The Effects of Exergaming on Elderly with Dementia in a Dutch Nursing Home – A Pilot Study

Master's Thesis
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Preface

This thesis was performed at the Communication, Philosophy and Technology chairgroup of Wageningen University, as part of the Master Health & Society. It contributed to my skills as a researcher, it gave me the chance to apply the knowledge that I gained throughout my education and concluded my Master's degree programme.

My gratitude goes out to my supervisor Jorinde Spook for her supervision, feedback and insights during the research period. She really knew how to inspire me and stimulate me when needed. I would also like to thank my friends and family for their support, critical evaluations and discussions on the topic of exergaming.

Also, I would like to thank health care organisation STMR for facilitating this research. A special thanks goes out to Gerjo Gloudemans, Wimke Weergang, and Anneke Peters. Thank you for making this research possible and supporting me from the beginning.

I hope you enjoy reading this thesis as much as I enjoyed making it,

Robin Splithof

July, 2016

Abstract

Background and aim: Exergame is a term that comes from the words 'exercise' and 'game'. It is used to describe games that require physical movement to control and play the game. Elderly are the least physically active age group of the Dutch society and they often live a sedentary lifestyle. This can cause many health problems and it will exacerbate age-related functional decline. Various literature reported physical and psychosocial benefits among elderly after playing exergames for an extended period of time. Exergaming seems to have a similar health benefit as traditional exercise. However, there is a knowledge gap regarding the effects of exergaming on cognition. The aim of this research is to investigate exergames as a tool for health promotion. This research specifically focuses on the potential positive effect of exergames on cognition of elderly with dementia.

Methods: A pretest-posttest experimental design was used to measure the effect of exergames on elderly. Fourteen demented elderly (average age 81 years old) from a Dutch nursing home participated in a six-week exergame intervention. During the intervention period, the elderly played exergames at least two times a week. The Nintendo Wii system was used to play exergames. Data collection took place before and after the intervention using the Behaviour Rating Scale for Psychogeriatric Inpatients (GIP-82) to measure psychosocial behaviour and the Mini Mental State Examination (MMSE) to measure cognitive function.

Results: Elderly scored significantly better in psychosocial behaviour in the post-test compared to the pre-test. They also scored significantly better in cognitive behaviour as well as social behaviour in the post-test compared to the pre-test. No significant improvement was found regarding their emotional behaviour or cognitive function. Furthermore, it was found that the elderly who participated frequently improved significantly on these outcome measures, whereas elderly who participated occasionally did not significantly improve.

Conclusion: Exergaming improved psychosocial, social and cognitive behaviour of demented elderly and it contributed to better psychosocial health. These results seem promising for the use of exergaming as a tool for health promotion. Continued research is needed to further investigate the cognitive and psychosocial benefits of exergaming on demented elderly.

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Chapter 1: Introduction

This chapter contains an introduction to the topic, the state of the art of exergaming, the relevance, research questions and hypotheses of this study as well as the theoretical framework.

1.1 Ageing Society

The Dutch population is ageing, which means there will be increasing numbers of elderly people over the age of 65. In 2012, there were about 2.7 million people aged 65 and over, that is 16% of the total population. This is expected to increase to 4.6 million people, equal to about 26% of the total Dutch population in 2040 (CBS, 2011). The increase in life expectancy is one of the main contributors to the ageing society (RIVM, 2014). Over the past few decades the average life expectancy at birth rose from 71 years in 1950 to 81 years in 2015 (Gapminder, 2016; Splithof, 2013). Ageing of the human body is a complex process influenced by many variables including lifestyle factors such as sedentary behaviour (Mazzeo, et al., 1998). Physiological changes like the loss of muscle tissue (sarcopenia) and bone mass (osteoporosis) are age related and can cause falls, which is a major cause for injuries and health problems of elderly (Knight & Nigam, 2008). Furthermore, ageing could result in alterations in the brain like shirking of the hippocampus and loss of neuroplasticity (the alteration and adaptations of the brain's functional and structural properties), which leads to impaired memory and increased risk for dementia (Erickson, et al., 2011). Advancing age as well as physical inactivity, are great risk factors for Alzheimer´s disease and other dementia's (Jokela, Batty & Kivimäki, 2013; Alzheimer´s Assosiaction, 2011).

Dementia is a general term for acquired and persistent syndromes of intellectual impairment (Kolb & Whishaw, 2012; Alzheimer Association, 2011). Dementia´s have two primary features which are (1) loss of memory and other cognitive deficits and (2) impairment in occupational and social functioning (Kolb & Whishaw, 2012; Alzheimer Association, 2011; Heyn, Abreu & Ottenbacher, 2004). The impairment in social functioning can lead to communication disorders and uncontrollable emotional outbursts, the so-called 'catastrophic reactions' of dementia (Rabins, Mace & Lucas, 1982). This behaviour can make it very difficult to aid demented patients and caregivers have also reported that it

gave them feelings of anger, depression and fatigue (Rabins, et al., 1982). There are many dementia´s, but Alzheimer's disease is one of the most prevalent and devastating forms of dementia (Heyn, et al., 2004). Because of the ageing society, dementia´s are becoming an substantial public health problem (Fratiglioni, De Ronchi & Agüero-Torres, 1999). The Dutch society will face the challenge of coping with increasing numbers of this chronic disease.

1.2 Exercise and Elderly Health

Research has indicated that older adults are less physically active than any other age group (Belza, et al., 2004; Harvey, Chastin & Skelton, 2013). The reduced levels of activity and an increased sedentary lifestyle among older adults are believed to exacerbate the decline (Harvey, et al., 2013). In general, elderly are more at risk of diseases that are linked to lifestyle behaviours, like cancer and heart disease (Levy, Kosteas, Slade & Myers, 2006). Overall, lifestyle behaviours with traditional exercise and a better fitness are associated with better quality of life and positive health outcomes (Penedo & Dahn, 2005; Knight, et al., 2008). This is reflected in an increase in longevity for physically active elderly, as well as a higher active life expectancy and maintenance of independency (Larson & Bruce, 1987). Exercise seems to have a protective effect for many diseases including coronary heart disease, hypertension, diabetes mellitus, osteoporosis, colon cancer, and depression or more in general, it seems to have favourable responses that contribute to healthy ageing (Pate, et al., 1995; Mazzeo, et al., 1998). Exercise is therefore often prescribed by general practitioners for sedentary people with signs of lifestyle diseases (Sørensen, Skovgaard & Puggaard, 2006).

Physical exercise also shows promise to counter some of the effects of the ageing brain. It has been proven to have a beneficial effect on maintaining neuroplasticity and therefore improving one's cognition (Høtting & Røder, 2013; Cotman & Berchtold, 2002; Colcombe & Kramer, 2003). A meta-analysis of several intervention studies by Colombe & Kramer (2003) shows that physical exercise, specifically low intensity aerobic fitness training, increases cognitive function and help maintain neural plasticity throughout the life span. For example, 15 minutes of daily cycling by institutionalized patients with dementia, over a period of 15 months, showed significant improvement in memory

function (Cancela, Ayán, Varela, & Seijo, 2016). Exercise at midlife also tends to reduce the risk of dementia later in life (Andel, et al., 2008). This all indicates that there is a positive relation between exercise, fitness and a healthy human brain (Churchill, et al., 2002).

1.3 Exergames

With the rise of new technology and innovations, physical activity gained a new dimension; exergaming. Exergames is a portmanteau of the words 'exercise' and 'games'. The term is used to describe video games that encourage and require exercise activities when playing (Sinclair, Hingston & Masek, 2007; Whitehead, Johnston, Nixon & Welch, 2010). The novel idea of having exercise equipment or activities interact with a video game is almost as old as video games themselves. One of the early examples of an exergame is the Atari Puffer-project from 1982. The Atari Puffer connected an exercise bike controller to a video game system. Peddling on the bike would start the virtual vehicle moving and give the gamer an exercise (Atari, 2016; Sinclair, et al. 2007). This system was released for entertainment purposes and not for scientific research towards healthy lifestyles, but it is one of the early examples of commercial exergaming.

One particularly important system that increased interest in research on the utility and potential positive health effects of exergames is the Nintendo Wii. This popular game system uses motion controllers to track the player's movements and these movements are translated into actions on the television screen. Two main promises of exergames are creating an incentive to play as well as giving the player the option to a physical work out (Whitehead, et al., 2010). As such, exergames could encourage elderly to have a more active lifestyle instead of the increasingly more common sedentary lifestyle, which predisposes people to numerous diseases.

An intervention performed by Padala et al. (2012) showed an improvement in balance and gait, which is the manner of walking, among demented elderly who played exergames daily. This result is interesting, since poor balance and gait abnormalities are very common among elderly with dementia (Allan, Ballard, Burn & Kenny, 2005). This can cause elderly to fall. Elderly with cognitive

impairment such as Alzheimer's disease have a threefold higher chance of falling, which can lead to significant morbidity and even mortality (Wittwer, Andrews, Webster & Menz, 2008; Weller & Schatzker 2004). Exergaming could help elderly with dementia to get some physical exercise without the need to leave the comfort and safety of the living room (of a nursing home). Furthermore, Rosenberg et al. (2010) found a positive effect of exergaming among elderly such as decreased signs of subsyndromal depression (SSD) and increased mental health related quality of life after a 12-week pilot study with Nintendo Wii Sports exergames. Brox, Luque & Evertsen (2011b) also argue that playing exergames with multiple people can help prevent loneliness, a major risk factor for depression, among elderly. This illustrates that the social nature of exergames also influences psychosocial health. Chao, Scherer & Montgomery (2015) looked at the effects on older adults and he stated that exergames seems to improve physical function, cognition and psychosocial outcomes in older adults. Exergaming is becoming a more and more acceptable way of encouraging physical activity and promoting better health. This research will investigate the effects on cognition and psychosocial behaviour of Nintendo Wii exergames on the elderly in a Dutch nursing home.

1.4 State of the Art

This paragraph contains the current knowledge and consensus about exergaming and its effect on the elderly population.

1.4.1 Serious Games

Exergames are a part of a broader concept called serious games. In general, games have four different components or functions that make up the game. These components are rules, challenges, interaction and an objective (Wattanasoontorn, Boada, Garcia & Sbert, 2013). The nature of a game is to entertain the player, the explicit objective, but serious games are a specific type of game that also serves an implicit objective; namely to educate or promote behavioural change. (Wattanasoontorn, et al., 2013; DeSmet, et al. 2014). In the case of serious games for health, examples of this implicit objective could be to provide health related information or to provide opportunities to practice healthy behaviour like physical activity (Kato, 2010). Figure 1 shows the differences between ordinary games and serious games.

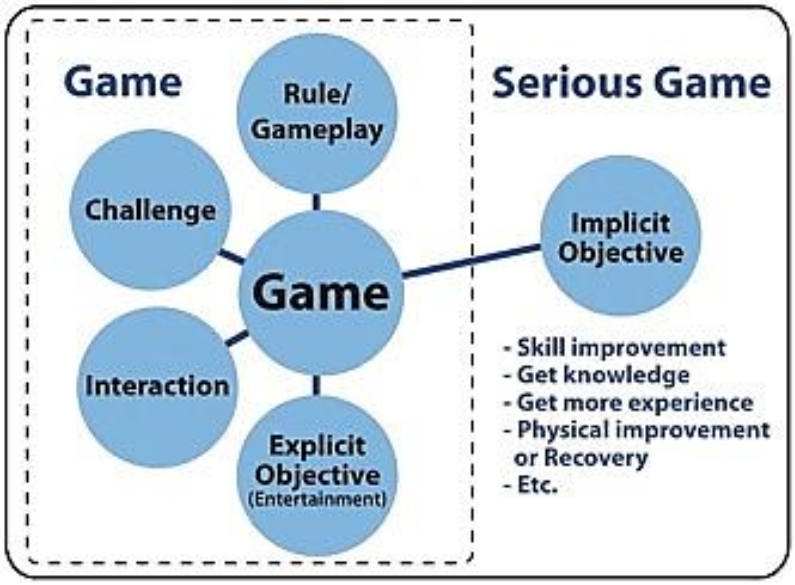

Figure 1, components of games. Source: Wattanasoontom, 2013.

