

# BARRIERS AND MOTIVATORS TO PARTICIPATE IN RESISTANCE TRAINING AMONG DIFFERENT AGE SUBGROUPS OF OLDER DUTCH ADULTS



March  
2019

Explorative study identifying barriers and motivators among different age subgroups of older Dutch adults to participate in resistance training using the Theoretical Domain Framework

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Specialisation – Health & Society

Thesis Code – HSO-80336

# Barriers and motivators to participate in resistance training among different age subgroups of older Dutch adults

## EXPLORATIVE STUDY IDENTIFYING BARRIERS AND MOTIVATORS AMONG DIFFERENT AGE SUBGROUPS OF OLDER DUTCH ADULTS USING THE THEORETICAL DOMAIN FRAMEWORK

### EXECUTIVE SUMMARY

**Introduction:** Sarcopenia, which is the progressive loss of muscle mass, is associated with many negative (health) outcomes, hospital admissions, poor quality of life, and death among older adults. Although the loss of muscle mass appears to be an inevitable part of the ageing process, the rate of muscle loss is modifiable. Resistance training interventions have shown to be effective in reversing losses of muscle mass and function, reducing the impact of sarcopenia on both the individual as well as the society. However, a detailed understanding of barriers and motivators to participate in resistance training among older adults is needed to provide appropriate exercise promotion strategies to increase participation.

**Method:** The methodological approach of this explorative study was based on a qualitative approach with semi-structured interviews as the primary data collection method. The interview questions were based on the 14 domains of the Theoretical Domain Framework. A total of 13 respondents (10 female, 3 male) were interviewed, four within group (1) 55-64, four within group (2) 65-79, and five within group (3) 80+. Data was analysed according to a two-stage process; 1. Inductively and deductively coding using the 14 pre-existing domains of the Theoretical Domain Framework, and 2. Analysing for themes within the barriers and motivators of each domain.

**Results:** The findings of this study suggest that there are barriers as well as motivators for older adults to participate in resistance training based on the 14 domains of the Theoretical Domain Framework of Behaviour Change. Also differences as well as similarities in barriers and motivators were found between the different age groups to participate in resistance training. Moreover, staying in shape was seen as the most important reason to participate in resistance training for all age groups. However, the most important reason not to participate in resistance training differed a lot between the different age groups.

**Conclusion:** This research provides a comprehensive overview of the different behavioural factors motivating or hindering older Dutch adults to participate in resistance training according to the 14 domains of the Theoretical Domain Framework. These findings can be used to guide future research, and also assist researchers, physical activity professionals, and policy makers in creating or enhancing resistance training promotion strategies to increase resistance training participation among older adults.

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# 1. INTRODUCTION

## 1.1. Healthy ageing

At the start of 2016, there were almost 3 million people aged 65 and over in the Netherlands of which 0.7 million were aged 80 years and over (Hiemstra & Kenniscentrum Sport, 2016). It is expected that the amount of older Dutch adults aged 65 and over will be 1.5 times as large by 2060 (Hiemstra & kenniscentrum Sport, 2016). However, the ageing population has a major impact on public health and healthcare in the Netherlands, as the prevalence of chronic conditions such as arthritis, neck and back complaints, diabetes, and dementia increases (Hilderink & Verschuuren, 2018). Moreover, as people become older they more often have physical limitations that affect their daily activities (e.g. climbing the stairs and housework), resulting in an increase in fall incidents, aid needed, and being more dependent (Hiemstra & Kenniscentrum Sport, 2016). Therefore it is important that older adults stay healthy for as long as possible, in order to avoid needing ongoing health and care services, hospitalization, or move into residential aged care (Burton et al., 2017b).

Regular physical activity can contribute to this by means of preventing and treating noncommunicable diseases (e.g. stroke, diabetes, cancer), preventing hypertension, overweight, obesity, and improving mental health, quality of life and well-being (WHO, 2018). Physical activity also plays an crucial role in staying healthy, maintain independency, reducing fall incidents, and increasing quality of life of older adults (Burton et al., 2017b). However, one of the biggest threats to healthy ageing is sarcopenia, which is the progressive decline of muscle mass, muscle quality, and muscle strength (Giallauria et al., 2016).

## 1.2. Sarcopenia

After the age of 30 maximum muscle mass and strength starts to decrease as muscle fibres become smaller, with an average of 0.5 to 2% muscle mass per year after the age of 50 and up to a loss of 50% of total muscle mass at the age of 80 (Pijnappels, 2017). This results in sarcopenia being associated with many negative (health) outcomes, such as frailty, disability and comorbidities, fall accidents, hospital admissions, poor quality of life, and death among older adults (Giallauria et al., 2016; Mijnders, 2016). Moreover, sarcopenia is also linked to an economic burden due to the related costs of fall accidents, disabilities, institutionalization and comorbidities (Mijnders, 2016). For example, the consequences of a fall accident were on average 8,900 euros in direct medical costs and 912 million euros in total health care costs (i.e. first aid visits and hospitalizations) in the Netherlands in 2015 (NVKG, 2017). Although the loss of muscle mass appears to be an inevitable part of the ageing process, the rate of muscle loss is modifiable. For example, resistance training interventions have shown to be effective in reversing losses of muscle mass and function. Therefore, management of sarcopenia by means of resistance training could reduce the impact of sarcopenia on both the individual (health related outcomes) as well as the society (costs of healthcare) (Mijnders, 2016).

## 1.3. Resistance training

Resistance training, which is also known as strength- or weight training, is an important form of physical activity in later life because it enhances the ability to undertake daily activities and it delays age-related deterioration (Fleck & Kraemer, 2014; Pettigrew et al., 2018). Resistance training consists of exercises that causes the muscles to work or hold against an applied force or weight, such as bodyweight exercises, resistance bands, plyometrics (jump training), hill running, free weights, and weight training machines (Fleck & Kraemer, 2014), and is mainly provided through venues such as gyms and fitness centres (Pettigrew et al., 2018). General benefits of resistance training consist of an increase in muscle mass, muscle strength, and bone density, reducing the breakdown of muscle mass (sarcopenia) and lowering the chance of fractures, which in turn will contribute to great functionality and quality of life (Van Mechelen, 2018).

Moreover, sport performance will improve, lower back pain will be reduced, and better body control and awareness will be achieved (Van Mechelen, 2018). Resistance training also has an inhibiting and positive effect on depression and increases confidence levels (Van Mechelen, 2018). Resistance training is therefore the perfect strategy to counteract the decline in functionality and quality of life, and will contribute to greater independency among older adults (Van Mechelen, 2018).

#### **1.4. Resistance training recommendations**

The importance of resistance training for older adults is also reflected in the inclusion of muscle- and bone strengthening activities at least twice a week in the global physical activity recommendations for older adults (65+) set by the World Health Organization (WHO, 2018; Pettigrew et al., 2018). These same recommendations regarding muscle- and bone strengthening activities also apply to older adults in the Netherlands, however older Dutch adults are categorized as 55+ instead of 65+ (Health Council of the Netherlands, 2017). Older Dutch adults (aged over 55 years) are therefore recommended to engage in physical activities that strengthen bones and muscles at least twice a week, such as climbing stairs, repeatedly rising from your chair, balance exercises, and strength training (Health Council of the Netherlands, 2017).

Nevertheless, it has been estimated that only 68.1% of the older Dutch adults (55+) meet the muscle- and bone strengthening recommendations (RIVM, 2017). Moreover, only 41.6% of the older Dutch adults (55+) exercise weekly (RIVM, 2017). This highlights the potential to increase resistance training participation of older Dutch adults aged 55 and therefore improve their health, quality of life, and to reduce health system costs associated with age-related deterioration, diseases and fall incidents (Mijnarends, 2016; Pettigrew et al., 2018).

Research nowadays tends to focus mainly on factors influencing physical activity in general, with relatively less research focussing on issues regarding resistance training participation (Pettigrew et al., 2018). Different forms of exercise could differ in motivators and barriers to those reported for general physical activity. These motivators and barriers could also differ significantly by age group, for example older adults experience different motivators and barriers for specific forms of physical activity relative to other population segment (Burton et al., 2017a). Therefore, a detailed understanding of barriers and motivators to participate in resistance training among older adults is needed to provide appropriate exercise promotion strategies to increase participation (Burton et al., 2017a).

## 2. READERS GUIDE

First of all in paragraph 3.1. characteristics of recent studies identifying factors influencing participation of older adults in resistance training will be discussed. In paragraph 3.2. barriers and motivators for older adults to participate in resistance training identified in the different studies will be discussed and categorized according to the three dimensions of the social ecological model (McLeroy et al., 1988);

**1. Individual factors;** *Characteristics of the individual such as knowledge, attitudes, behaviour, self-concept, skills. This includes the developmental history of the individual.*

**2. Social factors;** *Formal and informal social network and social support systems, including the family, work group, and friendship networks.*

**3. Environmental;** *Institutional factors, community factors and public policy factors, including programs and services, organizational resources and supports for self-management, and the built environment.*

This resulted in a comprehensive overview of the evidence regarding barriers and motivators influencing participation in resistance training. Moreover, in paragraph 3.3. limitations of the different studies are discussed, which resulted in a problem statement with the corresponding research questions.

Chapter 4. explains the theoretical domain framework of behaviour change, which offers a comprehensive framework that structures the data collection and data analysis of this research according to 14 dimensions.

Chapter 5. explains the research methodology, including study design, sampling and recruitment, semi-structured interviews, data analysis, and research ethics.

Chapter 6. consists of the results of this research. First of all, paragraph 6.1. explains the demographic characteristics of the respondents. Paragraph 6.2. explains the barriers and motivators to participate in resistance, followed by an overview of the barriers and motivators in paragraph 6.3. and the most important reasons to participate or not to participate in resistance training in paragraph 6.4.

Chapter 7. Discussion. First of all, paragraph 7.1. highlights the major findings of this study and compares them with the literature review. In paragraph 7.2. limitations and strengths are discussed of this research in general and the use of the Theoretical Domain Framework in this research. Paragraph 7.3. discusses practical relevance and offers suggestions for future research.

At last, chapter 8. Conclusion summarizes the findings of this research.

### 3. BACKGROUND

#### 3.1. Characteristics of studies identifying barriers and motivators for older adults to participate in resistance training

First of all, Burton et al., (2016) conducted a cross-sectional descriptive study with the aim to identify motivating factors and barriers among older adults (60+) to start or to continue with resistance training programs. Three groups of older adults (3119 participants) were included consisting of; 1. *Participants of a research training program (1130)*, 2. *Members of a seniors organisation (1060)*, and 3. *Older adults living in a community home receiving care (929)*. Groups 2 and 3 both included older adults already participating in resistance training and older adults not participating in resistance training. Older adults that were not able to communicate or were diagnosed with dementia were not included in this study. Results of this study were discussed in terms of motivating factors and barriers with no distinction between individual, social or environmental factors. The study found that the three groups of older adults had similarities and differences in motivators and barriers to participate in resistance training, which highlights the need for specifically tailored strategies for different groups.

This study was followed up by a systematic literature review by Burton et al., (2017a), which identified motivators and barriers among older adults to participate in resistance training, and included 14 different articles regarding resistance training. The study identified 92 motivators and 24 barriers to participate in resistance training, of which a large part were common barriers and motivators for general physical activity. Nevertheless, there were some factors identified specifically for resistance training, for example perceived risk of a heart attack, stroke or death, and fear of becoming too muscular were identified as specific barriers to participate in resistance training. The review by Burton et al., (2017a) categorized the motivators and barriers according to three dimensions of the socio-ecological model: 1. *Individual-level factors*, 2. *Social factors*, and 3. *Environmental factors*.

Moreover, another cross-sectional descriptive study done by Burton et al., (2017b) specifically focussed on why seniors leave resistance training programs. This study included older adults that had chosen to participate in a structured resistance training program especially designed for older adults. The focus of the study was mainly on cessation of resistance training exercise during the program. Study participants were older adults aged 60 and older and who had been attending a structured, gymnasium-based, resistance training program specifically designed for older adults, and who stopped participating during the period of 15 months.

