij wel eens eenzaam	O	O	O	O	O

Wilt u kans maken op één van de 5 VVV-bonnen ter waarde van €20,-? Laat dan hier uw emailadres of telefoonnummer achter. De loting zal worden gedaan via www.naamloting.nl/. Indien u in de prijzen bent gevallen, neem ik persoonlijk contact met u op.

Emailadres / telefoonnummer

Einde van de vragenlijst. Bedankt voor uw tijd en inzet om deze vragenlijst in te vullen.