Within health promotion, serious games are often digital and computer delivered. They can be of any game genre such as adventure games, strategy games or sports games (Connolly, Boyle, MacArthur, Hainey & Boyle, 2012; Wattanasoontorn, et al., 2013). Serious games can also be delivered through various game platforms. These platforms refer to specific combinations of (computer) hardware and software, which allows a video game to be played (Connoly, et al., 2012). Examples of platforms with serious games are the Nintendo Wii, Playstation, Xbox, personal computer and smartphones (Connolly, et al., 2012; Graafland, Schraagen & Schijven, 2012; De Carvalho & Ishitani, 2012). A systematic review by Caballero & Matas (2014) indicated that serious games, and especially exergames, help promote active ageing.

1.4.2 Physical, Psychosocial and Cognitive Effects of Nintendo Wii Exergames

Nintendo Wii exergaming has been proven to improve functional balance in elderly people. Older adults improved in their functional balance confidence after a Nintendo Wii exergames intervention (Bainbridge, Bevans, Keeley & Oriel, 2011; Chao, Scherer, Wu, Lucke & Montgomery, 2013; Williams, Doherty, Bender, Mattox & Tibbs, 2011; Bieryla, & Dold, 2013; Padala, Padala & Burke, 2011). Exergaming worked as an effective balance training (Bieryla, & Dold, 2013). An increase in confidence leads to a significant decrease in fear of falling (Jorgensen, Laessoe, Hendriksen, Nielsen

& Aagaard, 2013). Literature also suggests that Nintendo Wii exergaming improves walking endurance and maximal leg muscle strength among elderly (Chao, et al., 2013; Jorgensen, et al., 2013; Fung, Ho, Shaffer, Chung & Gomez, 2012). The increased functional balance, leg muscle strength, and the reduction of the fear of falling could predict a reduction in actual risk and incidence of falling (Miller, Hayes, Dye, Johnson & Meyers, 2012). Even people with certain physical medical conditions seem to benefit from Nintendo Wii exergaming. For instance a study by Joo et al. (2010) suggest that Nintendo Wii exergames help improve upper limb strength and function for rehabilitating people after stroke who suffer from upper limb weakness. A systematic review by Barry, Galna & Rochester (2014) shows that Nintendo Wii exergaming can be used to help reduce the severity of motor symptoms for people with Parkinson's disease (PD). This result is also found in an RCT by Pompeu et al. (2012) and he even concluded that the Nintendo Wii exergames intervention was as effective as balance exercise therapy for people with PD. Overall, these studies suggest that Nintendo Wii exergames have a positive effect on the physical health of elderly.

Next to physical health improvements, research on Ninentdo Wii exergames also suggests some improvements on psychosocial health. In general, the prevalence of depression and depressive symptoms among elderly is high (Djernes, 2006). There was a significant decline in depressive symptoms among elderly with subsyndromal depression after a 12-week intervention program with Nintendo Wii sports exergaming (Rosenberg, et al., 2010). Nintendo Wii exergaming may also improve mood and decrease loneliness, because of the (often) social nature of exergaming interventions (Kahlbaugh, Sperandio, Carlson & Hauselt, 2011). This indicates that Nintendo Wii exergames tend to promote mental well-being among elderly. Elderly from several interventions also reported to enjoy exergaming (Kahlbaugh, et al., 2011; Wollersheim, et al., 2010; Jorgensen, et al., 2013). This is an important finding because elderly are more likely to engage and adhere to activities that they find enjoyable (Nied & Franklin, 2002). Overall, these findings suggest improvements in psychosocial and mental health, but the effects of Nintendo Wii exergaming on cognition is more ambiguous in current literature.

Even though exercise has been proven to improve cognition and general brain health (Cotman, et al., 2002), research on the effects Nintendo Wii exergames on the cognitive function of elderly are very scarce and the results often inconclusive (Chao, et al., 2015). For instance, a study published by Rosenberg et al. (2010) found significant improvement in cognitive performance after a 12-week intervention using Nintendo Wii Sports exergames, but Padala et al. (2012) found no significant improvement in cognition after a 8-week Nintendo Wii Fitt exergames intervention. However, also no adverse effects have been indicated. This research will add to the knowledge about the use of Nintendo Wii exergaming interventions to improve psychosocial health of elderly and will try to fill the knowledge gap of the effects of exergaming on elderly cognition.

1.5 Scientific and Social relevance

Until recently, research for active video games such as exergames was scarce. Over the past decade, this has changed and the topic gained more popularity (Kharrazi, Lu, Gharghabi & Coleman, 2012; Kooiman, & Sheehan, 2015). A large part of this has to do with the introduction of the Nintendo Wii in 2006 (Kooiman, 2015). This was the first active video gaming system that was widely available for consumers and was a great commercial success with more than 101 million units since its launch (Nintendo, 2016). This was the beginning of the rise of exergames in scientific literature and since 2007 the amount of articles in scientific databases grew exponentially (Kharrazi, 2012). Early findings suggest positive health effects, justifying the further exploration of the health benefits of (Nintendo Wii) exergames and their potential use in health promotion interventions. This research will target the Dutch elderly population while the vast majority of research on elderly exergames targeted the elderly population from the United States (Kharrazi, et al., 2012; DeSmet et al, 2014).

As mentioned earlier, exercise has a positive effect on health and exergames seem to have a similar effect. However, there is a knowledge gap regarding the effects of exergaming on cognition and mental health. There is little known about the effects of exergames on cognition of elderly, even though traditional exercise has been proven to have positive cognitive effects. If exergames have a similar effect on cognition than traditional exercise, a great tool for mental health promotion would

currently be underused. Exergames could help encourage voluntary participation of elderly in physical activity by providing more than just a work out. Exergames also provide entertainment and cognitive stimulation through visual and audio feedback. Making exercise more enjoyable through the use of exergames could improve intrinsic motivation and possibly exercise adherence. Therefore this research focuses on the potential positive effect of exergames on cognition of elderly with cognitive impairment such dementia and Alzheimer's disease.

1.6 Salutogenic Approach and Theoretical Model

The underlying approach of this thesis is the salutogenic approach first coined by Aaron Antonovsky in 1979. Salutogenesis focusses on how health is formed, in contrast to the more traditional pathogenic approach which focuses on the origins of disease (Antonovsky, 1996) The starting point for pathogenesis is treating a disease whereas the salutogenic starting point is to promote health (Antonovsky, 1996) This is also what this research is trying to accomplish. Exergames promise to be a convenient tool to promote better physical as well as psychosocial health in elderly and this research will look at the potential of exergames on improving cognitive function and psychosocial health.

The model that is used is based on the psychosocial pathways schematic from Martikainen, Bartley and Lahelma (2002) and the Behaviour Rating Scale for Psychogeriatric Inpatients (GIP-82) from Verstraten & Van Eekelen (1987). Martikainen et al. (2002) stated that there are certain psychosocial factors that can contribute to (ill) health. Health research uses the 'psychosocial' theme in a variety of different ways. It is used to describe causes and risk factors (psychosocial influences) but also for mediating (psychosocial resources) and outcome factors (psychosocial well-being) (Martikainen, et al., 2002). It is used as an umbrella term to investigate a diverse set of research inquiries. This research uses the term psychosocial in the context of behaviour, which affects the state of well-being. Psychosocial behaviour in this thesis is defined as behaviour that consists of social, cognitive, and emotional aspects. Figure 2 shows the theoretical model for this research.

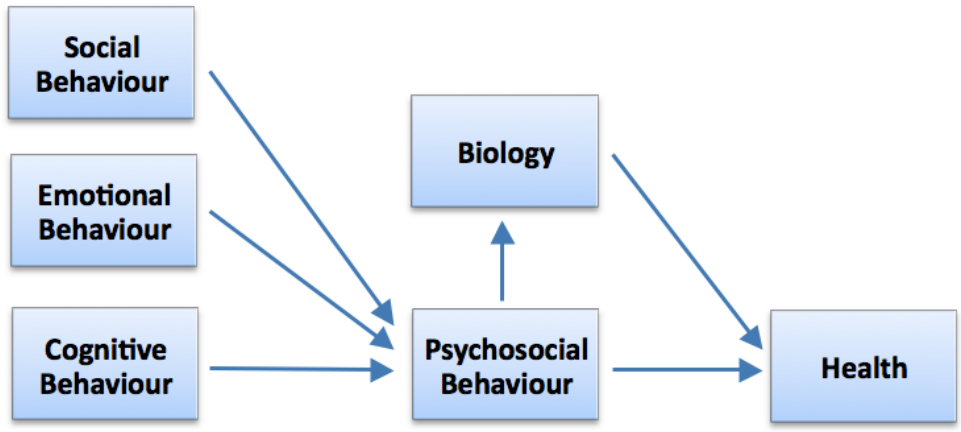

Figure 2, Theoretical model. Based on Psychosocial Pathways (Martikainen et al., 2002) and the GIP-82 (Verstraten & Van Eekelen, 1987; Jonghe, et al., 1996).

The GIP-82 was developed to detect and measure (deviant) psychosocial behaviour among demented elderly. Social, emotional and cognitive behaviour are the different domains that accurately represent the psychosocial behaviour of a person (Jonghe, Calis & Boom-Poels, 1996; Verstraten & Van Eekelen, 1987). These three domains each contain several subdomains that together form the social, emotional or cognitive behaviour domain (see table 1).

Table 1, Domains and subdomains of the GIP-82. Source: Jonghe, Calis & Boom-Poels (1996) and Verstraten & Van Eekelen (1987)

Social Behaviour	
Subdomain 1	Anti-social behaviour
Subdomain 2	Apathy
Subdomain 3	Disturbances of consciousness
Subdomain 4	Loss of decorum
Cognitive Behaviour	
Subdomain 5	Rebellious behaviour
Subdomain 6	Incoherent behaviour
Subdomain 7	Memory impairment

Subdomain 8	Disoriented behaviour
Subdomain 9	Meaningless repetitive behaviour
Subdomain 10	Restless behaviour
Emotional Behaviour	
Subdomain 11	Suspicious behaviour
Subdomain 12	Melancholic or sad behaviour
Subdomain 13	Dependent behaviour
Subdomain 14	Anxious behaviour

Psychosocial behaviour influences health directly, but also via the interaction with the one's biology. Psychosocial behaviour influences physiological processes in the body, which also has a relationship with health (see figure 2). This model is also consistent with the definition of health from the World Health Organisation (WHO). Their definition of health, as defined in the organizations constitution from 1948, is 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.

1.6 Research Questions and Hypotheses

Recent research by Chao et al. (2015) has showed that Nintendo Wii exergames are a safe and feasible tool to encourage elderly to engage in exercise. With the given positive effects of traditional exercise in mind, the aim of this research is to look at the possibility of exergames as a tool for health promotion instead of mere entertainment. Exergaming promises to combine physical as well as mental improvement alongside an incentive to play. In other words, exergames are expected to help elderly be more physically active in a fun and entertaining way, which could also result in increased psychosocial as well as mental health.

The main research question is:

To what extent does Nintendo Wii exergaming contribute to psychosocial health and cognitive function of elderly with psychiatric diagnosed dementia?

The main research question will be supported by three subquestions. Each subquestion focuses on the effects of exergaming on a different psychosocial domain.

The subquestions for this research are:

1. *Does exergaming improve cognitive function and behaviour of elderly with dementia*?
2. *Does exergaming improve emotional behaviour of elderly with dementia*?
3. *Does exergaming improve social behaviour of elderly with dementia*?

Given the positive effects of traditional exercise and the early finding of exergames, it is hypothesized that Nintendo Wii exergaming has a mild positive effect on the cognitive function and psychosocial behaviour of the elderly.

The null hypothesis is:

H_0) *The cognitive function and psychosocial behaviour of elderly after playing exergames is equal to the cognitive function and psychosocial before playing exergames*

The alternative hypotheses are:

H_a) *The cognitive function and psychosocial behaviour of elderly after playing exergames is higher/better than the cognitive function and psychosocial behaviour before playing exergames*

H_{a1}) Exergaming improves cognitive function and behaviour of elderly with dementia

H_{a2}) Exergaming improves mood and emotional behaviour of elderly with dementia

H_{a3}) Exergaming improves social behaviour of elderly with dementia

Chapter 2: Methods

This chapter contains the study design, participant information, experimental procedures and ethical measures and data analysis methods of this pilot study.

2.1 Study Design

Because of practical constraints, it was chosen to conduct a pilot study with an interventional study design. There was only a limited amount of potential participants available as well as limited time. This pilot study contained a pretest-posttest experiment with one group that was performed in a Dutch nursing home from the elderly health care organisation STMR (for ethical considerations see paragraph 2.5). The target population was demented elderly in the Dutch society. The population from the nursing home (study population) consisted of elderly with mild to severe dementia. Figure 3 shows the study design of this research.