At last, is a qualitative study by Pettigrew et al., (2018) that identified issues among older adults to participate in resistance training in gyms and fitness centres from different stakeholder perspectives. The study extends previous research regarding barriers and motivators by including stakeholders from four different domains; 1. *Strength training service providers*; 2. *Health and community care practitioners*, 3. *health policy representatives*, and 4. *seniors aged 60 and above*. This enabled data triangulation by including different perspectives from various types of individuals that added valuable information and ideas regarding resistance training. Including multiple stakeholder perspectives is a major strength of this study, since previous research mainly focussed on a single stakeholder group to identify factors influencing participation levels of older adults. The consistency of information received by the different stakeholders also increases the trustworthiness of the findings. The aim of the exploratory study by Pettigrew et al., (2018) was to produce a far-reaching account of factors that influence participation levels of older adults in resistance training at gyms or fitness centres. The study combined the self-determination theory with the ecological systems theory as

applied to health promotion, resulting in a valuable typology of different factors that encourage and discourage participation in resistance training among older adults.

This led to the identification of barriers and motivators based on five ecological levels (Pettigrew et al., 2018); 1. *Intrapersonal*, 2. *Interpersonal*, 3. *Institutional/organizational*, 4. *Community level*, and 5. *Policy level*, which can be narrowed down to individual, social and environmental.

### 3.2. Factors influencing resistance training participation of older adults

#### 1. Individual-level factors

First of all, the study by Burton et al., (2016) identified the following as motivators to participate in resistance training; feeling fit, enjoyment, independency, lose or maintain weight, prevent falls, feeling stronger, physical and mental health, and medical reasons. Regarding barriers, the main barriers were that resistance training being too hard, no time for resistance training, not liking the activities, feeling too old, not knowing how to do it, not interested, pain and injury complaints, and being too tired.

Moreover, a total of 64 individual-level motivators and 18 individual-level barriers were identified by the study of Burton et al., (2017a). The most common motivators consisted of increased strength, general health benefits, improved balance, physical function benefits, and preventing deterioration. In addition, mental benefits such as being more alert, better concentration and stimulating the mind, general mental fitness benefits, and improved wellbeing were the most commonly reported motivators. Identified barriers at the individual-level consisted mostly of poor health, pain, tiredness or fatigue, and a lack of willpower. In addition, becoming too muscular and perceived risk of strokes, heart attacks or even death were specific barriers identified for participation in resistance training and were not common for review regarding general physical activity.

The study by Burton et al., (2017b) identified the following as positive aspects to participate in resistance training programs; enjoyment, feeling fit, health benefits, and retirement (time). On the contrary, no time, boring, dissatisfaction with the program, dissatisfaction with the instructor, not interested, program not suitable, increased pain levels, health condition, injury, and illness are all part of reasons to not participate in resistance training.

At last, the study by Pettigrew et al., (2018) concluded that health benefits, functionality, and tackling age-related decline were internal motivators for older adults to participate in resistance training at the individual level. In addition, concerns about appearance was seen as an external motivator. Regarding barriers to participate in resistance training, older adults lack even the basic understanding of the benefits of resistance training and the multiple ways to undertake resistance training. Other barriers reported included health problems, preference for others form of physical activity, lack of experience with resistance training, and time constraints. Most older adults are not used to schedule regular strength-related activities into their daily lives.

A complete overview of all the individual motivators and barriers regarding resistance training participation of older adults can be found in *Table 1*. down below. However, possibility to exercise at own pace and choosing your own exercises were originally identified as environmental factors, but have been categorized as individual factors.



**TABLE 1: SUMMARY INDIVIDUAL FACTORS INFLUENCING RESISTANCE TAINING PARTICIPATION OF OLDER ADULTS**

Studies identifying individual factors	Burton et al., 2016	Burton et al., 2017a	Burton et al., 2017b	Pettigrew et al., 2018
<b>Individual motivators</b>				
Increased strength	X	X		
Health benefits		X	X	X
Improved balance / prevent falls	X	X		
Physical function benefits	X	X		X
Preventing deterioration		X		X
Mental benefits (alertness, concentration)	X	X		
Improved well-being / feeling fit	X	X	X	
Enjoyment	X	X	X	
Retirement (time)			X	
Appearance concerns				X
Independency	X			
Lose or maintain weight	X			
Medical reasons	X			
Possibility to exercise at own pace		X		
Choosing your own exercises		X		
<b>Individual Barriers</b>				
Poor health		X	X	X
Pain	X	X	X	
Tiredness / Fatigue	X	X		
Lack of willpower		X		
Becoming too muscular		X		
Perceived risk of strokes		X		
Heart attacks		X		
Fear of death		X		
Not knowing the benefits				X
Not knowing what to do / Resistance training being too hard	X			X
No time	X		X	X
Not liking resistance training	X		X	
Preference for other activities				X
Not used to schedule resistance training into daily lives				X
Feeling too old	X			
Injury	X		X	

## 2. Social factors

First of all, the study by Burton et al., (2016) identified health professional advice, doctors advice, being social, and competition/challenge as motivators to participate in resistance training, while barriers mainly consisted of medical advice and nobody to participate in resistance training.

Moreover, a total of 12 social motivators and two social barriers were identified by Burton et al., (2017a). The most common motivators consisted of an increase in social benefits, encouragement from peers or staff, social support, and giving participants a sense of belonging, and observing other people being active. Also social support and encouragement from family, friends, or health professionals were mentioned as motivators, which were also mentioned as motivators at the individual-level factors. Only two social barriers were identified, consisting mostly of responsibilities and obligations regarding work and family, and a lack of social support.

Another study by Burton et al., (2017b) identified helpful and supportive staff, staff engagement and presence, and group sizes around 10 people as motivating factors to participate in resistance training programs. However, poor staff support and caring for someone else were seen as barriers to participate in resistance training programs.

At last, the study by Pettigrew et al., (2018) concluded that achieving positive social outcomes was the main motivator to participate in resistance training, which conveyed both internal as external levels. Moreover, social motivation was identified by the study participants as one of the strongest influencers on participation. Although some factors either have a positive or negative impact on participation in resistance training, for example loved ones can encourage but also discourage resistance training as form of physical activity. Moreover, the presence of partners or friends could encourage participation, but could also form a barrier when they stop participating. At last, the presence of other people could either encourage or discourage participation. Older adults mentioned social contact with similar others as motivator, but the presence of (mainly younger) participants forms a barrier mainly due to their behaviour and/or attire.

A complete overview of all the social motivators and barriers regarding resistance training participation of older adults can be found in *Table 2*. down below. Presence of other (younger) people was identified as a social as well as an environmental factor, however based on the definitions of the categories it was only included in the table of social factors influencing resistance training participation of older adults.

**TABLE 2: SUMMARY SOCIAL FACTORS INFLUENCING RESISTANCE TRAINING PARTICIPATION OF OLDER ADULTS**

Studies identifying barriers & motivators	Burton et al., 2016	Burton et al., 2017a	Burton et al., 2017b	Pettigrew et al., 2018
<b><i>Social motivators</i></b>				
Social benefits	X	X		X
Encouragement from peers or staff		X	X	X
Encouragement from family, friends or health professionals	X	X		X
Social support		X		
Competition / Challenge	X			
Staff engagement and presence			X	X
Training together or in groups			X	X
Presence of other people				X
<b><i>Social barriers</i></b>				
Responsibilities and obligations		X	X	
Lack of social support		X		X
Medical advice	X			
Nobody to participate with	X			X
Poor staff support			X	
Presence of other (younger) people				X

### 3. *Environmental factors.*

First of all, the study by Burton et al., (2016) identified no motivators at the environmental level, however multiple barriers were identified consisting of; class not being available, class times not suitable, costs, lack of transport, no place to participate in resistance training.

Moreover, Burton et al., (2017a) identified a total of 16 environmental factors and four environmental barriers. The most common motivators consisted of availability of organized exercise, access to facilities or equipment, ability to exercise at your own pace, choosing your own exercises, and going to a specialized gym for elderly or a facility with a program specific to the population group. Environmental barriers identified by Burton et al., (2017a) consisted mostly of lack of availability of exercise facilities, moving away from the area, geographical isolation, and the lack of age appropriate resistance training programs.

Another study done by Burton et al., (2017b) identified individualized exercises to personal levels and capabilities, health funds payments, and the presence of staff as main motivators to participate in resistance training programs. However, costs, going elsewhere, classes not being available, class times, waiting for machines/equipment (availability), costs, music at facilities, distance to travel, and overcrowded facilities were seen as barriers to participate in resistance training programs.

At last, the study by Pettigrew et al., (2018) concluded that motivators mainly consisted of individual instructors putting effort in making older adults feel welcome and offer appropriate levels of assistance and promotion of activities that highlight positive health outcomes and affordability. Regarding internal motivation, memberships can add to their self-identity and therefore feelings of being part of a family-like community. This eventually results in an increase in loyalty, guardianship, positive word-of-mouth communications, and therefore providing benefits for the individual as well as the organization.

Pettigrew et al., (2018) also identified the physical environment of gyms and fitness centres as main barrier for older adults to participate in resistance training. This physical environment, besides the presence of (mainly younger) participants, consists of noise levels, poor hygiene, odours, and limited availability of equipment, which forms a barrier to participate in resistance training. Besides the physical environment, social norms and suitable types and levels of activity were also seen as barriers for older adults, which were reproduced by the lack of advice of professionals (e.g. health practitioners) about the importance of incorporating resistance training into their weekly schedule. In general, older adults mentioned that professionals generally recommend them to walk for health benefits, with little to none communication of the appropriateness and health benefits of resistance training in later life. Also the provision of fitting incentives and subsidies to motivate older adults to participate in resistance training can be seen as a barrier. Especially since cost was seen as a primary inhibiting factor for older adults who rely on government pension as their main source of income. This highlights the need for affordable fees regarding resistance training, especially for those with a limited income. In addition, the lack of facilities nearby or financial instable facilities also prevents older adults to participate in resistance training, even when they are internally motivated.

A complete overview of all the environmental motivators and barriers regarding resistance training participation of older adults can be found in *Table 3.* down below. However, some of the environmental motivators and barriers mentioned above have been categorized as individual factors (e.g. possibility to exercise at own pace and choosing your own exercises) and social factors (presence of other people).

**TABLE 3: SUMMARY ENVIRONMENTAL FACTORS INFLUENCING PARTICIPATION IN RESISTANCE TRAINING OF OLDER ADULTS**

Studies identifying barriers & motivators	Burton et al., 2016	Burton et al., 2017a	Burton et al., 2017b	Pettigrew et al., 2018
<b><i>Environmental Motivators</i></b>				
Availability of organized exercise		X		
Access to facilities		X		
Access to equipment		X		
Specialized gym/program for older adults		X		
Individualized exercises			X	
Health funds payment			X	
Affordability				X
Promotion of activities that highlight positive health outcomes				X
<b><i>Environmental Barriers</i></b>				
Lack of availability of exercise facilities	X	X		X
Geographical isolation / distance to travel		X	X	
Lack of (age appropriate) programs/exercises	X	X	X	X
(Program) times not suitable	X		X	
Cost of facilities	X		X	X
Lack of transport	X			
Waiting for exercises / machines			X	X
Music at facilities			X	
Overcrowded facilities			X	
Noise levels				X
Poor hygiene				X
Odours				X
No provision of incentives and subsidies				X

### 3.3. Problem statement

Sarcopenia (progressive loss of muscle mass, quality and strength) is a common problem among older adults causing many negative outcomes such as frailty, disability, comorbidities, fall accidents, hospital admissions, and death (Giallauria et al., 2016). About 1 in 3 older adults in the Netherlands fall at least once a year and half of them even more than once, which leads to serious injuries in 10% of the cases (NVKG, 2017). The costs of a single fall accident are on average 8,800 euro in direct medical costs, while the total medical costs of all fall accidents were estimated at 912 million in the Netherlands in 2015 (NVKG, 2017). One of the key components of interventions tackling sarcopenia is resistance training, which has long been identified as the most promising method for increasing strength and muscle mass among older adults. Therefore, increasing participation in resistance training does not only improve the well-being and quality of life of older adults, but also reduces the high health system costs associated with age-related diseases and fall accidents (Mijnarends, 2016; NVKG, 2017; Pettigrew et al., 2018).

To increase the number of older adults participating in resistance training and reduce age-related deterioration it is important to know what would motivate people to become involved and the factors preventing many older people from participating in resistance training (Burton et al., 2016). It is clear which factors motivate or hinder older adults to participate in resistance training. However, motivators and barriers regarding resistance training among different age subgroups of older adults were not explored. Studies identifying motivators and barriers mainly focussed on total samples of older adults or adherers and non-adherers aged 60 or 65 and above (Burton et al., 2017a; Pettigrew et al., 2018). This may be influential on the results regarding participation in resistance training, since especially muscle strength declines with age, but also physical limitations and inconveniences get more common, resulting in differences in reasons to participate in resistance training between age subgroups of older adults (Burton et al., 2017a).