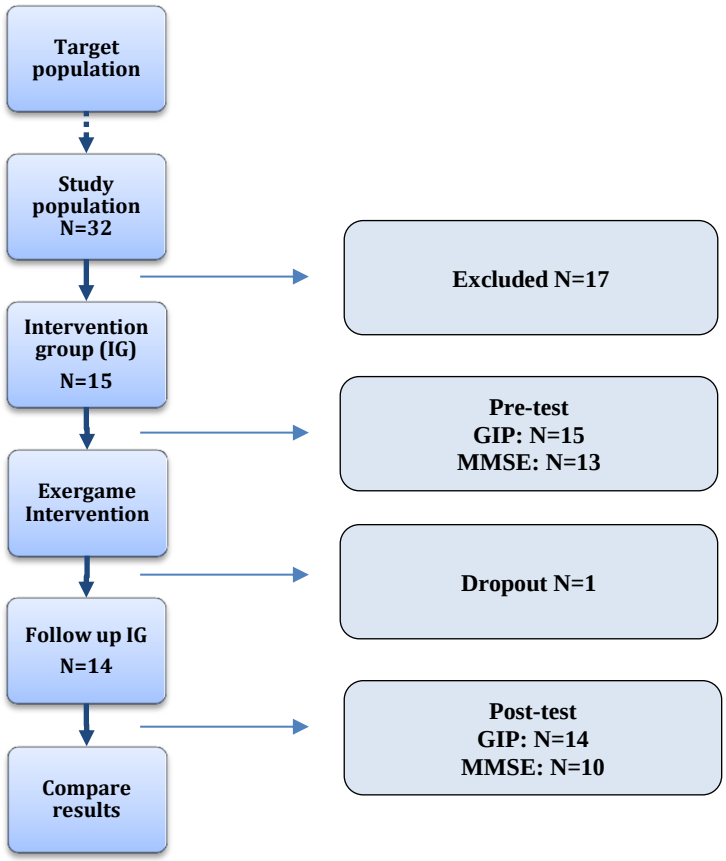

Figure 3, Study design flow chart

2.2 Participants

The participants that were invited consisted of elderly from a Dutch nursing home in the province Gelderland. This nursing home is part of the healthcare organisation STMR, who agreed to help facilitate this research. The population of this nursing home consists of 32 elderly with mild to severe dementia. The inclusion criteria were: the elderly had to be over the age of 65, have sufficient eyesight to play videogames and have a form of dementia. They should also be able to understand basic instructions in order to be able to partake in the intervention. Another important criterion was the current health status of the participants. Some people were physically and mentally not fit enough to participate in the pilot study. These were often elderly who suffer from severe Alzheimer Disease. Out of all the residents, the location manager and the senior nurse (further on: the nurse) made a first selection of the potential participants. Out of this selection, 15 elderly fit all the inclusion criteria and were willing to participate in this research. Of these participants, 6 were male and 9 were female. During the intervention there was one dropout case (female) due to health problems. This brought the total number of participants to 14 (see figure 3). The average age was 81 years old and all the participants had the Dutch nationality. For anonymity reasons, no individual results were published to the participants, family or STMR.

2.3 Procedures

The intervention consisted of a 6-week program where the researcher helped the elderly play with the Nintendo Wii exergames. The Nintendo Wii is a game system that can track a person's position and movements in a three-dimensional space with the use of a controller and a sensor bar (Wollersheim, et al., 2010). Data collection took place before the start of the intervention and after the exergames intervention. The nursing home is divided into four areas, each with their own living room. The intervention consisted of 4 small groups with three or four participants. Each group came together in their own shared living room where there is a TV and Nintendo Wii set up (for an impression see appendix V). During the group activity, the researcher made sure that all participants got a chance to play some exergames. After the first group played the exergames for a satisfactory amount of time, the same process was repeated for the second, third and fourth group of participants. Each play session

lasted somewhere between 30 to 60 minutes. There were at least 2 play sessions per week for each group, so each participant played exergames at least twice a week. The exergames that could be played were the following Nintendo Wii Sports games: Tennis, Baseball, Bowling, and Golf. It was up to the participants to decide which game they would like to play. The researchers visited the nursing home two times a week for a play session. Next to these scheduled group activities with the presence of the researcher, the nurses of the nursing home were asked to encourage the elderly from the intervention group to play with the Wii as much as possible. The health and well-being of the participants were always priority number one and playing exergames was always voluntary. During all the play sessions at least one, but often more, nurses were around for supervision.

2.4 Measurements

The measurement tools that were being used are the Behaviour Rating Scale for Psychogeriatric Inpatients (GIP-82) and the Mini Mental State Examination (MMSE). The GIP-82 is a behavioural observation tool, which is used by medical professionals in the field of (psychiatric) geriatrics (Eisses, & Kluiter, 2002, Verstraten & Van Eekelen, 1987). It consists of 82 items divided into three scales: social behaviour, cognitive behaviour and emotional behaviour (Jonghe, Calis & Boom-Poels, 1996). Social behaviour consists of 26 items divided among 4 subscales. Cognitive behaviour consists of 32 items, divided among 6 subscales. The last scale, which is emotional behaviour, consists of 24 items divided among 4 subscales (Jonghe, et al., 1996). Table 1 (paragraph 1.6) shows all the subscales/domains.

For each item, the participant could score 1 to 4 points on a likert scale. The higher the score, the more abnormal behaviour of the participant is being observed. An example of one of the items is a question from the scale 'social behaviour', subscale 'anti-social behaviour': "*Has contact with the nurses (with or without words)".* The answer options are; never-sometimes-often-always, where never yields 4 points and always yields 1 point. For a complete overview of the questions see appendix III.

MMSE is a widely used clinical screening test, which is capable of quantitatively estimating the severity of cognitive impairment and documenting cognitive change (Thombaugh & McIntyre, 1992; Folstein, Folstein & McHugh, 1975; Molloy & Standish, 1997). It is relatively easy and quick to perform, with only 11 items (standardized version of Kok & Verhey, 2002). The MMSE consists of a variety of questions divided into seven categories that represent a different cognitive domain or function. These domains are respectively (1) orientation to time, (2) orientation to place, (3) registration of words, (4) attention and calculation, (5) recall of words, (6) language, and (7) visual construction (Thombaugh, et al., 1992; Molloy, et al., 1997). All the questions combined could yield a maximum score of 30 points. A score of 23 or lower will indicate cognitive impairment and a score of 17 and lower indicates severe cognitive impairment (Thombaugh, et al., 1992; Molloy, et al., 1997.) For example, a study by Costarella, Monteleone, Steindler & Zuccaro (2009) used the MMSE to show the general cognitive decline of healthy elderly due to ageing. The average score of a sample of people aged 55-64 was 28.2, the average score of people aged 65-74 was 26.3 and the average score of people age of 75 and over was 25.3 (Costarella, et al., 2009). For this research, a standardized version of the MMSE with strict guidelines from Kok & Verhey (2002) will be used to improve reliability of the instrument. An example of one of the questions is a question from the domain 'orientation to place': "*In which city are we now?".* The correct answer would yield one point. The complete MMSE questionnaire can be found in appendix I.

The items from the MMSE at t=0 showed a Cronbach's Alpha of .713 and at t=1 the Cronbach's Alpha was .779. The items from the GIP-82 at t=0 showed a Cronbach's Alpha of .911 and at t=1 the Cronbach's Alpha was .904. This indicates that both measurement tools had a reliable scale that was internally consistent (Cronbach's Alpha > .7).

2.5 Ethics

Active consent was obtained from the manager 'Living and Treatment', the location manager and a senior nurse of the health care organisation. All the participants were asked if they wanted to participate in this research project and active consent was also obtained from the participants' legal

representatives (in all cases the children of the participants, see appendix IV). Additionally, the research proposal was discussed with the psychologist of the health care organisation and the ethical committee of the social science group at the Wageningen University was informed.

2.6 Data analysis

Once all data have been collected, a paired comparison between the data from the pre-test and the post-test was made using IBM SPSS Statistics software version 22. Factor analysis was used to see if all the questions of a scale are correlated. Normally distributed were analysed using paired t-tests with pre- and post-test data. If the data were not normally distributed, a Wilcoxon Matched-pairs Test will be conducted. Differences are considered significant when $p < .05$. All graphs were made with GraphPad Prism 7 software.

Chapter 3: Results

This chapter contains the results of the pilot study. Descriptive statistics, assumptions, reliability of the measurement tools and the findings regarding cognitive function, psychosocial behaviour, cognitive behaviour, emotional behaviour and social behaviour will be discussed. Lastly, a distinction is made between occasional and frequent exergaming elderly.

3.1 Descriptive Statistics

The sample contained 14 elderly, of which 8 women and 6 men, from a nursing home for psycho geriatric (PG) patients. The average age was 81 years old. The CIZ ('Centrum Indicatiestelling Zorg') indication, that indicates which care people are entitled to, was ZZP 5 (zorgzwaartepakket') for 12 of the elderly and 2 had the more demanding indication of ZZP 7. None of the participants ever played an exergame on the Nintendo Wii before. No injuries or falls were reported during the intervention period.

3.2 Assumption Testing

Since this pilot study had a small sample size, it was likely that the data were not normally distributed. Therefore a normality test was conducted. All the data were normally distributed except for the data for the post-test from the scale Social Behaviour (Kolmogorov-Smirnov and Shapiro Wilk show $p>.05$).

Because matched pairs were used, variance in the data is roughly equal and homogeneity of variance could be assumed. Furthermore, all data was measured and treated at interval level.

The assumptions for dependent samples t-tests were therefore met for all data except for the data from the scale Social Behaviour. Instead of a dependent samples t-test for this data, a Wilcoxon matched pairs test was conducted.

3.3 Reliability of the Measurement Tools

Factor analysis was used to find out if the variables from this dataset all correlate with the corresponding factor (subscale). Varimax rotation was applied if possible. Most of the variables loaded on one or two constructs with a KMO score of at least .5. It is likely that the small sample size is directly related to the fact that these criteria were not always met. In some cases, multiple variables were omitted because of zero variance in the data. This is less likely to happen with a bigger sample size.

3.4 Cognitive Function

A paired-samples t-test (N=10) was conducted to evaluate the impact of the exergaming intervention on cognitive function using the MMSE. Figure 4 shows the results from the t-test (N=10). No significant increase in cognitive function scores from t=0 (M=12.40, SD=5.56) to t=1 (M=13.40, SD=6.69), t(9)= -1.43, p=.19 was found. Therefore, the null hypothesis cannot be rejected. The exergaming intervention had no positive effect on the cognitive function of the elderly. The eta square statistic (η^2) is .29.

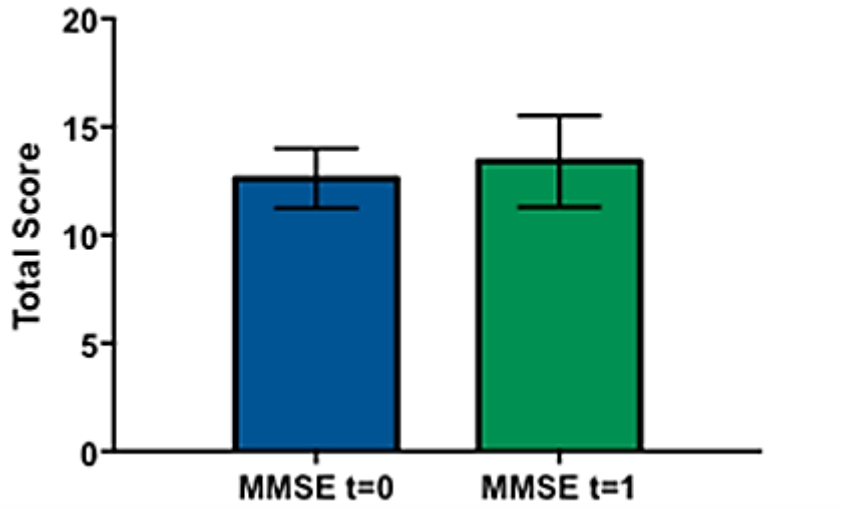

Figure 4, Bar graph of the total cognitive function score using the Mini Mental State Examinator (MMSE). The blue bar shows the mean for the pre-test, the green bar shows the mean for the post-test. The difference was non-significant, indicating that there was no improvement in cognitive function. Bar graph displays mean ± SEM

3.5 Psychosocial Behaviour

A paired-samples t-test was conducted (*N*=14) to evaluate the impact of the exergaming intervention on psychosocial behaviour using the GIP-82. Figure 5 shows the results from the t-test (*N*=14). A significant decrease in psychosocial behaviour scores (meaning less deviant behaviour and therefore a positive result) from t=0 (*M*=39.57, *SD*=19.50) to t=1 (*M*=31.07, *SD*=16.99), *t*(13)= 2.55, *p*<.05 was found.