Furthermore, most of the studies included in the systematic review by Burton et al., (2017a) came from North America, Australia, and New Zealand, and the study by Pettigrew et al., (2018) was solely done in Australia. This results in the findings being less generalizable to people living in different countries. People living in a different cultural, social, and geographical context could report different motivators and barriers regarding participation in resistance training, which highlights the need for further research in different settings (Burton et al., 2017a). At last, the focus in the studies was mainly on the frequency of reported motivators and barriers, rather than what barrier or motivator is most important for the older adult to participate. Studies included in the systematic review by Burton et al. (2017a) all reported the results in different ways, which made it difficult to conclude the relative importance of barriers and motivators.

Therefore, the aim of this research is to identify motivators and barriers to participate in resistance training among different age subgroups of older Dutch adults, according to a Theoretical Domain Framework of Behaviour Change. Currently there is no clear distinction in age subgroups of older adults aged 55 and above. Therefore the age subgroups in this research will be based on existing age subgroups in datasets regarding weekly physical activity participation in the Netherlands; 1. Aged 55-64, 2. Aged 65-79, 3. Aged 80+ (RIVM, 2017). Moreover, the importance of barriers and motivators will be explored among the different age subgroups.

This leads to the following research question:

*“What are the motivators and barriers to participate in resistance training among different age subgroups of older Dutch Adults (aged 55-64, 65-79, and 80+)?”*

To answer the research questions, the following sub questions will be answered:

1. *What motivators or barriers do older Dutch adults (aged 55-64, 65-79, and 80+) identify to participate in resistance training according to the 14 domains of the Theoretical Domain Framework of behaviour change?*
2. *What are the differences or similarities in motivators and barriers to participate in resistance training among different subgroups of older Dutch adults (aged 55-64, 65-79, and 80+)?*
3. *What barriers and motivators are highlighted as most important by older Dutch adults (aged 55-64, 65-79, and 80+) to participate in resistance training?*

## 4. THEORETICAL DOMAIN FRAMEWORK OF BEHAVIOUR CHANGE

The Theoretical Domain Framework is a framework consisting of 14 domains based on the synthesis of 33 theories of behaviour and behaviour change (Atkins et al., 2017). First of all, the basis of the framework is formed by the COM-B model, which consists of 3 sources of behaviour (B) that interact and produce a certain behaviour (Figure 1; Inner green circle):

1. **Capability (C): Knowledge, skills, and abilities to engage in the behaviour (physical & psychological)**
2. **Opportunity (O): Outside factors which make the behaviour possible (physical & social)**
3. **Motivation (M): Brain processes which direct our decisions and behaviours (automatic & reflective)**

Secondly, these 3 sources of behaviour comprise 14 different domains (Figure 1; Outer yellow circle), which are explained in Table 4. Moreover, these 14 domains consist of a total of 84 theoretical constructs (e.g. skills, identity, beliefs), which can be found in Appendix A. (Atkins et al., 2017). The framework therefore offers a theoretical lens to view the cognitive, affective, social, and environmental influences on behaviour, and is relevant in areas of behaviour change such as increasing physical activity and other population behaviours (Atkins et al., 2017). The TDF can be used to guide data collection by means of focus groups, interviews, structured observation, and questionnaires, to identify barriers and facilitators to change.

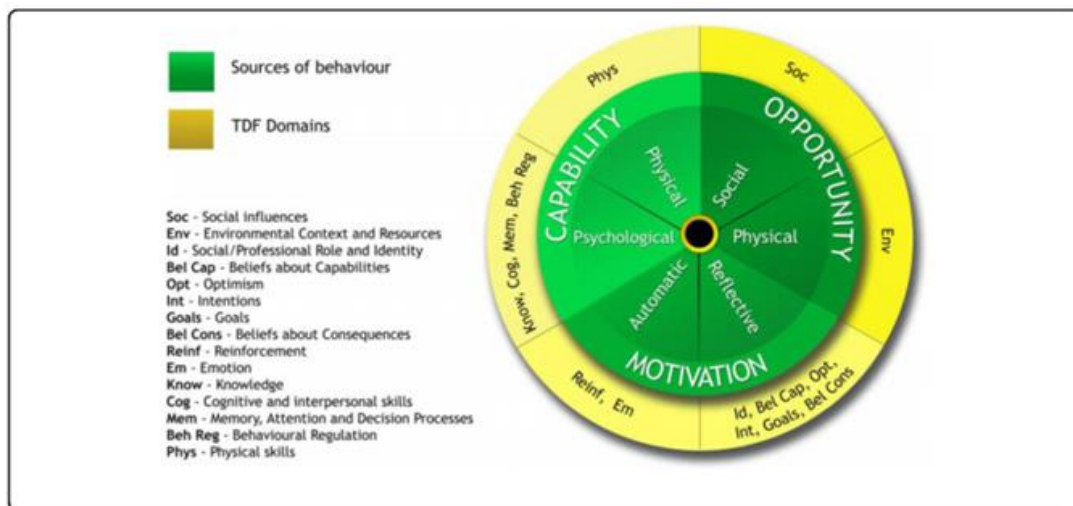


FIGURE 1: THEORETICAL DOMAIN FRAMEWORK OF BEHAVIOUR CHANGE (ATKINS ET AL., 2017).

Regarding the benefits of using the TDF, it provides an excellent theoretical basis for implementation studies, offers great coverage of possible reasons for implementation problems, and a methodological basis to progress from investigation to intervention (Atkins et al., 2017). The TDF opened up new possibilities to investigate and address different problems of implementation, especially in the exploratory stages of multidisciplinary research programs (Atkins et al., 2017).

The Theoretical Domain Framework (TDF) was used to explore what motivators and barriers older adults identify, create interview questions, guide data collection and analysis, and structure the results, all according to the 14 domains of the framework. Table 4. gives an overview of the 14 domains of the TDF with examples of interview questions used. A complete overview of all interview questions can be found in appendix B.



TABLE 4: DOMAINS OF THE THEORETICAL DOMAIN FRAMEWORK WITH EXAMPLES OF INTERVIEW QUESTIONS (ATKINS ET AL., 2017)

Domain	Definition	Example questions based on TDF
1. Knowledge	An awareness of the existence of something	<ul style="list-style-type: none"> <li>• <i>What are the benefits of resistance training according to yourself?</i></li> </ul>
2. Skills	An ability or proficiency acquired through patience	<ul style="list-style-type: none"> <li>• <i>What do you think about your strength in regards to resistance training participation?</i></li> </ul>
3. Social/Professional role and identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting	<ul style="list-style-type: none"> <li>• <i>What do you think of adults aged 55 and over participating in resistance training?</i></li> </ul>
4. Beliefs about capabilities	Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use	<ul style="list-style-type: none"> <li>• <i>What do you think of your own confidence to participate in resistance training?</i></li> </ul>
5. Optimism	The confidence that things will happen for the best or that desired goals will be attained	<ul style="list-style-type: none"> <li>• <i>What is your view on participation in resistance training?</i></li> </ul>
6. Beliefs about consequences	Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation	<ul style="list-style-type: none"> <li>• <i>What are the consequences of participating in resistance training?</i></li> </ul>
7. Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus	<ul style="list-style-type: none"> <li>• <i>What incentives would stimulate you to participate in resistance training?</i></li> </ul>
8. Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way	<ul style="list-style-type: none"> <li>• <i>What are your intentions regarding resistance training participation?</i></li> </ul>
9. Goals	Mental representations of outcomes or end states that an individual wants to achieve	<ul style="list-style-type: none"> <li>• <i>What priority do you give resistance training participation in comparison to other weekly activities?</i></li> </ul>
10. Memory, attention, and decision processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives	<ul style="list-style-type: none"> <li>• <i>What other forms of physical activity do you prefer over participating in resistance training?</i></li> </ul>

<b>11. Environmental context and resources</b>	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour	<ul style="list-style-type: none"> <li>• <i>What environmental factors influence your resistance training participation?</i></li> </ul>
<b>12. Social influences</b>	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours	<ul style="list-style-type: none"> <li>• <i>What would other people, whose opinion you value, think of you participating in resistance training?</i></li> </ul>
<b>13. Emotion</b>	A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event	<ul style="list-style-type: none"> <li>• <i>What emotional factors (e.g. stress, fear, enjoyment) potentially influence your participation in resistance training?</i></li> </ul>
<b>14. Behavioural Regulation</b>	Anything aimed at managing or changing objectively observed or measure	<ul style="list-style-type: none"> <li>• <i>What would be the influence of guidance on your participation in resistance training?</i></li> </ul>

## 5. RESEARCH METHODOLOGY

### 5.1. Study Design

The methodological approach of this explorative study was based on a qualitative approach with semi-structured interviews as the primary data collection method. The main purpose of the semi-structured interviews was to identify motivators and barriers to participate in resistance training among older Dutch adults of three different age categories; (1) 55-64, (2) 65-79, and (3) 80+. The study population of interest therefore consisted of older Dutch adults aged 55 and over.

### 5.2. Sampling and recruitment

The study population of interest was mainly recruited by means of convenience sampling (population sample close by hand) at different retirement homes and by means of snowballing through existing social connections. Exclusion criteria were not being able to communicate, being diagnosed with dementia, and being aged below 55. A total of 13 respondents were recruited, four within (1) 55-64, four within (2) 65-79, and five within (3) 80+. They were all approached individually and informed about the purpose of the study and offered an incentive in the form of coffee with cake. After completing the interview the respondents were also offered a small box of chocolate s as compensation for their time and effort.

### 5.3. Semi-structured interviews

The interview questions (Appendix A.) were based on the 14 domains of the Theoretical Domain Framework of Behaviour Change. They were created on the basis of examples given by Huijg et al., (2014), the descriptions given of each domain, and on the results of the literature review of this study. After the interview questions were determined based on the 14 domains they were adjusted to the language of the study population (Dutch). The interview questions were reviewed in total by two older Dutch adults, one within the 55-64 category and one within the 80+ category. This resulted in the order of the questions being changed to make sure similar questions were grouped together, and in the addition of the definition of resistance training (Appendix A.) in combination with examples of resistance training exercises (Appendix D.).

Written informed consent (Appendix C.) was obtained from all respondents at the beginning of the interviews. The semi-structured face-to-face interviews were carried out at different retirement homes and at the personal homes of respondents. The duration of the interviews varied from 15 to 30 minutes depending on the answers of the respondents.

### 5.4. Data-analysis

The semi-structured interviews were recorded and transcribed into textual form. Respondents were given fake names and the transcribed text was narrowed down into condensations and coded as a possible barrier or motivator, which was operationalized as any factor, characteristic, view or belief that possibly hinders or facilitates participation in resistance training. Moreover, a two-stage process was applied whereby identified barriers and motivators were 1. Inductively and deductively coded using the 14 pre-existing domains of the Theoretical Domain Framework, and 2. Analysed for themes within the barriers and motivators of each domain (e.g. distance or affordability). Results from the data analysis are presented in tables that summarizes barriers and motivators for each age group according the 14 domains of the Theoretical Domain Framework. This resulted in a comprehensive overview of the motivators and barriers for each domain, which allows for easier comparison between the different age groups in order to spot differences and similarities.

## 5.5. Research ethics

Regarding research ethics, the study was reviewed and approved by the Social Sciences Ethics Committee in Wageningen. The following was taken into account: *1. fair and respectful treatment of humans involved as subjects of research, in terms of inconvenience, consent and privacy, 2. Professional handling of data on human research subjects, 3. Acceptability of potential risks caused by the study. Potential risks are assessed in the light of the scientific and societal importance of the study.*

Informed consent, confidentiality, and anonymity were all taken into account. Respondents had to give informed consent before participating in an interview. Study participants were informed about the study's purpose, content, and duration. Moreover, the study participants were also informed that they could stop participating at any given point during an interview. Besides that, also identities of the study participant were kept confidential, in order to protect the relationship between the researcher and the participants to create a trusting environment to share their opinions. Therefore names, addresses and any (personal) numbers were not asked. At last, anonymity was taken into account, which relates to the privacy of study participants. This means that any data or information was not linkable to study participants by means of name. The letter of informed consent was based on the Informed Consent Form Template for Qualitative Studies by the World Health Organization (2011), and can be found in *Appendix C* in English as well as in Dutch.

## 6. RESEARCH RESULTS

### 6.1. Demographic characteristics of respondents

The first age group (55-64) consisted of only women with an average age of 59, the second age group (65-79) consisted of 2 men and 2 women with an average age of 71, and the last age group (80+) consisted of 4 women and 1 men with an average age of 83.

### 6.2. Identified barriers and motivators of all age groups

An overview of the results of each age group can be found in paragraph 6.3. (Page 41)

#### 1. Knowledge: an awareness of the existence of something

##### a. Barriers

Within the age category 55-64 being “unfamiliar with resistance training”, “unsure about benefits”, and “unknowing about financial support” were the only barriers identified regarding knowledge, which were mentioned by two respondents (Lotte & Sophie). Lotte explicitly stated that she was unfamiliar with resistance training in general and the consequences, besides injuries, of participating in resistance training. Sophie was not sure if resistance training would contribute to weight loss and also explained that there is not much known about financial support (e.g. reimbursement) regarding participation in resistance training.

*“NOT MUCH IS KNOWN ABOUT FINANCIAL SUPPORT, ESPECIALLY HERE IN THIS TOWN” (SOPHIE)*

Moreover, within the age category 65-79 “unfamiliar with resistance training”, “unknowing about resistance training initiatives”, and “unsure about knowing the correct information” were also identified as barriers to participate in resistance training by three respondents (Tess, Hugo, Tim). Tess as well as Hugo both mentioned that they were unfamiliar with resistance training in general. Hugo also mentioned that he did not know what was going on around his hometown and that he sometimes hears from others that there is something to do of which he does not know. Also Tim was not sure if what he knows regarding resistance training is correct, for example with weight is normal to use at his age.

*“I KNOW WHAT STRENGTH TRAINING IS, BUT I AM NOT SURE IF IT IS CORRECT WHAT I KNOW” (TIM)*

At last, within the age category 80+ only one barrier was identified by one respondent (Mila), which was “unknowing about consequences of resistance training”. When asked if Mila was familiar with any disadvantages or consequences of participating in resistance training she explicitly answered that she did not know any.

##### b. Motivators

Regarding the identified motivators within the age category 55-64, being “familiar with resistance training” was mentioned by all four respondents. Emma was familiar with resistance training because of her son. Lotte explained that she knew a little about resistance training in general. Sophie explicitly mentioned that she was familiar resistance training and Anouk also said that she knew what to do because of resistance training lessons.

However, what was noticeable is that Lotte at first said that she was unfamiliar with resistance training in general, but after explanation of the definition of resistance training in combination with examples of exercises she mentioned that she knew a little about it.

Moreover, Lotte also explained that she had been to the gym before and therefore should be familiar with resistance training. This implies that the respondent knows about resistance training but has a different perception of the term resistance training.

*"I AM FAMILIAR WITH RESISTANCE TRAINING THROUGH MY SON" (EMMA)*

Within the age category 65-70 all respondents (Tess, Tim, Hugo, Lieke) also mentioned being "familiar with resistance training" after being shown example exercises in combination with information about the definition of resistance training. Tess said that she knew the exercises that were shown as examples. Hugo said that strength training reminds him of lifting weights, rowing and pulling. Tim explained that he is familiar with resistance training because of his son participating in resistance training and also owning a fitness centre. Lieke mentioned that she knew the exercises as well because she had done fitness before and she also knew that you have to do resistance training twice a week.

However, two respondents (Tess & Hugo) also mentioned at first that they were unfamiliar with resistance training in general, but after being explained what the definition of resistance training is in combination with examples of resistance training exercises they mentioned being familiar with resistance training in general. This was also the case within the age category 55-64 and therefore implies that respondents have a different perception of the term resistance training.

*"I KNOW THESE EXERCISES BECAUSE I HAVE DONE FITNESS BEFORE" (LIEKE)*

Furthermore, 3 out of 4 respondents within the age category 55-64 (Lotte, Anouk, Sophie) mentioned "experience in resistance training", which was also identified as a motivator. Lotte has been to the gym before and observed how they did strength training there. Anouk also explained that she already does different exercises, for example push ups. Sophie had weights at home which she uses regularly. This was also mentioned twice in the age category 65-79 by two respondents (Tim & Lieke). Tim said that he used to do fitness, which included rowing. Lieke also did fitness before but also goes to gymnastics once a week nowadays. Moreover, within the age category 80+ four out of five respondents (Mila, Luuk, Jasmijn, Lauren) also had experience in resistance training. Mila had used equipment for resistance training in a fitness centre before. Luuk has also been doing resistance training for one and a half years already and explains that he exactly knows what to do. Jasmijn still participates in elderly gymnastics and also does back exercises on the ground several times a week at home. Lauren also explained that she does machine exercises every week for 30 minutes, for example exercises where you have to pull something down.

*"WE HAVE BEEN DOING IT FOR ONE AND A HALF YEARS, WE KNOW EXACTLY WHAT WE HAVE TO DO" (LUUK)*

At last, "awareness of guidance being present" and "awareness of health benefits" were only mentioned once by one respondent (Lotte) within the age category 55-64. She said that she knew that there was guidance available in the gyms and that she was also aware of the health benefits of exercising. This was also identified as a motivator to participate in resistance training. Moreover, "procedural knowledge" regarding resistance training exercises was also mentioned once by one respondent (Lauren) within the age category 80+. Lauren explained that you had to do the exercises slowly and that you should not force it.

## **2. Skills: An ability or proficiency acquired through practice**

### **a. Barriers**

Only one barrier was identified with regards to skills. One respondent (Sophie) within the age category 55-64 mentioned “physical problems” as a result of arthrosis. Sophie mentioned that she is not able to hold weights and therefore being limited to participate in resistance training. This barrier was also identified within the age category 65-79 by one respondent (Tess). Tess also explained that she had arthrosis in her knee, fingers and ankles and that she was not able to lay down and move her head and neck, which was her biggest obstacle to participate in resistance training. Moreover, “physical problems” was also identified within the age category 80+ by four out of five respondents (Jasmijn, Anna, Lauren, Luuk). Jasmijn was not able to lift her legs properly. Anna had heart problems as well as a new knee that does not fit properly which makes participating in exercises much more difficult. Lauren also explained that he could not do any exercises on his knees and that too much with his back is not good either. Luuk also explained that he had to be careful with his back, otherwise he will have pain.

*“ARTHROSIS LIMITS MY PARTICIPATION IN STRENGTH TRAINING” (SOPHIE)*

Besides physical problems, having “less strength than before” was the only other barrier identified by one respondent (Tim) within the age category 65-79. Tim explained that muscle mass and strength decline and that there is not much you can do about it, resulting in him having less strength than when he was younger.

### **b. Motivators**

Three out of four respondents (Sophie, Lotte, Anouk) within the age category 55-64 mentioned “having enough strength” to participate in resistance training exercises. Sophie said that she had the strength to participate if she could take her time, and Lotte as well as Anouk had both no problems with their strength as well as their balance, therefore enabling them to participate in resistance training.

*“I HAVE NO PROBLEMS WITH STRENGTH OR BALANCE” (LOTTE)*

One respondent (Lotte) within the age category 55-64 also mentioned “being able to do resistance training exercises”. Lotte explained that she was in a good shape and was able to do the different exercises if needed. This barrier was also identified within the age category 80+ by two respondents (Mila & Jasmijn). Mila explained that her skills were still reasonably good when asked if she could do certain exercises, although it depends on how heavy these exercises get. Jasmijn mentioned that she still goes through her legs at gymnastics, although not very far. She also mentioned that she had nice strength in her fingers when asked if she had enough strength to do resistance training exercises.

*“MY SKILLS ARE STILL REASONABLY GOOD, BUT OF COURSE IT DEPENDS ON HOW HEAVY IT GETS” (MILA)*

Nevertheless, there was nothing explicitly mentioned regarding skills within the age category 65-79 that could be identified as motivators.

### **3. Social/Professional role and identity: a coherent set of behaviours and displayed personal qualities of an individual in a social or work setting**

#### **a. Barriers**

Regarding the social/professional role and identity, identified barriers were “age” related and were mentioned by two respondents (Sophie & Anouk) within the age category 55-64. Sophie said that you are not 20 years old anymore, thus you are more vulnerable to overloading the muscles and feeling tired. Anouk explained that elderly will not re-join after they stop participating, because they feel too old and do not see the need to participate anymore. This was also identified within the age category 65-79 by one respondent (Lieke). Lieke mentioned that it is crazy if you have to start at the age of 80 and over with resistance training.

*“IT IS CRAZY IF YOU HAVE TO START AT THE AGE 80 AND OVER” (LIEKE)*

Moreover, four out of 5 respondents (Jasmijn, Anna, Mila, Luuk) within the age category 80+ also identified barriers relating to “age”. Jasmijn explained that you have to be careful that you are not too old for the gym and that it is different for everyone. She also mentioned that as a 83 year old you can say that you want to participate in resistance training but that you have to be careful and pay attention to what you do. Anna thinks you are able to do resistance training at the age of 50, but at her age not anymore, which is in line with what Jasmijn explained about becoming too old for the gym. Mila also says you are crazy if you have to start at the age of 80, which was also mentioned by Lieke. She said that it is okay if you have always done resistance training before, but you should not start at the age of 80 because you will not have enough strength anymore. At last, Luuk mentioned that there is also a local fitness centre, but when asked if he would like to go there he explained that only younger people go there. Thus Luuk sees the gym as an environment mainly for younger people, which can be identified as a barrier to participate in resistance training for older adults.

*“YOU HAVE TO BE CAREFUL THAT YOU ARE NOT TOO OLD FOR THE GYM, THAT IS DIFFERENT FOR EVERYONE” (JASMIJN)*

Furthermore, one respondent (Tim) within the age category 65-79 mentioned participating in resistance training not being in line with his “social identity”. Tim explained that he is not the type of person that lifts weights and that normal people do not have to train with heavy weights.

#### **b. Motivators**

“Appropriateness of resistance training” was the only motivator identified regarding social/professional role and identity. Within the age category 55-64 two respondents (Sophie & Anouk) mentioned resistance training being an appropriate form of exercising for older adults. Sophie found strength training good and appropriate even for adults aged 75 and over, because if you get older you need to work harder. Anouk also thought that strength training was appropriate because you are able to do it at different levels and people are naturally lazy and should therefore be challenged.

*“STRENGTH TRAINING IS OKAY, EVEN FOR ADULTS AGED 75 AND OVER” (SOPHIE)*

Moreover, within the age category 65-74 three respondents (Tess, Tim, Lieke) also mentioned resistance training being an appropriate form of exercising for older adults. Tess said that strength training is not only for the younger generations and if people aged over 55 do it gradually and not too heavy it is certainly possible. Tim mentioned resistance training recommendations being useful and being good for you since you need strength to do things around the house. Lieke mentioned that people aged 80 and over should do exercises, although not too heavy, but with adjusted weights or even without weights in the beginning. She also said it was an appropriate form of training which you really have to keep doing if possible.



*“ AS LONG AS PEOPLE AGED 55 AND OLDER DO IT GRADUALLY AND NOT TOO HEAVY IT IS POSSIBLE” (TESS)*

However, it is noticeable that Tim indicated resistance training being an appropriate form of exercising for older adults, although he does not personally identify himself as the type of person that lifts weights. Also there were no motivators identified within the age category 80+ regarding social/professional role and identity.

#### **4. Beliefs about capabilities: Acceptance of the truth, reality, or validity about an ability, talent or facility that a person can put to constructive use**

##### **a. Barriers**

Regarding beliefs about capabilities, “perceived competence” and “self-efficacy” were mentioned by two respondents (Emma & Sophie) within the age category 55-64. “Perceived competence” refers to the perceived ability to participate in resistance training. So was Emma sure that she needed guidance to participate in resistance training, otherwise she would be using her muscles the wrong way.

*“I NEED HELP, OTHERWISE I WILL USE MY MUSCLES THE WRONG WAY” (EMMA)*

“Perceived competence” was also mentioned by one respondent (Tess) within the age category 65-79. Tess explained that she was really vulnerable for injuries in general, which can make it more difficult for her to participate in resistance training. Moreover, it was also mentioned by all respondents (Jasmijn, Anna, Lauren, Luuk, Mila) within the age category 80+. Jasmijn mentioned that her reactions had declined and that it is not as good as it used to be. Anna explained that she would not be able to get up anymore if she did resistance training exercises on the ground. She said that you do not participate because you cannot do half of the things they do there. Lauren also said that there are exercises she could not do because she does not have enough power for them. Luuk explained that he had to be careful and had to make sure that it does not hurt or else he will experience problems in the evening, which was also mentioned by Mila who said that she was very careful of injuries.