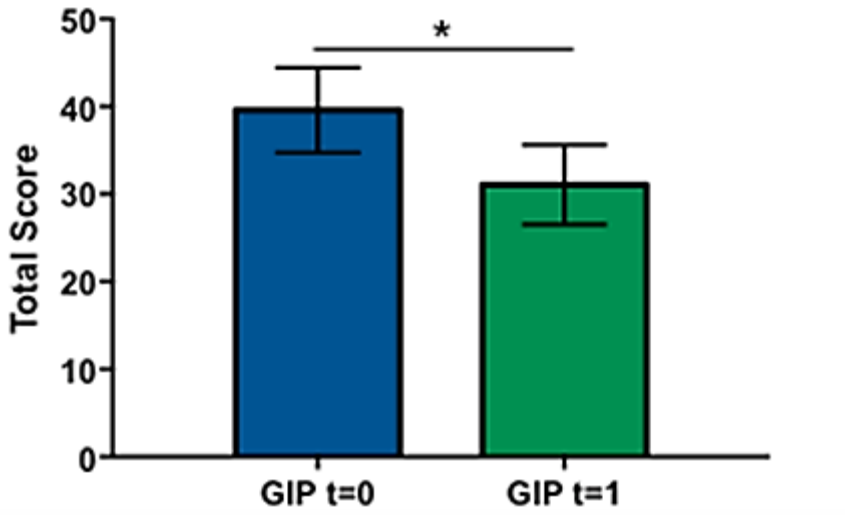

Figure 5, Bar graph of the total psychosocial behaviour score using the Behavioural Rating Scale for the Psychogeriatric Inpatient (GIP-82). The blue bar shows the mean for the pre-test, the green bar shows the mean for the post-test. The difference was significant, indicating that the elderly improved in psychosocial behaviour. Bar graph displays mean ± SEM

This indicates that the null hypothesis can be rejected and the alternative hypothesis can be accepted. The exergaming intervention had a positive effect on the psychosocial behaviour of the elderly. The eta square statistic (η^2) is .33, which indicates a medium effect (Field, 2009).

3.6 Cognitive, Emotional and Social Behaviour

Further analyses investigated the different scales/domains of the GIP-82 in order to determine the impact of the intervention on each of the domains. Figure 6 shows the results from the dependent t-tests (Cognitive Behaviour, CBT; Emotional Behaviour, EBT) and the Wilcoxon Matched-Pairs test (Social Behaviour, SBT).

The paired-samples t-test for CBT (*N*=14) showed a significant decrease (p<.05) in (deviant) cognitive behaviour score (meaning less deviant behaviour and therefore a positive result) from t=0 (*M*=13.71, *SD*=8.59) to t=1 (*M*=10.07, *SD*=8.46), *t*(13)= 2.77, *p*<.05. This indicates that the null hypothesis can be rejected and the alternative hypothesis can be accepted. The exergaming intervention had a positive effect on the cognitive behaviour of the elderly. The eta square statistic (η^2) is .37, which indicates a medium effect (Field, 2009).

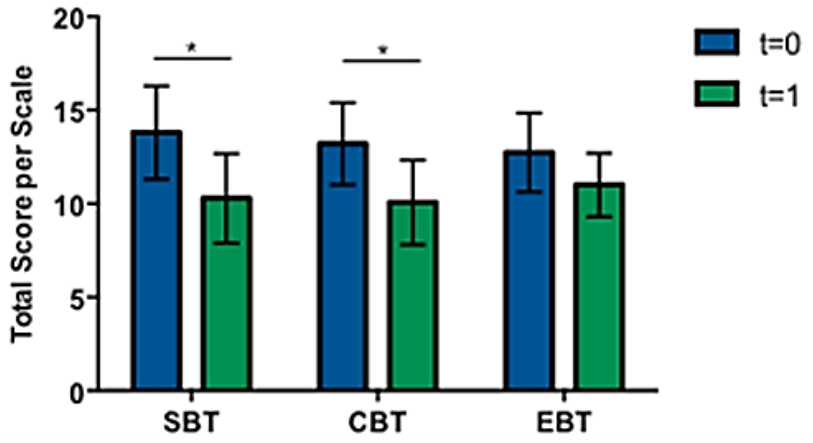

Figure 6, Bar graph of the total score per scale/domain of the GIP-82, Social Behaviour (SBT), Cognitive Behaviour (CBT), Emotional Behaviour (EBT). The blue bar shows the mean for the pre-test, the green bar shows the mean for the post-test. The differences in means for the SBT and CBT were significant, indicating that the elderly improved in social and cognitive behaviour. Bar graph displays mean ± SEM

The paired-samples t-test for EBT (*N*=14) showed a non-significant decrease in the emotional behaviour score (meaning less deviant behaviour and therefore a positive result) from t=0 (*M*=12.43, *SD*=8.38) to t=1 (*M*=11.00, *SD*=6.30), *t*(13)= 1.15, *p*=.27. This indicates that the null hypothesis cannot be rejected. The exergaming intervention had no positive effect on the emotional behaviour of the elderly. The eta square statistic (η^2) is .09.

The Wilcoxon Signed-Ranks test for SBT (*N*=14) showed a significant decrease (*Z*=-2.23, *p*<.05) in social behaviour score (indicating less deviant behaviour and therefore a positive result) from t=0 (*M*=13.57, *SD*=9.96) to t=1 (*M*=10.29, *SD*=8.96). This indicates that the null hypothesis can be rejected and the alternative hypothesis can be accepted. The exergaming intervention had a positive effect on the social behaviour of the elderly. The eta square statistic (η^2) is .42, which is also a medium effect. However, .42 comes pretty close to the threshold value of .5 for a large effect (Field, 2009).

3.7 Additional Analyses: Occasional Participation vs. Frequent Participation

During the first intervention week, it became clear that the willingness to participate was not always consistent. The behaviour of the demented elderly could sometimes be impulsive. For instance; the elderly could say that they were excited to play some exergames at one point, but five minutes later they just wanted watch others play or stay in their own room. Furthermore, occasional visits to e.g. general practitioner, a day of sleeping in or visits from friends and family caused some of the participants to miss some of the play sessions.

With this in mind, an attendance and actual participation list was kept. This extra information was added into SPSS for additional analyses after the intervention. All the participants were assigned to a group of 'frequent participation' (FP) or 'occasional participation' (OP). In the frequent participation group (N=7) are elderly who participated between 6 and 12 times. The occasional participation group (N=7) consist of elderly who participated between 1 and 5 times. The threshold value for the group was calculated using the median, which was 5 times.

Using the select cases option in SPSS, dependent t-tests (or a Wilcoxon matched-pairs test) were conducted for each group to investigate the differences between these groups. Primary results that were found significant were used for additional analyses.

3.7.1 Psychosocial Behaviour

OP group: A non-significant decrease in psychosocial behaviour scores for the OP group was observed from t=0 (M=46.80, SD=22.55) to t=1 (M=40.29 SD=17.83), $t(6)$= 1.09, p=.319.

FP group: A significant decrease in psychosocial behaviour scores was observed for the FP group from t=0 (M=32.29, SD=13.85) to t=1 (M=21.86 SD=10.45), $t(6)$= 3.10, p<.05. This indicates that unlike the elderly from the OP group, the elderly from the FP group improved significantly in psychosocial behaviour (see figure 7).

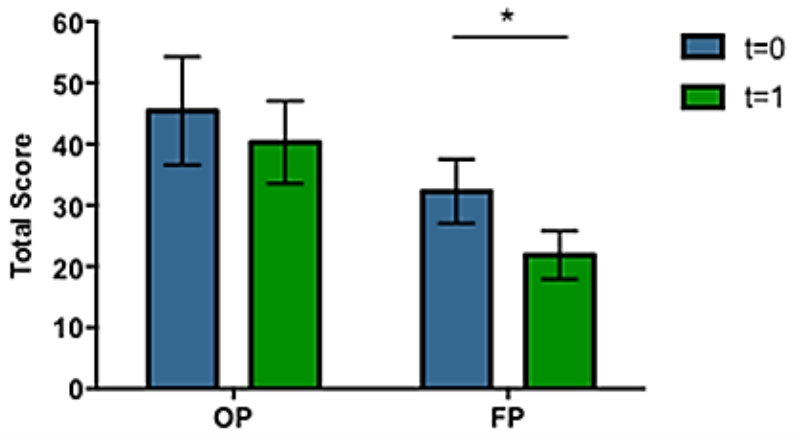

Figure 7, Bar graph of the total psychosocial behaviour score for the occasional participation group (OP) and the frequent participation group (FP). The blue bar shows the mean for the pre-test, the green bar shows the mean for the post-test. The difference between the pre- and post-test was significant for frequent participation group. Frequent participation resulted in a significant improvement in psychosocial behaviour. Bar graph displays mean ± SEM

3.7.2 Cognitive Behaviour

OP group: A non-significant decrease in cognitive behaviour scores was observed for the OP group from t=0 (M=15.57, SD=10.89) to t=1 (M=12.71 SD=10.39), $t(6)$= 1.33, p=.233.

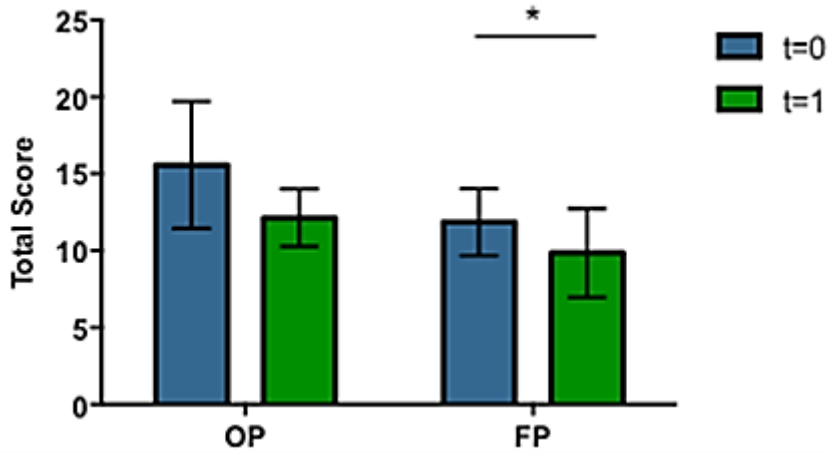

Figure 8, Bar graph of the total cognitive behaviour score (CBT) for the occasional participation group (OP) and the frequent participation group (FP). The blue bar shows the mean for the pre-test, the green bar shows the mean for the post-test. The difference between the pre- and post-test was significant for frequent participation group. Frequent participation resulted in a significant improvement in cognitive behaviour. Bar graph displays mean ± SEM

FP group: A significant decrease in cognitive behaviour scores was observed for the FP group from t=0 (*M*=11.86, *SD*=5.76) to t=1 (*M*=7.43 *SD*=5.56), *t*(6)= 2.75, *p*<.05. This indicates that unlike the elderly from the OP group, the elderly from the FP group improved significantly in cognitive behaviour (see figure 8).

3.7.3 Social Behaviour

OP group: A non-significant decrease social behaviour scores was observed for the OP group from t=0 (*M*=18.86, *SD*=8.40) to t=1 (*M*=15.43, *SD*=8.66), *Z*=-1.16, *p*=.246.

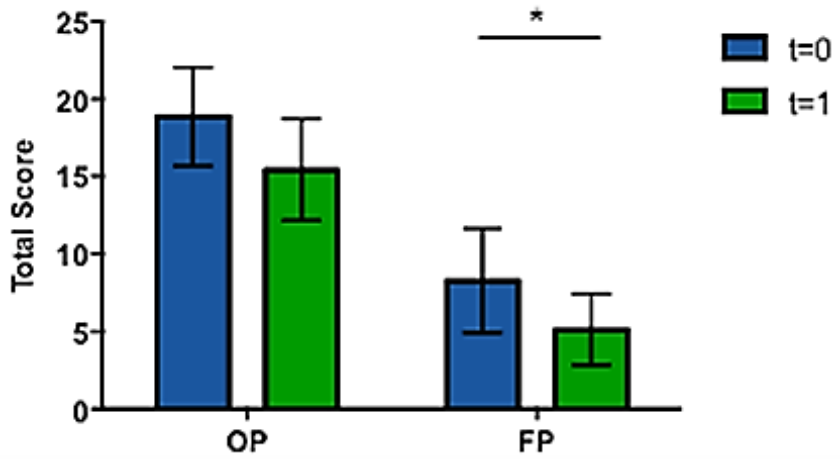

Figure 9, Bar graph of the total social behaviour score (SBT) for the occasional participation group (OP) and the frequent participation group (FP). The blue bar shows the mean for the pre-test, the green bar shows the mean for the post-test. The difference between the pre- and post-test was significant for frequent participation group. Frequent participation resulted in a significant improvement in social behaviour. Bar graph displays mean ± SEM

FP group: A significant decrease in the social behaviour score for the FP group from t=0 (*M*=8.29, *SD*=8.90) to t=1 (*M*=5.14, *SD*=6.09), *Z*=-2.03, *p*<.05 was observed. This indicates that unlike the elderly from the OP group, the elderly from the FP group improved significantly in social behaviour (see figure 9).

These results all follow the same trend. Elderly who participated frequently had a better baseline score (lower GIP-82 score) than elderly who participated occasionally. Elderly who participated more also improved significantly in psychosocial behaviour whereas elderly who participated occasionally did not improve in psychosocial behaviour.

Chapter 4: Discussion and Conclusion

This chapter contains the findings of the pilot study, the comparison of these findings with current literature, the implications, practical considerations, limitations, recommendations and the conclusion of this research.

4.1 Findings

In order to find out what effect exergaming has on demented elderly cognition the following research question was stated in paragraph 1.6: '*Does exergaming improve cognitive function and behaviour of elderly with dementia*?'. The results indicate that exergaming did not improve cognitive function, but did improve cognitive behaviour.

The following research question, as stated in paragraph 1.6, was formulated to examine the effect of exergaming on the emotional behaviour of demented elderly: '*Does exergaming improve emotional behaviour of elderly with dementia*?'. The results indicate that exergaming did not have a significant effect on emotional behaviour of elderly.

To examine the effect of exergaming on social behaviour of demented elderly, the following research question was formulated in paragraph 1.6: '*Does exergaming improve social behaviour of elderly with dementia*?'. The results indicate that exergaming improved social behaviour of elderly.

The main research question of this pilot study is: '*To what extent does Nintendo Wii exergaming contribute to psychosocial health and cognitive function of elderly with psychiatric diagnosed dementia?'.* The results indicate that exergaming improved psychosocial behaviour of the elderly. The results from the subquestions also support this claim, since the elderly improved in two of the three domains of psychosocial behaviour. All the found effects were of a medium size. There was less deviant psychosocial behaviour, which has a profound effect on health. Exergaming therefore contribute to a medium extent to psychosocial health of elderly with psychiatric diagnosed dementia. However, exergaming did not improve the cognitive function of elderly with dementia.

The aim of this pilot study was to investigate the possibility of using exergames as a tool for health promotion. The results indicate that this is indeed the case. It can be successfully used to promote health, which is the starting point of salutogenesis. Additional analyses of the data indicate that the elderly who participated frequently during the intervention improved significantly in psychosocial, cognitive and social behaviour. This in contrast to the elderly who participated occasionally. They did not improve in psychosocial, cognitive and social behaviour. Furthermore, no injuries or falls were reported. These additional findings also support the claim of exergaming as a good tool for health promotion.

4.2 Comparing the Findings with Current Literature

The elderly population is the biggest sedentary segment of the society and this lifestyle poses a huge health risk factor (King, Rejeski & Buchner, 1998). The results of this pilot study are congruent with the hypotheses. As suggested by previous research, Nintendo Wii exergaming is a safe and feasible tool for health promotion (Chao, et al., 2015; Klompstra, Jaarsma & Strömberg, 2014). However, elderly did need help operating the Nintendo Wii, which indicates that it is not optimized for this population. Brox, Fernandez-Luque & Tøllefsen (2011a) investigated (exer-) games for health promotion and concluded that most games were not specifically designed for elderly. However, the results from this study show that elderly improved on most of the outcome measures after the exergame intervention. A non-significant improvement was found for the remaining outcome measures.

One of the significant improvements from this pilot study was the improvement of elderly in psychosocial behaviour. Current literature states that exergaming improves psychosocial health (Chao, et al., 2015) and this pilot study found a similar result. For instance, community dwelling elderly women stated in a focus group to perceive better psychosocial well-being after a 6-week Nintendo Wii exergames intervention (Wollersheim et al., 2010). This is similar to the finding from this study. After the intervention, elderly from the nursing home showed less deviant psychosocial behaviour and improved on the GIP-82 score. The results also show significant improvement in social as well as cognitive behaviour.

Exergaming interventions are often performed in groups because of practical reasons. Many exergames like Wii Sports can also be played with more than one person (multiplayer-games). This creates an extra social dimension to the games, which also has a profound effect on the people. The frequent enjoyable interactions with others seem to strengthen social bonds with the other elderly and increase the amount of communication (Wollersheim, 2010). A review by Brox & Hernández (2011b) concluded that exergames could be used to enhance physical activity and at the same time reduce loneliness. The results from this pilot study follow the same trend. Exergaming seems to improve social behaviour of the elderly. For instance, less anti-social behaviour and less apathy were observed (these were subdomains from social behaviour).

Another interesting finding is the improvement in cognitive behaviour of the elderly after the intervention. Literature with a focus on improving cognition by playing exergames is limited, and it is still open for debate whether or not such an effect even exists (Chao, et al. 2015). However, there is some research suggesting that exergaming could have a positive effect on cognition similar to the positive effect of traditional exercise (Rosenberg, et al. 2010). No improvement on actual cognitive function was found during this study. An article by O'Leary, Pontifex, Scudder, Brown & Hillman (2011) states that although exergames may increase physical activity, it may not exert the same benefit as traditional exercise because it is a less intensive type of work out. Another explanation of why no improvement on cognitive function was found could be that the cognitive function of the elderly was already irreversibly impaired. Even though there are many therapies and (non-)pharmacologic treatments available that can enhance quality of life, dementia's like Alzheimer disease are generally considered progressive and irreversible (Small, et al., 1997). This indicates that cognitive function of elderly with severe dementia might only be improved on the short term. However, dementia is progressive so it is possible that no decline in cognitive function also indicates a positive result.

4.3 Implications

As mentioned in paragraph 1.6, psychosocial behaviour in this thesis has three aspects/domains, which are social, cognitive, and emotional behaviour. Elderly showed better psychosocial behaviour after the

6-week intervention, indicating an improvement in these three aspects of psychosocial behaviour. When looking into more depth, a significant improvement in social as well as cognitive behaviour was found. Social behaviour measured a.o. aspects of anti-social behaviour, apathy and disturbances of consciousness. Elderly improved upon these aspects after the intervention. Cognitive behaviour measured a.o. incoherent behaviour, restless behaviour and memory impairment. It is these kinds of cognitive aspects that elderly improved upon after the intervention. There is a relationship, an interplay, between health and biological, social, behavioural and psychological variables (Sharby, 2005). Therefore, the improvement on psychosocial behaviour will have a profound effect on the quality of life and health of the elderly. Exergaming helped the elderly to be more physically active, which has health benefits. But it is also likely that the improvement in psychosocial behaviour is at least partly caused by the social interaction and overall social nature of the intervention. Nonetheless, exergaming as used in this pilot study is useful tool for health promotion. Elderly really seemed to enjoy playing exergames with other nursing home residents. This Agmon, Perry, Phelan, Demeris & Nguyen (2011) also found a high enjoyment level among elderly who played exergames. Elderly reported to have enjoyed the exergames and found it motivating for physical exercise (Agmon, et al., 2011; Wollersheim, et al., 2010). The elderly in this pilot study also reported to the researcher and nurses to enjoy playing exergames.

4.4 Practical Considerations

There are some practical considerations that have to be taken into account when conducting research on exergaming and elderly. The standard Wii controller was found to have too many, often unnecessary, buttons for simple games like Wii Sports. This only adds to the confusion of the demented elderly. An example of a simple modification that greatly improved the playability of the exergames was found during this study. Whilst playing the Wii Sports Bowling exergame, only one button needed to be occasionally pressed on the controller (Wii motion controller button B). This button was the only button on the back of the controller. By holding the controller upside down, only the necessary button would be visible and the elderly would not be distracted and confused by the many buttons on the front of the controller. Future exergame design and interventions should take

these things in to account to limit the non-response and increase the enjoyment, playability and possibly the positive effect.

Another practical consideration is to make precise arrangements and agreements with the health care organisation. It is advised to calculate some extra time in the schedule. Because during this pilot study it became clear that dealing with demented elderly could take longer than expected. Communication between the nurses from the nursing home and the elderly is essential. Demented elderly cannot always cope well with surprises, so it is important that the nurses at the location remind the elderly that they will be able to play exergames on a certain day. It made the elderly much more likely to be willing to participate, once they were expecting the arrival of the researcher. This limited non-response and preparation time for each play session.

4.5 Limitations

Although this study indicates that exergames improve psychosocial health, the findings should be interpreted within the boundaries and limitations of the pilot study. A clear limitation was the small sample size. This is a threat to the reliability and validity of the study. Because of the small sample size, not all assumptions for the factor analysis were met. More participants might increase the statistical power of the study, making results better generalizable to a greater population. A threat to the validity is the fact that this experimental design had no control group. Therefore, it is possible that a confounding factor instead of the intervention caused the positive result from this intervention. A control group would help to eliminate (some of) these confounding factors that this pilot did not control for. Another threat to the validity is the fact that this pilot study was not a blind experiment. The GIP-82 observation scale was not filled in by an independent person. Instead, the senior nurse and the researcher filled in the GIP-82's. They were aware of the aim and goal of the pilot study. This means that they could be biased towards a favourable outcome. This could be resolved by future research by letting an independent person fill in the observation questionnaire. Overall, the findings are not fully generalizable to the whole target population because of the pilot nature of this study and the lack of a control group. However it seems likely that a full-scale study with a large sample size

will also find a positive effect of exergaming, since the results from this study are congruent with the results from other literature. An adequate sample size can be calculated using statistical power analysis.

Another limitation is the fact that the Wii Sports exergames were not designed or developed for elderly with dementia. Elderly usually have little technological experience (Brox, et al. 2011a). Even though the controls and menus of the Nintendo Wii are relatively simple, it was still hard for many of the demented elderly to operate. This resulted in an unnecessary steep learning curve for some of the exergames and occasional loss of interest from some elderly. For instance, the games could mostly be played by motions and gestures, but the controller still has many buttons making it confusing at times when a game actually required a certain button press. At this point, someone needed to assist the elderly. Elderly also suffer from age-related functional limitations like a diminish in sensory-perceptual and motor abilities (IJsselstein, Nap, de Kort & Poels, 2007). This has to be taken in to account when developing an exergame (intervention). However, there were also a great number of elderly who liked the exergames right away. Moreover, a great sense of achievement was felt by the elderly when the elderly did managed to operate the Nintendo Wii or play a certain exergame as intended after some practice. Keogh, Power, Wooller, Lucas, & Whatman (2014) even state that elderly who played Nintendo Wii exergames developed a sense of empowerment and achievement after some initial reluctance and anxiousness.

4.6 Recommendations for Future Research

The results from this study are consistent with the current literature. Further research is needed to fully investigate the effect of exergaming on cognition. This pilot study found an improvement in cognitive behaviour but not in cognitive function. A randomised controlled-trial (RCT) with a longer intervention period and more participants could help determine the effect of exergaming on elderly and in particular their cognitive function. A RCT can control for confounding factors with the use of a control group. This makes it more likely that a potential effect is caused by the independent variable. A lot of the current knowledge about exergames are based on pilot studies with 6 to 12 week

interventions (Chao, et al., 2015). A longer intervention period could help determine the long-term effect of exergaming on elderly. It is also important to note that demented elderly are a specific target group who can benefit from adjustments to the Nintendo Wii system/ or games when setting up an exergame intervention for demented elderly. They would greatly benefit from a simplified menu and control setup. Elderly friendly exergames would for instance minimize the amount of menus, options and buttons on the controller.