*“I HAVE TO BE CAREFUL, SO I HAVE TO MAKE SURE IT DOES NOT HURT OTHERWISE I WILL HAVE PROBLEMS IN THE EVENING” (LUUK)*

“Self-efficacy” was only identified by one respondent (Sophie) within the age category 55-64 and refers to an individual’s belief in their innate ability to participate in resistance training. Sophie mentioned that she needed to work on her balance and flexibility, because she had a very bad sense of balance and flexibility especially in the lower legs. Moreover, one respondent (Lieke) within the age category 65-79 also mentioned “self-efficacy”. Lieke mentioned that she had balance problems and that she had to really focus to do certain resistance training exercises.

*“BALANCE IS A PROBLEM FOR ME, I REALLY HAVE TO FOCUS” (LIEKE)*

At last, “lack of perseverance” was mentioned by two respondents (Tess & Tim) within the age category 65-79. Tess mentioned that she had problems with perseverance in resistance training because of her physical problems and Tim also wished that he had more perseverance to participate in resistance training.

## **b. Motivators**

Even though perseverance was identified as a barrier it could also be identified as a motivator by means of having a “good perseverance” regarding resistance training participation. One respondent (Anouk) within the age category 55-64 mentioned her perseverance being very good, because she learned to turn things like pain off to be able to continue with certain exercises. Two respondents (Hugo & Lieke) within the age category 65-79 also mentioned “good perseverance” regarding resistance training participation. When asked what they thought about their own perseverance in relation to resistance training participation Hugo answered that he had great perseverance. Lieke also said she had perseverance if she really wants something.

*“MY PERSEVERANCE IS VERY GOOD AND WE LEARN THAT AS WELL. WE LEARN TO SWITCH THINGS LIKE PAIN OFF TO BE ABLE TO CONTINUE” (ANOUK)*

Furthermore, “perceived competence” was also identified as a barrier as well as a motivator. Two respondents (Hugo & Lieke) within the age category 65-79 identified “perceived competence” as a motivator to participate in resistance training. Hugo explained that he was really capable to do resistance training exercises, especially in comparison to others of his age. He also thought that he had reasonably good stamina to participate in resistance training. Lieke mentioned that it was possible for her to do resistance training exercises as well.

*“I AM REALLY CAPABLE IN COMPARISON TO OTHERS” (HUGO)*

Likewise, “self-efficacy” was also identified as a barrier as well as a motivator. One respondent (Mila) within the age category 80+ identified “self-efficacy” as a motivator. Mila mentioned that she had always been pretty powerful when asked if she would be able to do resistance training exercises.

Two respondents (Lotte & Anouk) within the age category 55-64 identified “confidence to participate in resistance training” also as a motivator. Lotte as well as Anouk both explicitly stated that they had the confidence to participate in resistance training. One respondent (Tim) within the age category 65-79 also mentioned feeling self-assured and not disabled to participate in resistance training when asked if he was confident enough to participate. Likewise, two respondents (Luuk & Lauren) within the age category 80+ also identified “confidence to participate in resistance training” as a motivator. Luuk explained that he could do the exercises without supervision, and Lauren said that resistance training exercises are going great right now.

*“I COULD ALSO DO THESE EXERCISES WITHOUT SUPERVISION” (LUUK)*

Also “beliefs” was identified as a motivator by two respondents (Jasmijn & Mila) within the age category 80+. “Beliefs” is defined as the mental representation of an attitude towards resistance training participation. Jasmijn said that she was responsible for herself. Mila explained that everyone has to decide for themselves what nonsense is, and if she feels like participating in resistance training she has to do it.

## **5. Optimism: confidence that things will happen for the best or that desired goals will be attained**

### **a. Barriers**

"Being pessimistic about resistance training participation" was the only barrier identified within all age categories. It was identified as a barrier because the tendency to expect bad or negative outcomes could form a barrier to participate in resistance training. Emma was the only respondent within the age category 55-64 that was pessimistic about participating in resistance training. Emma explained that if you get older you need guidance to participate or else you will use the muscles the wrong way and get injured. Also Tess within the age category 65-79 was pessimistic about resistance training participation. Tess said that participating in resistance training would have more disadvantages than benefits, thus the benefits are not outweighing the disadvantages of participation. Moreover, Anna within the age category 80+ was also pessimistic about resistance training participation. Anna explained that she will keep on exercising but that it could also have negative consequences.

*"MORE DISADVANTAGES THAN BENEFITS IS WHAT I HAVE EXPERIENCED" (TESS)*

### **b. Motivators**

"Positive attitude regarding resistance training participation" and "resistance training being beneficial" were the only two motivators identified regarding optimism, because a positive attitude towards resistance training participation and seeing resistance training as something beneficial could stimulate participation.

Three out of four respondents (Sophie, Lotte, Emma) had a "positive attitude regarding resistance training participation". Sophie mentioned that resistance training had a positive influence on your body. Lotte explained that participating in resistance training was possible right now with how things were going and that it would be a good thing to do because they recommend it. Emma also said that resistance training exercises are good and that you should motivate your muscles to do something. This was also identified as a motivator by two respondents (Hugo & Lieke) within the age category 65-79. Hugo sees resistance training as something positive. He thinks that people need to exercise. Lieke explained she keeps on trying even if it does not go as intended, because it is good to exercise. Only two respondents (Jasmijn & Anna) within the age category 80+ had a positive attitude towards resistance training participation. Jasmijn explained that it was good to use the muscles and that you should use them, therefore being very positive about participating in resistance training. Anna mentioned that it was good to have recommendations regarding resistance training participation nowadays.

*"I FIND STRENGTH TRAINING AND EXERCISING GOOD, MOTIVATING THE MUSCLES TO DO SOMETHING" (EMMA)*

Moreover, "resistance training being beneficial" was identified by three out of four respondents (Sophie, Anouk, Emma) within the age category 55-64 as a motivator. Sophie explicitly mentioned resistance training being beneficial. Emma also said that she did not see resistance training participation as a disadvantage, which was also mentioned by Anouk who also said that the benefits outweigh the disadvantages. This was also identified as a motivator by two respondents (Lieke & Tim) within the age category 65-79. Lieke explained that the benefits of participating in resistance training outweigh the disadvantages. Tim also mentioned that participating in resistance training would be beneficial for him, although at a normal level.

*"MORE BENEFITS AND IT OUTWEIGHS THE DISADVANTAGES" (LIEKE)*

Likewise, two respondents (Jasmijn & Luuk) also identified “resistance training being beneficial” as a motivator to participate. Jasmijn explained that resistance training would be beneficial, however you need to keep on going. Luuk also mentioned resistance training being beneficial and that it would be good for most people to participate..

*“IT IS JUST BENEFICIAL, IT WOULD BE GOOD FOR MOST PEOPLE” (LUUK)*

## **6. Beliefs about consequences: acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation**

### **a. Barriers**

“Risk of injuries” was identified as a barrier by three out of four respondents (Emma, Lotte, Sophie) within the age category 55-64, because the fear of injuries can withhold adults from participating in resistance training. Emma explained that there is a risk of injuries when you participate in resistance training, especially if you push yourself too hard. Lotte also mentioned that heavy exercises are not good to do, because there is a chance of injuries and also pain. Sophie explained that mistakes were easily made resulting in injuries. “Injuries” was also identified by two respondents (Hugo & Tim) in the age category 65-79. Hugo explained that the only disadvantage of participating in resistance training would be injuries and that you will more likely get an injury if you have not done resistance training before. Tim also said that injuries were a disadvantage of resistance training, however if he decides to participate he will do it moderately to reduce the risk of injuries. Moreover, three out of five respondents (Anna, Luuk, Lauren) within the age category also identified “Injuries” as a barrier to participate in resistance training. Anna also explained that there is a risk of injuries when participating in resistance training, especially if you are not familiar with resistance training. Luuk also said that you need to keep an eye on injuries if you participate in resistance training. Lauren explicitly mentioned injuries as a consequence of resistance training participation, in particular if you do certain things too much.

*“YOU GET EASILY INJURED IF YOU HAVE NOT DONE STRENGTH TRAINING BEFORE” (HUGO)*

It is noticeable that many respondents of different age categories mentioned injuries as a consequence of resistance training participation, in particular if you do too much or train too heavy. Also both Hugo and Anna explained that there is a higher risk of injuries if you are not familiar with resistance training.

Besides injuries, “pain” was also frequently mentioned as a consequence of participating in resistance training. Three out of four respondents (Emma, Lotte, Sophie) within the age category mentioned “pain” as a consequence. Emma and Sophie both explained that resistance training could hurt, which can be a barrier to participate. Lotte also mentioned that heavy exercises could lead to pain and eventually injuries. Similar answers were given within the age category 65-79 by two respondents (Lieke & Tess). Both explicitly mentioned pain or sore muscles as a consequence of resistance training. Likewise only one respondent (Anna) within the age category 80+ identified “pain” as a barrier to participate in resistance training.

*“SORE MUSCLES AFTER EXERCISING CAN BE A DISADVANTAGE, BUT NOT ALWAYS” (LIEKE)*

Furthermore, “overloading the muscles” was only identified as a barrier to participate within the age category 55-64 by two respondents (Emma & Sophie). Emma explained that wrong movements and overloading the muscles could be a consequence of resistance training, which could be prevented by knowing what to do in resistance training. Sophie also said that wrong movements lead to tired and overloaded muscles. It is noticeable that both respondents mentioned wrong movements during resistance training as a factor leading to overloaded muscles, which is in line with the answers of respondents of doing too much or too heavy.

At last, “deterioration”, “Muscles will protest”, and “risk of falling” were also identified as barriers to participate in resistance training, however they were only mentioned once in total. One respondent (Tim) within the age category 65-79 explained that he did not see the need of having a lot of muscles, because if you get sick or become older you will lose it again. He explained that having more muscles would lead to a bigger deterioration eventually. Moreover, one respondent (Jasmijn) within the age category 80+ mentioned both that her “Muscles will protest” and that there is a “risk of falling”. Jasmijn explicitly said that her muscles will protest if she participates in resistance training and therefore she will not do it. She also mentioned that you can fall if you participate in resistance training.

*“I DO NOT SEE THE POINT OF HAVING A LOT OF MUSCLES, BECAUSE IF YOU GET SICK OR OLDER YOU LOSE IT AGAIN. THE MORE MUSCLES YOU HAVE THE BIGGER THE DETERIORATION” (TIM)*

## **b. Motivators**

The following themes were identified as motivators because they were seen as positive consequences of resistance training participation. First of all, “social contact” was seen as a positive consequence of resistance training participation by two respondents (Lotte & Anouk) within the age category 55-64. When asked what the benefits were of participating in resistance training Lotte responded that social contact is a possibility, which was also mentioned by Anouk who also said that social contact is important. Moreover, two respondents (Hugo & Lieke) within the age category 65-79 also mentioned “social contract” as a positive consequence of resistance training. Hugo said that if you do something together there is social contact. Lieke also mentioned having social contact with people of your own age and some older people. Likewise, only one respondent (Mila) within the age category 80+ mentioned “social contact” as a positive consequence. Mila explained that you will have social contact with others in a fitness centre because you often see them.

*“YOU HAVE SOCIAL CONTACT WITH PEOPLE OF YOUR OWN AGE AND SOME OLDER PEOPLE” (LIEKE)*

Furthermore, “muscle related benefits” were identified as a positive consequence of resistance training participation. All respondents (Emma, Lotte, Sophie, Anouk) within the age category 55-64 mentioned some sort of benefits for the muscles as a motivator to participate. Emma explained that resistance training contributed to the development of the muscles and therefore less overloading of the muscles. Lotte mentioned that you will preserve your muscles, thus maintaining your muscle mass. Sophie explained that resistance training builds muscle, increases explosiveness of the muscles, and keeps your muscles on level. She explained that for example a stronger back helps when you have to work in the garden and that being able to lift things is a benefit of resistance training. Anouk also mentioned an increase in muscle mass as consequence of resistance training and she also said that you become stronger and that your skills get better. “Muscle related benefits” was also mentioned by two respondents (Tess & Tim) within the age category 65-79. Tess as well as Tim also explained that resistance training strengthens the muscles. Moreover, four out of five respondents (Mila, Lauren, Luuk, Anna) also mentioned “muscle related benefits”. Mila said that you will remain powerful if you do resistance training, and Anna explicitly mentioned that resistance training would have benefits for the muscles. Lauren mentioned that you will strengthen the muscles, and Luuk said that if you do not participate in resistance training you will suffer more from your muscles and you become stiffer.