It would be interesting to further investigate the impact of the social aspect of exergaming, since this study found that this has a positive influence on the social behaviour of elderly. Future research that focusses on the social effects of exergaming is important, because this can have a profound effect on the quality of life. This can also lead to minimizing the amount of catastrophic reacties among demented elderly in a nursing home. This would make it easier to aid demented elderly in a nursing home. It would also be interesting to investigate actual physical health outcomes in future research. A good tool to measure this would be the QoL-AD scale (includes the social domain), which measures the quality of life for people with Alzheimer Disease (Padala, et al., 2012). Although literature clearly states some physical health benefits of exergaming due to the improved physical activity, it has never been tested for elderly in a Dutch nursing home. Physical function could be measured for example with the Berg Balance Scale (BBS) test for balance and Short Physical Performance Battery (SPPB) test for mobility (Kosse, Caljouw, Vuijk, & Lamoth, 2011; Laver, et al., 2012). Another interesting outcome measure that could be incorporated is the amount of fun and satisfaction that the elderly get from playing exergames. This is interesting because a high enjoyment level would increase the efficacy of the intervention as well as provide the player with a beneficial psychosocial effect. A modified version of the Physical Activity Enjoyment Scale (PACES) as used by Graves et al. (2010) could be used to measure the exergame satisfaction.

4.7 Conclusion

Exergaming contributed to better psychosocial health among the demented elderly. An improvement in psychosocial, cognitive as well as social behaviour of the demented elderly was observed. However, no improvement was found after the intervention in emotional behaviour or cognitive function. These results need to be replicated and confirmed by a larger methodological sound study, preferably a randomized controlled trial. Future research is also suggested to investigate other outcome measures like physical health, social health and exergame satisfaction. Overall, the results from this pilot study seem promising for the use of exergaming as a tool for health promotion.

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Appendix I – Standardized MMSE

Gestandaardiseerde MMSE

Naam patiënt :

Datum invullen : Naam invuller :

Ik ga u nu enkele vragen stellen en geef u enkele problemen om op te lossen. Wilt u alstublieft uw best doen om zo goed mogelijke antwoorden te geven.

	noteer antwoord	score:
1. a. Welk jaar is het? b. Welk seizoen is het? c. Welke maand van het jaar is het? d. Wat is de datum vandaag? e. Welke dag van de week is het?		(0-5) _____
2. a. In welke provincie zijn we nu? b. In welke plaats zijn we nu? c. In welk ziekenhuis (instelling) zijn we nu? d. Wat is de naam van deze afdeling? e. Op welke verdieping zijn we nu?		(0-5) _____
3. Ik noem nu drie voorwerpen. Wilt u die herhalen nadat ik ze alle drie gezegd heb? Onthoud ze want ik vraag u over enkele minuten ze opnieuw te noemen. (Noem "appel, sleutel, tafel", neem 1 seconde per woord) (1 punt voor elk goed antwoord, herhaal maximaal 5 keer tot de patiënt de drie woorden weet)		(0-3) _____
4. Wilt u van de 100 zeven aftrekken en van wat overblijft weer zeven aftrekken en zo doorgaan tot ik stop zeg? (Herhaal eventueel 3 maal als de persoon stopt, herhaal dezelfde instructie, geef maximaal 1 minuut de tijd) Noteer hier het antwoord. of Wilt u het woord "'worst" achterstevoren spellen?. Noteer hier het antwoord.		(0-5) _____
5. Noemt u nogmaals de drie voorwerpen van zojuist. (Eén punt voor elk goed antwoord).		(0-3) _____
6. Wat is dit? En wat is dat? (Wijs een pen en een horloge aan. Eén punt voor elk goed antwoord).		(0-2) _____
7. Wilt u de volgende zin herhalen: " Nu eens dit en dan weer dat ". (Eén punt als de complete zin goed is)		(0-1) _____
8. Wilt u deze woorden lezen en dan doen wat er staat'? (papier met daarop in grote letters: "Sluit uw ogen")		(0-1) _____
9. Wilt u dit papiertje pakken met uw rechterhand, het dubbelvouwen en het op uw schoot leggen? (Eén punt voor iedere goede handeling).		(0-3) _____
10. Wilt u voor mij een volledige zin opschrijven op dit stuk papier? (Eén punt wanneer de zin een onderwerp en een gezegde heeft en betekenis heeft).		(0-1) _____
11. Wilt u deze figuur natekenen? (Figuur achterop dit papier. Eén punt als figuur geheel correct is nagetekend. Er moet een vierhoek te zien zijn tussen de twee vijfhoeken)		(0-1) _____
	TOTALE TEST SCORE:	(0-30)_____

Appendix II – MMSE Scoring Form

Toelichting scoring gestandaardiseerde MMSE

RM Kok, FRJ Verhey (2002)

Deze standaardisering is gebaseerd op de originele MMSE van Folstein et al. (1975)
en de Standardised MMSE van Molley et al. (1991).

Algemene instructies

1. Zorg dat voor het starten van de afname de persoon tegenover u zit. Beoordeel of iemand u verstaat en begrijpt middels eenvoudige vragen zoals 'Wat is uw naam?' Zorg dat de persoon de beschikking heeft over eventuele gehoorapparaten en brillen.

2. Introduceer uzelf en probeer de persoon op zijn/haar gemak te stellen. Vraag toestemming om vragen te mogen stellen, zoals 'Vindt u het goed dat ik u enige vragen over het geheugen stel?'. Dit kan helpen om paniekreacties te voorkomen.

3. Stel iedere vraag maximaal 3 keer, tenzij anders aangegeven. Als de persoon geen antwoord geeft, scoor 0.

4. Als de persoon incorrecte antwoorden geeft, scoor 0. Geeft geen hints, stel de vraag nogmaals. Accepteer het antwoord, stel de vraag niet opnieuw, geef geen suggesties of fysieke duidingen zoals hoofd schudden, enz.

5. Benodigde hulpmiddelen zijn: een horloge, een pen, potlood/gum en papier. Een blaadje met hierop 'sluit uw ogen' in grote letters en de figuur is eveneens nodig.

6. Als iemand vraagt 'Wat zegt u' geef geen uitleg of begin een gesprek, herhaal slechts dezelfde aanwijzing tot maximaal 3 keer.

7. Als de persoon u onderbreekt met b.v. de vraag 'Waar is dit voor', antwoordt met 'Ik zal het u uitleggen over enkele minuten als we klaar zijn. Kunnen we nu alstublieft doorgaan, we zijn bijna aan het eind'.

Afname - en scoringsinstructies

Vraag 1. Geef 10 seconden voor ieder antwoord. Alleen exacte jaar is goed. Gedurende de laatste week van het oude seizoen, of de eerste week van het nieuwe seizoen reken beide seizoenen goed. Reken zowel 1 maart als 21 maart goed voor het begin van de lente, enzovoorts. Op de eerste 2 dagen van een nieuwe maand en laatste 2 dagen van de vorige maand reken beide maanden goed. Accepteer 2 dagen ernaast m.b.t. datum. Alleen exacte weekdag is goed.

Vraag 2. Geef 10 seconden voor ieder antwoord. Accepteer alleen exact goede antwoorden. Indien de patiënt niet opgenomen is vraag dan in welke instelling we zijn (bij de patiënt thuis: welke straat) en in welke kamer we zijn, in plaats van de naam van het ziekenhuis en de afdeling.

Vraag 3. Zeg de woorden langzaam met een interval van ongeveer 1 seconde. Geef 1 punt voor ieder goed antwoord bij eerste poging. Geef 20 seconden voor het antwoord. Als de persoon niet alle 3 voorwerpen genoemd heeft, herhaal ze tot de persoon ze heeft geleerd tot een maximum 5 van herhalingen.

Vraag 4. Schrijf de antwoorden van de persoon op. Als iemand is begonnen -onderbreek niet- laat hem/haar doorgaan tot 5 aftrekkingen zijn gemaakt. Als de persoon stopt voordat 5 aftrekkingen zijn gemaakt herhaal maximaal 3 maal de oorspronkelijke instructie ' blijf 7 aftrekken van wat er is overgebleven'.

Scoringsvoorbeelden:	93, 86, 79, 72, 65	5 punten (allen goed)
	93, 88, 81, 74, 67	4 punten (4 goed, 1 fout)
	92, 85, 78, 71, 64	4 punten (4 goed, 1 fout)
	93, 87, 80, 73, 64	3 punten (3 goed, 2 fout)
	92, 85, 78, 71, 63	3 punten (3 goed, 2 fout)
	93, 87, 80, 75, 67	2 punten (2 goed, 3 fout)

93, 87, 81, 75, 69 1 punt (1 goed, 4 fout)

Als het rekenen niet lukt ga dan over tot het achteruit spellen van het woord "worst". Reken van deze 2 opdrachten de hoogste score.
Instructie; 'Wilt u het woord "'worst" achterstevoren spellen?". Geef 30 seconden de tijd hierbij. Als de persoon het woord "worst" niet kan spellen, zelfs niet met hulp, scoor dan 0.

Scoringsvoorbeelden spelling:

ontbreken van 1 letter, b.v. tsrw, trow, tsow, tsro	score 4
ontbreken van 2 letters, b.v. tsr, sro, tsw	score 3
omkering van 2 letters, b.v. tsorw, trsow, tsrwo, tswor	score 3
ontbreken of omkeren van 3 letters, b.v. torsw, ts, ow	score 2
omkeren van 4 letters, b.v. trswo, strwo	score 1

Vraag 5. Scoor 1 punt voor ieder goed antwoord, ongeacht de volgorde. Neem 20 seconden voor het antwoord.

Vraag 6. Scoor 1 punt voor ieder goed antwoord.
Laat een horloge zien. Accepteer 'polshorloge' of 'horloge', maar niet 'klok' of 'tijd' o.i.d.
Geef 10 seconden voor het antwoord.
Laat een pen zien. Accepteer alleen pen en niet bijvoorbeeld potlood. Geef 10 seconden voor het antwoord.

Vraag 7. Reken alleen het exacte antwoord goed.

Vraag 8. Geef papier met daarop 'sluit uw ogen'. Als persoon alleen leest en de ogen niet sluit, herhaal maximaal drie maal de zin 'Wilt u deze woorden lezen en dan doen wat er staat'. Geef 10 seconden, geef alleen 1 punt als de persoon de ogen sluit. De persoon hoeft niet hardop voor te lezen wat er staat.

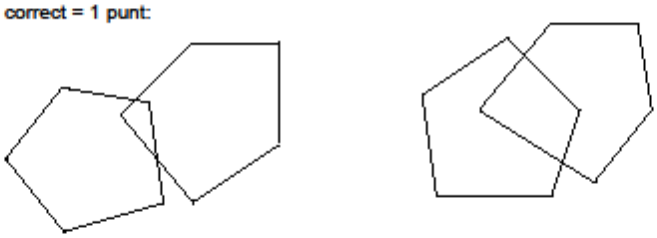
Vraag 9. Neem een stuk papier, houdt het vast recht voor de persoon en zeg het volgende: 'Wilt u dit papiertje pakken met uw rechterhand, het dubbelvouwen en het op uw schoot leggen?' Herhaal deze opdracht niet. Geef 30 seconden. Scoor 1 punt voor iedere correct uitgevoerde instructie.

Vraag 10. Geef 30 seconden. Scoor 1 punt als de zin een onderwerp en gezegde heeft en betekenis heeft. Negeer spellingsfouten.

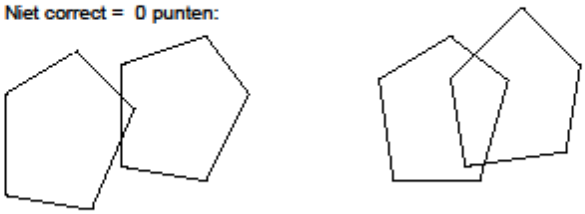
Vraag 11. Leg de figuur, papier, pen of potlood en gum voor de persoon neer. Sta meerdere pogingen toe tot de patiënt klaar is en het papier terug geeft. Scoor 1 punt voor een correct getekend diagram. De persoon moet een vierhoek hebben getekend tussen twee vijfhoeken in. Maximaal toegestane tijd; 1 minuut.

Scoringsvoorbeelden:

correct = 1 punt:



Niet correct = 0 punten:



Appendix III – GIP-82

Cliënt:	Geboortedatum:	Kamer/appartement:

Gedragsobservatieschaal voor de intramurale psychogeriatrie (GIP-82)

Gegevens beoordelaar:

Naam: _____

Functie: _____

Datum: _____

Instructie
Geef op de voor u liggende uitspraken aan in welke mate u de genoemde gedrageingen de laatste twee weken bij de cliënt hebt waargenomen. **Beantwoord iedere uitspraak door één van de vier antwoordmogelijkheden te omcirkelen.**

Geef maar één antwoord per uitspraak. Ook wanneer u twijfelt tussen bijvoorbeeld ‘soms’ en ‘vaak’, omcirkel ze dan niet beide, maar probeer toch tot een keuze te komen en omcirkel maar één antwoord.

Sla geen uitspraken over. Beantwoord ze allemaal. Soms zijn er uitspraken die niet kunnen worden ingevuld voor cliënten die volledig bedlegerig zijn. Links van zo’n uitspraak zie je dan ‘bedl.’ vermeld. Ook zijn er uitspraken die niet beantwoord kunnen worden voor cliënten die absoluut niets kunnen zeggen. In dat geval zie je links van zo’n uitspraak ‘afat’ staan. Een enkele keer zie je op die plaats ‘dagb.’ staan, dit betekent dat die uitspraak niet van toepassing is voor bezoekers van de dagbehandeling. In deze gevallen kunnen desbetreffende uitspraken worden overgeslagen, maar dan ook alleen als ze echt niet van toepassing zijn.

Rechts van de uitspraken is ruimte overgelaten voor de uiteindelijke scoring, je hoeft daar zelf niets in te vullen. Het enige wat je moet omcirkelen zijn de antwoorden op de uitspraken.

Bij het beantwoorden van de uitspraken is het belangrijk dat je zo weinig mogelijk gebruik maakt van andere informatie over de cliënt. Als een bepaalde diagnose van een cliënt bekend is, dan ben je misschien gemakkelijk geneigd zijn een aantal uitspraken daarmee overeenkomend te beantwoorden, probeer die neiging te onderdrukken. Vul in wat je zelf ziet en meemaakt met de cliënt, ook als dat misschien strijdig is met de diagnose.

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken.

GIP
Subschaal 1

Dagb	**Vraag 1** Lijkt blij te zijn met bezoek van familieleden Nooit – soms – vaak – altijd *Deze vraag overslaan wanneer het gaat om een bezoeker van dag behandeling. Hier is het antwoord niet gekoppeld aan het aantal dagen, maar aan het aantal familiebezoeken.*	Vraag 1 ( ) <
Dagb Bedl	**Vraag 2** Neemt deel aan gezamenlijke activiteiten buiten de afdeling Nooit – soms – vaak – altijd *Hier is het antwoord niet gekoppeld aan het aantal dagen, maar aan het aantal gezamenlijke activiteiten buiten de afdeling.*	Vraag 2 ( ) <
Bedl	**Vraag 3** Is bereid om desgevraagd iemand te helpen Nooit – soms – vaak – altijd *Wanneer het nooit gevraagd wordt, is het belangrijk om dit alsnog te doen, om zo inzicht te krijgen in de bereidheid iemand anders te helpen.* *Bij hen die niet in staat zijn om te helpen dient de vraag overgeslagen te worden.*	Vraag 3 ( ) <
Afat	**Vraag 4** Begint uit zichzelf een gesprek met anderen Nooit – soms – vaak – altijd *Hierbij maakt het niet uit of de ander wel of niet reageert.*	Vraag 4 ( ) <
	Vraag 5 Heeft contact met de verpleging (met of zonder woorden) Nooit – soms – regelmatig – vaak	Vraag 5 ( ) <
	Vraag 6 Lijkt te luisteren naar wat anderen vertellen Nooit – soms – vaak – altijd *Het gaat er hier om dat de betreffende bewoner door woord of gebaar laat merken te luisteren. Het er alleen bijzitten is niet genoeg.*	Vraag 6 ( ) <
	Vraag 7 Kan met medecliënten heel goed opschieten Niemand – enkele – meerdere – de meeste *Het ontbreken van ruzie is hier niet genoeg. Er moet sprake zijn van positief gedrag naar één of meerdere medebewoners en ook van positieve reacties van één of meerdere bewoners.* *Enkele: 1 of 2; meerdere: 3 t/m 5; de meeste: meer dan 5*	Vraag 7 ( ) <
	Vraag 8 Toont interesse voor personeelsleden Nooit – soms – vaak – altijd *Bijvoorbeeld: je leeftijd, gezondheid, vakanties, werkbelasting e.d.*	Vraag 8 ( ) <

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken.

GIP
Subschaal 2

	Vraag 1 Reageert wanneer hij/zij aangespraken wordt Meestal niet – soms – meestal wel – altijd	Vraag 9 ( ) <
	Vraag 2 Leest krant en/of tijdschrift Nooit – soms – regelmatig – vaak *Hierbij maakt het niet uit of de bewoner wel of niet iets opneemt.*	Vraag 10 ( ) <
	Vraag 3 Toont emoties bij niet alledaagse of ingrijpende gebeurtenissen Nooit – soms – vaak – altijd *Hierbij moet gedacht worden aan voorvallen als "het vallen van een medebewoner, ruzie tussen bewoners, verandering van dagindeling, feestelijkheden e.d.*	Vraag 11 ( ) <
	Vraag 4 Reageert zichtbaar op muziek Nooit – soms – vaak – meestal *Hierbij moet uit het gedrag/emotie van de bewoner blijken dat hij/zij luistert of kijkt.*	Vraag 12 ( ) <
	Vraag 5 Kijkt op als er iemand binnenkomt of als er iets gebeurt Nooit – soms – vaak – altijd	Vraag 13 ( ) <
	Vraag 6 Luistert naar de radio en/of kijkt televisie Nooit – bijna nooit – soms – vaak	Vraag 14 ( ) <

GIP
Subschaal 3

	Vraag 1 Zit te suffen Nooit – soms – vaak – altijd *Hier is sprake van als de bewoner echt weggezakt is en met de ogen dicht zit terwijl er géén sprake is van een "middagdutje".*	Vraag 15 ( )
	Vraag 2 Schrikt op uit een droomtoestand als hij/zij wordt aangesproken Nooit – bijna nooit – soms – vaak *De nadruk ligt hier op het woord 'schrikt op'. De bewoner wordt als het ware met een schok wakker.*	Vraag 16 ( )
	Vraag 3 Maakt een afwezige indruk Nooit – soms – vaak – altijd *Hiermee wordt bedoeld dat iemand tijdens een gesprek of activiteit niet echt versuft is, maar er toch ook niet met de aandacht er helemaal bij is, b.v. door weg te kijken van de gesprekspartner en/of de activiteit niet te volgen.*	Vraag 17 ( )
	Vraag 4 Is overdag, indien wakker, klaar wakker Nooit – soms – vaak – altijd	Vraag 18 ( ) <

	Vraag 5 Moet wakker geschud worden als men hem/haar wil bereiken Nooit – soms – vaak – meestal	Vraag 19 ( )
	Vraag 6 Verkeert overdag in een droom- of trance-achtige toestand Nooit – soms – vaak – voortdurend *Hiermee wordt bedoeld dat iemand wel de ogen open heeft, maar alleen reageert wanneer hij/zij rechtstreeks wordt aangesproken.*	Vraag 20 ( )
	Vraag 7 Suft weg tijdens gesprekken of bezigheden Nooit – zelden – regelmatig – meestal	Vraag 21 ( )

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken

GIP
Subschaal 4

Bedl	**Vraag 1** Zit onderuit gezakt zonder moeite te doen rechtop te zitten Nooit – zelden – regelmatig – meestal	Vraag 22 ( )
	Vraag 2 Besteedt zorg aan uiterlijk Nooit – soms – vaak – altijd *Hierbij gaat het er niet om of de bewoner er verzorgd uitzet, maar of hij/zij daadwerkelijk actie onderneemt om iets aan het uiterlijk te doen of te laten doen.*	Vraag 23 ( ) <
	Vraag 3 Laat ongegeneerd boeren of winden Nooit – zelden – soms – vaak	Vraag 24 ( )
	Vraag 4 Houdt zich aan de gewone omgangsvormen (groeten, danken, verontschuldigen) Nooit – soms – vaak – altijd	Vraag 25 ( ) <
	Vraag 5 Laat vocht uit mond of neus gewoon lopen (zonder het af te vegen) Nooit – zelden – regelmatig – voortdurend	Vraag 26 ( )

GIP
Subschaal 5

Bedl	**Vraag 1** Probeert uit het huis te ontsnappen, uit verzet tegen het verblijf hier Nooit – bijna nooit – soms – regelmatig *Hier gaat het erom dat de bewoner de opname niet accepteert, niet om een situatie waarin de bewoner weg wil om b.v. 'thuis te gaan koken' of te "gaan werken".*	Vraag 27 ( )
	Vraag 2 Sputtert tegen als er wat gevraagd wordt Nooit – bijna nooit – soms – vaak *Hiermee wordt bedoeld dat de bewoner zich in woord en/of gebaar verzet wanneer hem iets gevraagd wordt.*	Vraag 28 ( )
	Vraag 3 Houdt zich aan de regels en gebruik van de afdeling Zelden – vaak niet – meestal wel – altijd *Bij het zich niet aan de regels houden gaat het om actief verzet tegen b.v.: etenstijden, de tijd dat men 's morgens verzorgd wordt, toiletrondes e.d.*	Vraag 29 ( ) <

	Vraag 4 Wijst hulp van het personeel van de hand Nooit – bijna nooit – soms – vaak *Hierbij gaat het om de hulp actief niet te willen.*	Vraag 30 ( )
	Vraag 5 Werkt mee wanneer dat gevraagd wordt Nooit – soms – vaak – altijd *Er is ook sprake van meewerken wanneer iemand iets niet goed kan, maar het wel probeert.* *Deze vraag overslaan wanneer de hulpbehoevendheid zo groot is dat hij/zij zelfs geen poging meer kan doen.*	Vraag 31 ( ) <

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken

GIP
Subschaal 6

Bedl	**Vraag 1** Trekt op de verkeerde plaats kleren uit (zonder seksuele bedoelingen) Nooit – bijna nooit – soms – vaak	Vraag 32 ( )
Afat	**Vraag 2** Spreekt op een verwarde manier (bijvoorbeeld mengt woorden en zinnen door elkaar, verzint nieuwe woorden) Nooit – soms – vaak – altijd	Vraag 33 ( )
Afat	**Vraag 3** Geeft antwoorden die niets te maken hebben met wat gevraagd wordt Nooit – bijna nooit – soms – vaak	Vraag 34 ( )
	Vraag 4 Kan de dingen zodanig duidelijk maken dat men begrijpt wat bedoeld wordt Nooit – soms – vaak – altijd *Dit hoeft niet alleen d.m.v. woorden, maar kan ook door gebaren*	Vraag 35 ( ) <
	Vraag 5 Urineert of defaeceert op de verkeerde plaats Nooit – bijna nooit – soms – vaak *Hier is sprake van als de bewoner de indruk wekt te denken op de goede plaats te urineren of te defaeceren.*	Vraag 36 ( )

GIP
Subschaal 7

Afat	**Vraag 1** Kent andere cliënten bij naam Geen – één – meerdere – de meeste *Meerdere: 2 t/m 4; de meeste: meer dan 4* *Deze vraag overslaan wanneer bewoner zich onvoldoende kan uiten (bv afasie)*	Vraag 37 ( ) <
Afat	**Vraag 2** Kent naaste familieleden bij naam Nooit – soms – vaak – altijd	Vraag 38 ( ) <