*“THAT MY MUSCLE MASS INCREASES” (ANOUK)*

Likewise, “stronger bones” was also identified as a motivator, however only by two respondents (Tim & Lieke) within the age category 65-79. Tim explained that most accidents among older adults happen at home and if you exercise a lot your bones will be less fragile. Lieke only mentioned that resistance training was good for the bones.

*“MOST ACCIDENTS AMONG THE ELDERLY HAPPEN AT HOME, IF YOU EXERCISE A LOT THE BONES ARE OFTEN NOT SO FRAGILE THAN IF YOU DO NOT EXERCISE” (TIM)*

“Feeling great” was also identified as a motivator to participate in resistance training. Two respondents (Sophie & Anouk) within the age category 55-64 both mentioned that participating in resistance training made them feel great or feel better because of it. This was also identified by one respondent (Lieke) within the age category 65-79. Lieke also said that you feel great after you have participated in resistance training.

Also a “muscular appearance” was identified as a positive consequence of resistance training participation. One respondent (Sophie) within the age category 55-64 mentioned that resistance training contributes to less arm fat, nicer looking shoulders, and a tighter body, therefore enhancing your appearance. She also said that resistance training enhances your body posture. This was also identified by one respondent (Lieke) within the age category 65-79. Lieke explained that a bit of a muscular appearance is nice, otherwise everything becomes so weak and starts sagging.

*“LESS ARM FAT, NICER IN THE SHOULDERS AND TIGHTER BODY” (SOPHIE)*

Another motivator identified by respondents was “prevention”, which mainly relates to the prevention of falls, injuries, and deterioration. One respondent (Anouk) within the age category 55-64 explained that the more emphasis on resistance training is good, especially with regards to the prevention of fall and injuries. Likewise, Tess (65-79 category) mentioned that your stamina will decline if you do not exercise, thus exercising prevents your stamina from declining which was seen as a positive aspect of resistance training. This was also mentioned by one respondent (Jasmijn) within the age category 80+. Jasmijn explained that if you do not push through to a certain level of exercising you will deteriorate, thus participating in resistance training can prevent deterioration.

Moreover, “feeling fitter” was mentioned by one respondent (Anouk) within the age category 55-64 as well as two respondents (Lauren & Luuk) within the age category 80+. Anouk explained that participating in resistance training made her feel fitter overall. Lauren also mentioned that participating in resistance training helped you to stay fitter, which was also mentioned by Luuk as staying in shape.

At last, some other positive consequences of resistance training mentioned only by respondents within the age category 55-64 were a “faster post-operation recovery” (Sophie), “Mental benefits” (Emma), “Losing weight” (Emma & Anouk), and an “increase of your resting metabolic rate” (Anouk).

## **7. Reinforcement: increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus**

### **a. Barriers**

Regarding reinforcement barriers, “financial support” was one of the barriers identified, which mainly consisted of some form of missing financial support or disappeared discounts. Three out of four respondents (Emma, Sophie, Anouk) within the age category 55-64 identified “financial support” as a barrier to participate in resistance training. Emma said that financial support would not stimulate to participate in resistance training. Sophie explained that the financial situation of others could be a problem to participate in resistance training, especially of those who have less money to spend. Anouk said that participating in resistance training should be more attractive by means of discounts. She explained that they used to have discounts if you participated in a second sport at the same sports club but that was cancelled out. Moreover, “financial support” was also identified by two respondents (Lauren & Luuk) within the age category 80+. Lauren also explained that there used to be a discount for older adults at the local pool and even though she can still go others won’t be able to pay the costs without the discount. Luuk however explained that the only reason he is able to pay for resistance training is by means of health insurance, without health insurance it would be too expensive for him to participate. This indicates that resistance training is quite costly and without financial support it would be difficult or impossible to participate, therefore forming a barrier.

*“PREVIOUSLY THERE WAS A DISCOUNT FOR THE ELDERLY BUT THAT IS NOW GONE, NEVERTHELESS WE STILL GO BUT OTHERS CANNOT PAY THAT” (LAUREN)*

### **b. Motivators**

“Financial support” could be identified as a barrier but also as a motivator to participate in resistance training, for example by means of reimbursement, discounts, and other cost related factors. Two respondents (Sophie & Anouk) within the age category 55-64 identified “financial support” also as a motivator to participate in resistance training. Sophie mentioned that the municipality helped people by giving them financial support to exercise and that you are able to get financial support if you really wanted to participate in a certain sport. Anouk mentioned that a discount would stimulate to participate, which is in line with the barrier she mentioned earlier of discounts being cancelled out. Also one respondent (Hugo) within the age category 65-79 identified “financial support” as a motivator to participate. Hugo said that participation free of charge from the municipality would stimulate to do resistance training, but also that discounts or money are always nice and would possibly stimulate to participate. Likewise, two respondents (Lauren & Luuk) within the age category 80+ also identified “financial support” as a motivator to participate. Lauren explained that a contribution for example a discount for older adults would stimulate participation and would also stimulate to keep on going. Luuk also agreed that people who really want to participate should get some form of reimbursement and wherever it comes from does not matter.

*“I ALSO THINK THAT PEOPLE WHO WANT IT GET REIMBURSED AND WHERE THAT REIMBURSEMENT COMES FROM DOES NOT MATTER” (LUUK)*

At last, “information” was identified only by one respondent (Hugo) within the age category 65-79. Hugo explained that more information from the municipality regarding resistance training initiatives would help him to participate. Also Anouk (55-64 category) identified “Advertisement of resistance training” as a motivator to participate. Anouk explained that resistance training was not really advertised and that advertising it would stimulate others to participate, therefore advertising resistance training was seen as a motivator.



## **8. Intentions: a conscious decision to perform a behaviour or a resolve to act in a certain way**

### **a. Barriers**

Identified barriers regarding intention consist of conscious decisions to not participate in resistance training. One of the identified barriers therefore was “no intention to do resistance training”, which was mentioned by one respondent (Emma) within the age category 55-64. When Emma was asked if she had any intention to participate in resistance training she explicitly stated that she had no intention at all to participate in resistance training. This was also mentioned by Hugo within the age category 65-79. Hugo also said that he had no intention to do resistance training anymore. Moreover, only one respondent (Mila) within the age category 80+ mentioned that she would not do resistance training anymore, thus not having the intention to participate. She explained that the reason to not participate was that she did not grow up in it.

*“I HAVE NO INTENTION TO DO STRENGTH TRAINING ANYMORE” (HUGO)*

Moreover, “having other priorities” was identified as a barrier as well to participate in resistance training. One respondent (Lotte) within the age category 55-64 mentioned that exercising had her lowest priority and that she had other activities during the week that had a higher priority. This was also mentioned by three out of four respondents (Lieke, Hugo, Tim) within the age category 65-79. Lieke explained that she had to maintain the garden and also the household, therefore always being really busy. Hugo also explained that other activities had a higher priority than participating in resistance training. Tim also explained that his intention to participate in resistance training is less because of other priorities. Likewise, all respondents (Anna, Lauren, Luuk, Mila) within the age category 80+ also mentioned “having other priorities”. Anna mentioned that there was resistance training on the Monday in the retirement home, but because she had the cleaning lady on Monday she did not participate. Lauren mentioned that she already swims and also has to maintain the household, therefore participating only once a week is enough in her opinion. Luuk mentioned that they are very busy at home in the summer resulting in less time for yourself, and if he does not have time for it he will not do it. Mila explained that participating once a week is possible if you have nothing to do, but she still has so many hobbies and other things during the week.

*“ONCE A WEEK IS SUFFICIENT IF YOU HAVE NOTHING TO DO, BUT I STILL HAVE SO MANY HOBBIES AND OTHER THINGS” (MILA)*

Also “unnecessary to participate in resistance training” was identified as a barrier regarding intention, because if respondents do not see the need to participate the intention will not be there. This was mentioned by one respondent (Lotte) within the age category 55-64. Lotte explained to us that she had no interest to participate in resistance training if it is not necessary. This was also identified by Tim within the age category 65-79. Tim did not see the need to train heavily, which can result in him not having the intention to participate. Likewise only one respondent (Anna) within the age category 80+ also identified “unnecessary to participate in resistance training” as a barrier. Anna explained that she is already satisfied by only training her arms and legs. She does not see the necessity to train other muscle groups besides arms and legs which could limit her intention to participate in resistance training.

At last, “resistance training is not appealing” was only identified by one respondent (Tim) within the age category 65-79. When asked if he had the intention to participate in resistance training he explained that participating did not appeal to him.



## **b. Motivators**

Regarding identified motivators, “intention to do resistance training” was identified by only one respondent (Anouk) within the age category 55-64 and one respondent (Tim) within the age category 65-79. Anouk explained that she had the intention to participate in resistance training and actually wants to do exercises more frequently, because she noticed that exercising becomes easier the more you do it. Tim also explicitly mentioned that he intends to do resistance training again. However, Tim also mentioned that his intention to participate was less because of other priorities and that resistance training not appeal to him, which were identified as barriers to participate. It is noticeable that even though he has other priorities and it does not appeal to him the intention to eventually participate in resistance is there.

*“YES THE INTENTION IS PRESENT. I ACTUALLY WANT TO DO IT MORE OFTEN, BECAUSE I THINK THAT YOU CAN DO THE EXERCISES EASIER IF YOU EXERCISE MORE OFTEN” (ANOUK)*

“Resistance training as a priority” was also identified as a motivator to participate. Only one respondent (Anouk) within the age category 55-64 mentioned that participating in resistance training had a high priority for her. This therefore does not limit her intention to participate.

Moreover, “keep on going if possible” was identified as a motivator because this could be seen as the intention to participate. One respondent (Lieke) within the age category 65-79 mentioned that she was already participating and that she will keep on going. This was also mentioned by all four respondents (Jasmijn, Mila, Luuk, Anna) within the age category 80+. Jasmijn, Mila, and Luuk all mentioned that they will keep on participating as long as they were able to, and therefore having the intention to keep on participating. Luuk also said that he had to slow himself down when participating in resistance training. Anna explained that she will keep on doing the exercises a few times a week, which also highlights her intention to keep on participating in resistance training.

*“WE WILL CONTINUE UNTIL WE CAN NO LONGER DO IT, WE KEEP ON GOING” (LUUK)*

## **9. Goals: mental representation of outcomes or end states that an individual wants to achieve**

### **a. Barriers**

Barriers regarding goals consisted mainly of the reasons why respondents would not be able to achieve their goals in the future regarding resistance training participation, thus what would result in them not participating anymore in resistance training in the future. Only one barrier was identified regarding goals, which was “not being able to do resistance training anymore”. This was identified by two respondents (Tim & Lieke) within the age category 65-79 and two respondents (Lauren & Luuk) within the age category 80+. Tim explained that one of the reasons to not participate anymore is not being able to do resistance training, thus when it really starts to hurt or a medical advice. Lieke also mentioned that she would not participate anymore if health problems arise in the future or other barriers. Luuk as well as Lauren both also mentioned that they would not participate anymore if they were no longer able to do resistance training anymore.

*“ONE OF THE REASONS TO NOT PARTICIPATE IS NOT BEING ABLE TO PARTICIPATE ANYMORE, THUS IF IT REALLY STARTS TO HURT OR A MEDICAL ADVICE” (TIM)*

## **b. Motivators**

Motivators regarding goals mainly consisted of what respondents wanted to achieve by participating in resistance training, thus what their outcome expectancies were. One of the motivators identified was “to stay in shape”, which was mentioned by three out of four respondents (Sophie, Lotte, Anouk) within the age category 55-64. Sophie explained that it is important to keep your body up to standard by doing weekly resistance training and to also stay fit for as long as possible. Lotte as well as Anouk both explicitly mentioned staying in shape as a goal to keep on participating in resistance training. Likewise, two respondents (Tim & Lieke) within the age category 65-79 and all four respondents (Jasmijn, Anna, Lauren, Luuk) within the age category 80+ also mentioned “to stay in shape” as a goal to keep on participating in resistance training. Tim explained that staying in shape was his main goal to participate, even more than increasing strength. Lieke also mentioned staying healthy and in shape as a goal, because she wants to keep on working in the garden and if you do not participate you become stiff and working in the garden becomes difficult. Jasmijn, Anna, Lauren and Luuk all mentioned that their goal was to stay fit or become even fitter, which can be seen as a motivational goal to participate in resistance training as well.