	Vraag 3 Onthoudt wat gevraagd of opgedragen wordt Nooit – soms – vaak – altijd *Dit heeft betrekking op het onthouden van dingen op de hele korte termijn, bv als je de bewoner vraagt zich te wassen of aan te kleden en je dit steeds moet herhalen.*	Vraag 39 ( ) <
	Vraag 4 Vergeet dat hij/zij hier opgenomen is (en niet bv op visite) Nooit – soms – vaak – voortdurend *Naast het idee alleen maar op bezoek te zijn, kan het ook gaan om de overtuiging dat men nu in het vorige of ouderlijk huis verblijft. Bij iemand die weinig zegt zal er gericht naar gevraagd moeten worden.* *Bij bezoeken van de dagbehandeling is de vraag: vergeet dat hij/zij maar een gedeelte van de dag aanwezig is.*	Vraag 40 ( )
	Vraag 5 Kent de eigen naam Nooit – soms – meestal – altijd *Het gaat om de achternaam. Bij gehuwde bewoonsters gaat het om de naam van de echtgenoot of de eigen achternaam, wanneer men dat van vroeger uit gewend was.*	Vraag 41 ( ) <
	Vraag 6 Lijkt te vergeten waar hij/zij mee bezig is (bijv. met eten, koffiedrinken enz.) Nooit – soms – vaak – voortdurend	Vraag 42 ( )
	Vraag 7 Geeft blijk de personeelsleden te herkennen Geen – sommige – meeste – allemaal *Het gaat erom of personeelsleden als individuele personen herkend worden en niet alleen maar als 'zuster'. Dit kan bv blijken uit het kennen van namen of het goed koppelen van bepaalde ervaringen aan personeelsleden of doordat de bewoner consequent verschillend reageert op personeelsleden. Sommige: 1 t/m 3; meeste: meer dan 3.*	Vraag 43 ( ) <

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken

GIP
Subschaal 8

Bedl	**Vraag 1** Wordt in de gaten gehouden om verdwalen te voorkomen Nooit – bijna – regelmatig – meestal *Dit is bv van toepassing wanneer een bewoner van de afdeling gaat en de weg niet meer terug kan vinden.*	Vraag 44 ( )
	Vraag 2 Ziet cliënten of personeelsleden voor iemand anders aan Nooit – zelden – soms – vaak	Vraag 45 ( )
	Vraag 3 Uit het gedrag is op te maken dat hij/zij op een andere plaats meent te zijn Nooit – zelden – regelmatig – meestal *Wanneer het uit het gedrag niet te achterhalen is kan de bewoner gevraagd worden waar men denkt te verblijven. Wanneer het dan nog niet duidelijk is zal 'nooit' gescoord moeten worden.*	Vraag 46 ( )
	Vraag 4 Lijkt te beseffen welk tijdstip van de dag het is Nooit – soms – vaak – altijd *Bv wanneer de bewoner weet hoe laat het ongeveer is (eventueel naar vragen) of wanneer hij/zij op tijd terug is voor het middageten, koffietijd e.d. Op dagbehandeling wanneer bezoeker bv weet dat het tijd is om naar huis te gaan.*	Vraag 47 ( ) <
	Vraag 5 Uit het gedrag is af te leiden dat hij/zij het heden met het verleden verwisselt Nooit – zelden – regelmatig - voortdurend *Bv wanneer bewoner meent nog te werken, naar vader en moeder wil, denkt nog voor de kinderen te zorgen.*	Vraag 48 ( )

GIP
Subschaal 9

Bedl	**Vraag 1** Schuift met de voeten heen en weer Nooit – bijna nooit – soms – vaak	Vraag 49 ( )
Afat	**Vraag 2** Herhaalt woorden, zinnen of stukken van zinnen Nooit – bijna nooit – soms – vaak	Vraag 50 ( )
Afat	**Vraag 3** Praat of mompelt langdurig, tegen niemand in het bijzonder Nooit – bijna nooit – soms – vaak	Vraag 51 ( )
	Vraag 4 Zit aan kleding, dekens, tafelkleden e.d. te plukken Nooit – soms – vaak – voortdurend	Vraag 52 ( )
	Vraag 5 Maakt langdurig dezelfde zinloze geluiden Nooit – bijna nooit – soms – vaak *De nadruk ligt hier op de term 'zinloos'. Het gaat hierbij om geluiden waar geen woorden in te herkennen zijn.*	Vraag 53 ( )

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken

GIP
Subschaal 10

Bedl	**Vraag 1** Loopt rusteloos rond in huis Nooit – soms – vaak – voortdurend *Het gaat hier niet om 'rustig kuieren'. Er moet iets van gejaagdheid in het lopen zitten. Ook iemand in een rolstoel kan zich 'rusteloos' voortbewegen.*	Vraag 54 ( )
Afat	**Vraag 2** Praat veel en snel Nooit – soms – vaak – meestal *Het gaat hier om de combinatie van 'veel' en 'snel'. Als iemand veel praat, maar dit op een rustige manier doet, moet hier 'nooit' ingevuld worden.*	Vraag 55 ( )
	Vraag 3 Kan rustig stil blijven zitten/liggen Nooit – zelden – vaak – altijd	Vraag 56 ( ) <
	Vraag 4 Gedraagt zich zenuwachtig Nooit – soms – regelmatig – meestal *Het gaat er hier om dat je kunt zien dat iemand wat angstig, gejaagd, gespannen is.*	Vraag 57 ( )
	Vraag 5 Is te ongedurig om langere tijd met iets bezig te blijven Nooit – soms – vaak – altijd	Vraag 58 ( )

GIP
Subschaal 11

Afat	**Vraag 1** Beweert in de gaten gehouden te worden Nooit – bijna nooit – soms – vaak *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer een bewoner zich onvoldoende kan uiten (bv afasie).*	Vraag 59 ( )
Afat	**Vraag 2** Zegt door anderen opzettelijk gekwetst te worden Nooit – bijna nooit – soms – vaak *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer een bewoner zich onvoldoende kan uiten (bv afasie).*	Vraag 60 ( )
Afat	**Vraag 3** Beweert verwaarloosd of slecht verzorgd te worden Nooit – bijna nooit – soms – vaak *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer een bewoner zich onvoldoende kan uiten (bv afasie).*	Vraag 61 ( )
Afat	**Vraag 4** Zegt bestolen te worden Nooit – bijna nooit – soms – vaak *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer een bewoner zich onvoldoende kan uiten (bv afasie).*	Vraag 62 ( )
Afat	**Vraag 5** Beweert dat anderen hem/haar niet mogen Nooit – bijna nooit – soms – vaak *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer een bewoner zich onvoldoende kan uiten (bv afasie).*	Vraag 63 ( )
	Vraag 6 Gedraagt zich wantrouwend tegenover personeelsleden Nooit – bijna nooit – soms – vaak *Bv: niet geloven wat je zegt; van je wegdraaien of weg gaan zitten wanneer je een praatje wilt maken.*	Vraag 64 ( )
	Vraag 7 Gedraagt zich wantrouwend tegenover mede cliënten Nooit – bijna nooit – soms – vaak *Bv: afwerend reageren wanneer andere bewoners contact zoeken; apart gaan zitten.*	Vraag 65 ( )

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken

GIP
Subschaal 12

Afat	**Vraag 1** Zegt zich nutteloos te voelen Nooit – bijna nooit – soms – vaak *Het gaat hier niet om het zich vervelen, maar om het zich als persoon nutteloos, waardeloos te voelen.* *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer bewoner zich onvoldoende kan uiten (bv. door een afasie).*	Vraag 66 ( )
Afat	**Vraag 2** Zegt bang te zijn voor dingen die staan te gebeuren Nooit – bijna nooit – soms – vaak *Met 'bang zijn' wordt zoals bedoeld als 'zich zorgen maken over'.* *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer bewoner zich onvoldoende kan uiten (bv. door een afasie).*	Vraag 67 ( )
Afat	**Vraag 3** Zegt zich neerslachtig te voelen Nooit – soms – regelmatig – vaak *Het gaat hier niet om een inschatting van de beleving. De bewoner moet een dergelijke opmerking echt gemaakt hebben.* *Deze vraag overslaan wanneer bewoner zich onvoldoende kan uiten (bv. door een afasie).*	Vraag 68 ( )
	Vraag 4 Heeft een verdrietige gezichtsuitdrukking Nooit – soms – vaak – altijd *Hier gaat het niet zozeer om een keihard feit, maar om je persoonlijke indruk.*	Vraag 69 ( )
	Vraag 5 Lijkt zich ongelukkig te voelen Nooit – soms – vaak – voortdurend *Hier gaat het niet zozeer om een keihard feit, maar om je persoonlijke indruk.*	Vraag 70 ( )
	Vraag 6 Wordt snel verdrietig als iets tegenzit Nooit – soms – vaak – altijd	Vraag 71 ( )

Niet zoeken naar oorzaken van gedrag, alleen maar scoren wat je hebt gezien/gehoord.
Bij het invullen niet verder terugkijken dan 2 weken

GIP
Subschaal 13

Bedl	**Vraag 1** Gedraagt zich afhankelijk ten opzichte van het personeel Nooit – soms – vaak – altijd *Hiermee wordt bedoeld dat de bewoner meer hulp vraagt dan hij/zij, gezien de aanwezige handicaps, feitelijk nodig heeft.*	Vraag 72 ( )
Afat	**Vraag 2** Vraagt om geholpen te worden bij dingen die hij/zij zelf blijkt te kunnen Nooit – bijna nooit – soms – vaak	Vraag 73 ( )
Afat	**Vraag 3** Vraagt personeelsleden om raad of advies Nooit – bijna nooit – soms – vaak	Vraag 74 ( )
	Vraag 4 Probeert op alle mogelijke manieren de aandacht op zich te vestigen Nooit – bijna nooit – soms – vaak	Vraag 75 ( )
	Vraag 5 Lijkt aarzelend of onzeker in het nemen van kleine beslissingen Nooit – soms – vaak – altijd *Bij deze vraag gaat het om onzekerheid, die zich uit in non-verbaal gedrag, bv. Twijfelen waar we gaan zitten; twijfelen bij het kiezen van kleding, eten, drinken etc.*	Vraag 76 ( )

GIP
Subschaal 14

Bedl	**Vraag 1** Raakt in paniek bij het verlaten van de afdeling Nooit – bijna nooit – soms – vaak	Vraag 77 ( )
	Vraag 2 Laat merken bang te zijn voor bepaalde personen of dingen Nooit – bijna nooit – soms – vaak	Vraag 78 ( )
	Vraag 3 Is plotseling angstig, zonder duidelijke reden Nooit – bijna nooit – soms – vaak	Vraag 79 ( )
	Vraag 4 Is angstig in aanwezigheid van bepaalde andere cliënten Nooit – bijna nooit – soms – vaak	Vraag 80 ( )
	Vraag 5 Toont angst wanneer hij/zij door het personeel geholpen wordt Nooit – bijna nooit – soms – vaak	Vraag 81 ( )
	Vraag 6 Is angstig in aanwezigheid van ‘onbekenden’ Nooit – bijna nooit – soms – vaak	Vraag 82 ( )

Appendix IV – Informed Consent Form

Beste contactpersoon,

Het Kulturhus doet mee aan een onderzoek van de universiteit Wageningen naar de effecten van 'gamen' (beweegspellen) op het gebied van cognitieve gezondheid en stemming bij ouderen met dementie. Uit eerder onderzoek is gebleken dat deze beweegspellen naar alle waarschijnlijkheid een positief effect hebben op de gezondheid.

Een Master student van de universiteit Wageningen zal gedurende een aantal weken langskomen om in kleine groepjes te 'gamen' op de Nintendo Wii. Hierop zullen sportspellen zoals golf, bowling, tennis etc. gespeeld gaan worden. Voorafgaand aan het onderzoek zal er een beginmeting plaatsvinden d.m.v. een korte vragenlijst en een aantal observaties. Na afloop zal er een eindmeting plaatsvinden d.m.v. diezelfde vragenlijst en observaties om het effect van de beweegspellen te meten.

Zowel het 'gamen' als het afnemen van de vragenlijst zal onder begeleiding van verpleegkundige gerontologie en geriatrie Anneke Peters van STMR plaatsvinden. Het onderzoek is anoniem en de resultaten zullen in vertrouwen worden behandeld. Ook zullen er geen individuele resultaten bekend worden gemaakt. Er zal worden gekeken naar gemiddeldes uit de groep.

Wij willen u om uw toestemming vragen om uw familielid bij dit onderzoek te betrekken. STMR is van mening dat deelname aan dit onderzoek voor uw familielid erg leuk zal zijn en daarnaast een mogelijk positief effect op de (cognitieve) gezondheid zal hebben. Het 'gamen' omvat een sociaal aspect, er wordt extra bewogen en de hersenen worden geprikkeld.

Kunt u voor woensdag 6 april aangeven of u akkoord gaat dat wij uw familielid bij dit onderzoek betrekken?

Hartelijke groet,

Robin Splithof (Wageningen University) en Anneke Peters (STMR)

Ps. Voor vragen kunt u altijd contact opnemen.

Appendix V – Intervention Set-up Impression