*“FIT AND STAYING FUNCTIONAL, I HOPE TO BE THERE FOR A LONG TIME, THUS YOU HAVE TO TRY TO KEEP THAT UP” (LUUK)*

Moreover, “staying healthy” was also mentioned as a motivational goal to participate in resistance training. Two respondents (Emma & Sophie) within the age category 55-64 and also two respondents (Tim & Lieke) within the age category 65-79 identified “staying healthy” as a motivator. Sophie wanted to be able to walk up the stairs as long as possible without for example twisting her ankles. She also explained that you benefit from resistance training on a regular basis when you are sick. Emma explicitly mentioned that she would do resistance training because of health reasons. Tim explained that his goal to participate in resistance training was because of his arthrosis, it would be better for him to do resistance training. Lieke also explained that she did exercises because of a breast operation she had.

Also “maintenance of the body” was frequently mentioned by respondents. Two respondents (Sophie & Anouk) within the age category 55-64 identified “maintenance of the body” as a motivator. Sophie mentioned that she would participate in resistance training to train and strengthen weak abdominal muscles, and Anouk also explained that a stronger body and core are important because of her back complaints. Likewise, one respondent (Tim) within the age category 65-79 and two respondents (Anna & Luuk) within the age category 80+ also identified “maintenance of the body” as a motivator. Tim explained that he would participate in resistance training to strengthen his muscles and that you had to do it consciously for muscle building and because it is good for the body. Anna her main goal was to not lock up, thus not becoming stiff and to stay flexible. Luuk explained that participating in resistance training would be mainly because of his back.

*“MAIN GOAL IS THAT YOU DO NOT LOCK UP” (ANNA)*

Furthermore, only one respondent (Sophie) within the age category 55-64 identified “a balance in exercising and nutrition”. Sophie explained that she would like to live without paying attention to what makes you fatter, thus a healthy balance between exercising and nutrition.

At last, only one respondent (Lauren) within the age category 80+ identified “more physical complaints” as a motivator to participate in resistance training. Lauren explained that she would participate in resistance training when she got more physical complaints.

## **10. Memory, Attention, and Decision Processes: the ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives**

### **a. Barriers**

Identified barriers regarding memory, attention and decision processes mainly consisted of the conscious decisions to not participate in resistance. One of the barriers identified was therefore the “decision to not participate in resistance training”, which was only identified by three out of four respondents (Emma, Lotte, Sophie) within the age category 55-64. Emma explained that she had no problems withholding her from resistance training participation, but she simply did not want to do resistance training even though she could. She also mentioned that she really likes walking, which contributed to her decision to not participate in resistance training. Lotte explained that if she wanted to exercise she had to go in the evening, but the problem is that she did not want to leave her home in the evening. This resulted in a decision to not participate in resistance training. Sophie mentioned that she would rather go to a physiotherapist than a gym or fitness centre, which was identified as a barrier because it could limit her decision to participate in resistance training.

*“NO PROBLEMS WITH ANYTHING BUT I DO NOT WANT TO DO IT” (EMMA)*

### **b. Motivators**

Identified motivators regarding memory, attention and decision processes mainly consisted of the conscious decision to participate in resistance training. Only one motivator was identified by three out of four respondents (Emma, Lotte, Sophie) within the age category 55-64, which was “decision to participate in resistance training”. Emma stated that when she started something she keeps on going, the decision was made. She also mentioned that if really she wanted to participate in resistance training that she would do it and not do it for attention but only for herself. Sophie also mentioned that if she really wanted to participate in resistance training she would do it. Lotte explained that she would decide herself whether if she wanted to participate in resistance training or not.

*“IF I WANT SOMETHING I DO IT” (SOPHIE)*

At last, one respondent (Anouk) within the age category 55-64 also identified “decision to do an alternative” as a motivator. Anouk explained that she knew when to stop doing certain resistance training exercises and to do an alternative. She also said if it does not work out she will still try to do it, but will stop in time and not continue if it is not possible. The ability to choose an alternative exercise during resistance training and to be able to decide when to stop was identified as a motivator to participate in resistance training.

## **11. Environmental context and Resources: any circumstances of a person's situation or environment that discourages or encourages the development of skills, and abilities, independence, social competence and adaptive behaviour**

### **a. Barriers**

First of all, “distance to facilities” was identified as a barrier regarding environmental context and resources. One respondent (Sophie) within the age category 55-64, three respondents (Tess, Hugo, Tim) within the age category 65-79, and one respondent (Anna) within the age category 80+ identified “distance to facilities” as a barrier to participate in resistance training. Sophie explained that distance might be a problem to participate in resistance training.

This was also mentioned by Tess who explained that she had to go to another town to participate in resistance training, and Hugo who also said that it should not be too far away. Tim's son is the owner of a fitness centre, however it is located far away. Tim explained that if the fitness centre of his son was close by he would have participated twice a week already. This indicates that distance to the facility is a barrier for him to participate in resistance training. Anna explained that she had to go by rollator and that the sports hall across the road is reachable, but the gym located a few streets further was too far away for her.

*"IT SHOULD NOT BE TOO FAR AWAY" (HUGO)*

Secondly, "unfavourable program times" was also identified as a barrier by two respondents (Sophie & Anouk) within the age category 55-64 and one respondent (Hugo) within the age category 65-79. Sophie explained that the time of a program is important, especially because she is not a morning person and programs are most of the time in the morning. Anouk mentioned that you have to always be there at a certain time if you participate in a resistance training program, which could be a disadvantage. Hugo also mentioned that there was a resistance training program he would like to join, but it was at an unfavourable time.

Also "guidance" was identified as a barrier to participate in resistance training by respondents, which consisted of no guidance being available or a change in sports instructors in resistance training groups. One respondent (Anouk) within the age category 55-64 and one respondent (Anna) within the age category 80+ identified "guidance" as a barrier to participate in resistance training. Anouk explained how a change in sports instructor could lead to people quitting resistance training, and Anna explained that there was no guidance available at the retirement home gym.

*"ELDERLY PEOPLE STOPPED BECAUSE OF THE CHANGE OF TEACHER. THEY HAVE A LESSER BOND WITH THE NEW TEACHER, WHICH MAKES THEM STOP" (ANOUK)*

Furthermore, "no transportation" was also identified as a barrier by a total of two respondents. Sophie within the age category 55-64 mentioned that transportation might be a barrier to participate in resistance training and that she had to contact the municipality for options. Tess within the age category 65-79 explained that she was not able to drive a car anymore and that she was dependent on someone else regarding transportation. Jasmijn also mentioned that her exercise group used to be larger, but that there are no new people joining which is a shame.

Another barrier identified was "groups becoming smaller", which was identified by two respondents (Tess & Hugo) within the age category 65-79 and one respondent (Jasmijn) within the age category 80+. Tess explained that the local gymnastics group was getting smaller because elderly are quitting, which makes it difficult. Hugo also explained that instructors will not come for a few people, but only for groups.

*"AT FIRST IT WAS A LARGER GROUP, BUT THERE ARE NO NEW ONES JOINING AND THAT IS A SHAME" (JASMIJN)*

At last the following barriers were only mentioned once in total by respondents. "Time available to participate in resistance training" was mentioned by Anouk (55-64 category) as a barrier to participate. Anouk explained that if she had to work a 9 to 5 job she would not have the time anymore to participate in resistance training, because the program she is currently following is in the morning. Also "Bad weather conditions" was identified as a barrier by Sophie (55-64 category). Sophie said that she was prone to bad weather conditions and that it could create a barrier for her to participate in resistance training. "Air-conditioning in gyms" was identified as a barrier by Tess (65-79 category). Tess said that the air-conditioning in gyms was a problem, especially if you are sweaty. Lauren (80+ category) identified "affordability of facilities" as a barrier to participate in resistance training. Lauren explained that facilities increased their prices recently, making it more difficult to participate in resistance training.

## **b. Motivators**

Three out of four respondents (Sophie, Emma, Anouk) within the age category 55-64 identified “available guidance at facilities” as a motivator to participate in resistance training. Sophie explained that guidance when you start with resistance training would help to do resistance training and also that expert guidance in general would be nice. Emma also mentioned that guidance is a pro and that she does not have that with other activities. Anouk explained that an experienced and good supervisor who takes into account possible injuries or other physical problems stimulates to do resistance training. Likewise, three out of four respondents (Tim, Hugo, Tess) within the age category 65-79 and two respondents (Anna & Lauren) within the age category 80+ also mentioned “available guidance at facilities” as a motivator to participate in resistance training. Tim said that guidance was not missing and that every fitness centre had guidance. Hugo as well as Tess both mentioned that expert guidance with older people or a supervisor with knowledge about the human body stimulates resistance training participation. Anna said that if there is guidance available it is usually really good. Lauren also mentioned the presence of a physiotherapist that guides you helps you to do resistance training, especially in the beginning when you do exercises too quickly.

*“A PHYSIOTHERAPIST IS PRESENT AND CHECKS IF YOU ARE DOING WELL AND DECIDES WHAT IS GOOD FOR US AND GUIDES US”  
(LAUREN)*

Also “Accessibility of facilities” was a common motivator mentioned by respondents of different age categories. Lotte as well as Anouk (55-64 category) mentioned that it was close by which made it easier to participate in resistance training. This was also mentioned by Anna (80+ category) who said that the facilities were open all day. In addition, Sophie (55-64 category) explained that all facilities were sufficiently facilitated, and Jasmijn (80+ category) also mentioned that there were enough facilities to do resistance training.

Moreover, the availability of transportation to resistance training facilities or programs also helps people to participate in resistance training if they would like to. Therefore, “available transportation” was identified as a motivator to participate in resistance training. This was identified within all age categories as a motivator. One respondent (Lotte) within the age category 55-64 mentioned that she could drive herself anywhere, thus transportation would not be a problem for her to participate. This was also mentioned by two respondents (Lieke & Tim) within the age category 65-79 who both mentioned that they could go by bike or car. Likewise, transportation was also not a problem for all respondents (Mila, Lauren, Luuk, Jasmijn) within the age category 80+, because they were able to drive themselves or take the bus if needed.

*“THERE IS A BUS AVAILABLE THAT YOU CAN CALL THAT PICKS YOU UP AND TAKES YOU TO THE DESIRED LOCATION” (MILA)*

“Time available to participate in resistance training” was also identified by respondents of different age categories as a motivator to participate in resistance training. Sophie as well as Emma within the age category 55-64 both had no other responsibilities or obligations that withholds them from participation in resistance training. They both had time available to do resistance training or were able to plan it. This was also mentioned by Tess and Tim (65-79 category). Tess as well as Tim also would have time available to participate in resistance training. Likewise, Mila and Anna within the 80+ category also both said that they had enough time to participate in resistance training or could make time to participate.

One respondent of each age category also identified “affordability of resistance training”. Anouk (55-64 category) mentioned that exercising in general is not expensive, which makes participating in resistance training easier. Tim (65-79 category) as well as Luuk (80+ category) also mentioned that fortunately resistance training is still affordable.

*“THEY DO NOT PAY FOR YOU, BUT IT HAS BECOME MORE EXPENSIVE LATELY” (LAUREN)*

At last, there were also some motivators identified by respondents, however they were only mentioned once in total. While some respondents mentioned “available program times” being a barrier Sophie (55-64 category) explained that you could exercise in the morning, afternoon or even evening if you would like to. The possibility of exercising whenever you like was identified as a motivator to participate in resistance training. Furthermore, one respondent (Mila) within the 80+ category also identified the possibility of exercising at home as a motivator. Mila explained that she could do the exercises she did at gymnastics also at home. This makes it easier for Mila to participate in resistance training and is therefore seen as a motivator.

## **12. Social influences: interpersonal processes that can cause individuals to change their thoughts, feelings or behaviours**

### **a. Barriers**

Respondents were asked what others would think of them participating in resistance training and if their opinions would stop them from participating. One of the barriers identified by respondents was the “negative reaction of others”. Three respondents (Jasmijn, Anna, Mila) within the 80+ age category mentioned that others would react negatively if they would participate in resistance training. Jasmijn explained that others would find it very bad and that she should not be doing resistance training anymore. She was also told by the physiotherapist that she should not do resistance training exercises anymore. Anna as well as Mila also mentioned that others would think she is crazy if she participated in resistance training and that it is nonsense.

*“THEY WOULD FIND IT VERY BAD, I SHOULD NOT BE DOING THESE THINGS ANYMORE” (JASMIJN)*

Likewise, Anouk (55-64 category) mentioned that others would be “sceptic about her participating in resistance training” because they do not exactly know what resistance training is. This reaction of others could have a negative impact on the participation of Anouk in resistance training and is therefore identified as a barrier.

Moreover, “having enough acquaintances” was also identified as a barrier by respondents. Tim (65-79 category) and Mila (80+ category) both mentioned that they had already enough acquaintances and therefore are not looking forward to have more social contacts. This could be a barrier for them to participate in resistance training, because they do not want to socialize with other people.

*“I AM NOT A COFFEE DRINKER AND I HAVE ENOUGH ACQUAINTANCES” (MILA)*

Furthermore, one respondent (Sophie) within the age category 55-64 explained that a “trainings partner” could help with resistance training participation, but that it could also become an obligation to participate and your partner quitting resistance training or not showing up could also make participation more difficult.

At last, Tim (65-79 category) explained that he was not somebody who exercised on command because that did not appeal to him at all. This could limit his participation in resistance training group programs and is therefore considered a barrier. He also mentioned that he would not participate in resistance training in a gym if it was busy.

This indicates that the “presence of others in the gym” could be a barrier for him. Furthermore, Anna (80+ category) mentioned that a lot of older adults with dementia participated in resistance training at the retirement home. She explained that she looked at them differently and therefore would not like to participate in the same resistance training program. Moreover, Luuk (80+ category) explained that he had no social contact during his half hour resistance training sessions. Not being able to have social contact with others could be seen as a barrier to participate, especially if they would like to have social contact.

*“I AM NOT SOMEONE WHO EXERCISES ON COMMAND, THAT DOES NOT APPEAL TO ME AT ALL” (TIM)*

## **b. Motivators**

Besides negative reactions of others being identified as a barrier, “positive reactions of others” was also mentioned by respondents. Others being supportive could stimulate resistance training participation and therefore was identified as a motivator. Three respondents (Emma, Lotte, Sophie) within the age category 55-64 mentioned others being positive about their participation in resistance training. Emma thinks others will say that it is good of her to participate in resistance training, and Lotte also thinks others would be okay with her participating. Sophie said that other could say that it was really cool of her to participate in resistance training. This was also mentioned by all respondents (Tess, Hugo, Tim, Lieke) within the age category 65-79. Lieke as well as Hugo said that others would find their participation in resistance training positive, Tess thinks that others will be okay with it, and Tim also said that others would think it is good of him to participate. Likewise, two respondents (Lauren & Luuk) within the age category 80+ also mentioned others being positive about their participation in resistance training. Lauren as well as Luuk both said they would not be negative and think it is good of them to participate.

*“I THINK THEY WOULD BE OKAY WITH IT” (TESS)*

“Social support” was also identified as a motivator to participate in resistance training, which consists of going together with someone else or exercising in a group. Sophie (55-64 category) explained that exercising is more fun in a group, although it has to be a cosy group. This was also mentioned by Tess (65-79) category who said that it is more fun to exercise in a group, Jasmijn (80+ category) who said that doing things together in a group is important, and Anna (80+ category) who said that going together with others is cosy. Furthermore, Anouk (55-64 category) also mentioned that the support of others in the same exercising group stimulates to participate. She also added that social contact with others of the group is the reason she participates in resistance training. Also Hugo as well as Lieke (65-79 category) both mentioned that going together with someone else stimulates resistance training participation, because you would be more inclined to go. Moreover, three respondents (Jasmijn, Mila, Lauren) within the age category 80+ also identified “social support” as a motivator by means of social contact with other older adults. Jasmijn explained that if you are alone you have to make sure you have contact with others, exercising in combination with social contact stimulates participation. Mila also said that social contacts were important regarding participation. Lauren also said that in between exercises you could talk with other older adults.

*“THEY SAY WE LOOK FIT FOR 84” (LAUREN)*

Furthermore, “having your own opinion and not listening to others” was also identified as a motivator regarding resistance training participation, because the negative opinion of others would not influence them. Two respondents (Emma, Sophie) within the age category 55-64 mentioned that they had their own opinions and did not listen to what others would think of them participating in resistance training.



Emma explicitly said that she did not listen to the opinion of other people, which was also mentioned by Sophie who also said she would do her own thing. Likewise two respondents (Tim & Lieke) within the age category 65-79 also mentioned that they would not listen to the opinion of others. Tim and Lieke both said that they would put the opinion of others besides them. This was also mentioned by Luuk (80+ category) who also said that he had his own opinion when asked if the opinion of others would influence his participation in resistance training.

At last, “advice from a professional” and “husband being pro exercising” were only mentioned once each by one respondent (Lotte) within the age category 55-64. Lotte explained that she would participate in resistance training if the doctor gave her an advice to do so. Moreover, Lotte also said that her husband exercised a lot and was a fan of exercising. This could have a positive influence on Lotte to also participate in resistance training and was therefore considered a motivator.

### **13. Emotion: a complex reaction pattern, involving experiential behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event**

#### **a. Barriers**

“Not enjoying resistance training” was one of the barriers identified by respondents of different age categories. Lotte (55-64 category) said that she hated exercising and did not care about it at all. Anouk (55-64 category) said that she not always likes resistance training or finds it fun, because it challenges you to do something out of your comfort zone and that is unpleasant. This was also mentioned by Lieke as well as Tim (65-79 category) who both also said that resistance training was an unpleasant activity. In addition Tim also said that resistance training just was not an interesting activity to do. Also Tess (65-79 category) explained that resistance training alone is boring.

*“I DO NOT ACTUALLY DO IT WITH PLEASURE” (LIEKE)*

Moreover, Anouk (55-64 category) also explained that different emotions can hinder your resistance training participation and therefore form a barrier. She said that when you feel good you will do more and when there is something going on and you feel stressed you cannot do as much as you would like to.

#### **b. Motivators**

In contrast, “enjoying resistance training” was the only motivator identified by respondents of different age groups. Emma as well as Sophie (55-64 category) both mentioned that resistance training is nice and fun to do. This was also mentioned by Tess (65-79 category) who also said that resistance training exercises are fun. Moreover, four out of five respondents (Jasmijn, Anna, Mila, Luuk) within the age category 80+ also mentioned that they enjoyed doing resistance training. Jasmijn said that it is very cosy to do resistance training and that the gym she used to go to was wonderful. Anna also said that it is nice to do resistance training if you are able to participate. Mila and Like both explicitly mentioned that they liked resistance training a lot.

*“I LIKED THE GYM, IT WAS WONDERFUL AND BEAUTIFUL” (JASMIJN)*



## **14. Behavioural regulation: anything aimed at managing or changing objectively observed or measured actions**

### **a. Barriers**

Respondents were asked what would help them to create a routine of participating in resistance training every week. Within all age categories only one barrier was identified by one respondent (Emma) within the age category 55-64. Emma explicitly mentioned that guidance would not help her to participate in resistance training every week.

### **b. Motivators**

Regarding motivators, "Resistance training as part of the weekly schedule" was most frequently mentioned by respondents of different age categories. This was identified as a motivator because according to respondents it helped them to create a routine of participating in resistance training. once or even twice a week. Anouk (55-64 category) explained that a fixed time and day when you participate in resistance training helps you to create a routine, it becomes a part of your weekly schedule. This was also mentioned by one respondent (Lieke) within the age category 65-79 who also said that a fixed morning to participate in resistance training helps to create a routine of participating. Likewise, two respondents (Lauren & Luuk) within the 80+ category also mentioned that they had fixed appointments and that they will schedule things around that appointment. It becomes part of your weekly schedule, however if you do not keep a fixed day to participate in resistance training it will become difficult to maintain that routine of participating.

*"WE HAVE A FIXED APPOINTMENT, OTHERS DO NOT HAVE TO COME UP WITH SOMETHING BECAUSE WE ARE NOT THERE" (LAUREN)*

Moreover, Tim (65-79 category) explained that a "personalized scheme" that explains what he should be doing and what weights to use at what age would help him to create a routine of participating in resistance training. This was also mentioned by Anna (80+ category) who explained that she would like to participate in a personalized program, and by Luuk (80+ category) who explained that the physiotherapist had adjusted exercises for him that really helped him to participate.

At last, "Self-motivation" was identified as a motivator to participate in resistance training, because it could stimulate you to participate in resistance training. Only one respondent (Jasmijn) within the 80+ category explained that you only have to say it to yourself that you have to do this and that is just it. You have to motivate yourself to participate in resistance once or twice every week.

*" SAYING TO YOURSELF I HAVE TO DO THIS AND THAT'S JUST IT" (JASMIJN)*

## 6.3. Overview results for each age category

### 6.3.1. Age group 55-64

TDF Domain	Barriers	Motivators
<b>1. Knowledge</b>		
	Unfamiliar with resistance training (Lotte)	Familiar with resistance training (Emma, Lotte, Sophie, Anouk)
	Unsure about benefits of resistance training (Sophie)	Experience in resistance training (Lotte, Anouk, Sophie)
	Unknowing about financial support (Sophie)	Awareness of guidance being present (Lotte)
		Awareness of benefits (Lotte)
<b>2. Skills</b>		
	Physical problems (Sophie)	Having enough strength (Sophie, Lotte, Anouk)
		Being able to do resistance training exercises (Lotte)
<b>3. Social/Professional role and identity</b>		
	Age (Sophie, Anouk)	Appropriateness of resistance training (Sophie, Anouk)
	Alternatives (Lotte)	
<b>4. Beliefs about capabilities</b>		
	Perceived competence (Emma)	Confidence to participate in resistance training (Lotte, Anouk)
	Self-efficacy (Sophie)	Good perseverance (Anouk)
<b>5. Optimism</b>		
	Being pessimistic about resistance training participation (Emma)	Positive attitude regarding resistance training participation (Sophie, Lotte, Emma)
		Resistance training being beneficial (Sophie, Anouk, Emma)
<b>6. Beliefs about consequences</b>		
	Injuries (Emma, Lotte, Sophie)	Muscle related benefits (Emma, Lotte, Sophie, Anouk)
	Experiencing pain (Emma, Lotte, Sophie)	Faster post-operation recovery (Sophie)
	Overloading the muscles (Emma, Sophie)	Mental benefits (Emma)
		Feeling fitter (Anouk)
		Feeling great (Sophie, Anouk)
		Prevention of falls, injuries, or deterioration (Anouk)
		Social contacts (Lotte, Anouk)
		Losing weight (Emma, Anouk)
		Increase of your resting metabolic rate (Anouk)
		Muscular appearance (Sophie)
<b>7. Reinforcement</b>		
	Financial support (Emma, Sophie, Anouk)	Financial support (Sophie, Anouk)
		Advertisement of resistance training (Anouk)
<b>8. Intentions</b>		
	No intention to do resistance training (Emma)	Intention to do resistance training (Anouk)
	Having other priorities (Lotte)	Resistance training as a priority (Anouk)
	Unnecessary (Lotte)	
<b>9. Goals</b>		
	<b>None identified</b>	A balance in exercising and nutrition (Sophie)
		Maintenance of the body (Sophie, Anouk)
		Staying healthy (Emma, Sophie)
		To stay in shape (Sophie, Lotte, Anouk)
<b>10. Memory, attention and decision processes</b>		
	Decision to not participate in resistance training (Emma, Lotte, Sophie)	Decision to participate in resistance training (Emma, Lotte, Sophie)
		Decision to do an alternative (Anouk)
<b>11. Environmental context and resources</b>		
	Distance to facilities (Sophie)	Available guidance at facilities (Sophie, Emma, Anouk)
	Bad weather conditions (Sophie)	Available program times (Sophie)
	No transportation (Sophie)	Time available to participate in resistance training (Sophie, Emma)
	Unfavourable program times (Sophie, Anouk)	Affordability of resistance training (Anouk)
	No guidance or a change in guidance (Anouk)	Accessibility of facilities (Lotte, Anouk, Sophie)
	Time available to participate in resistance training (Anouk)	Available transportation (Lotte)
<b>12. Social influences</b>		
	Others being sceptic about participating in resistance training (Anouk)	Having your own opinion and not listening to others (Emma, Sophie)
	Trainings partner quitting or not showing up (Sophie)	Positive reactions of others (Emma, Lotte, Sophie)
		Advice from a professional (Lotte, Emma)
		Social support (Sophie, Anouk)
		Husband being pro exercising (Lotte)
<b>13. Emotion</b>		
	Not enjoying resistance training (Lotte, Anouk)	Enjoying resistance training (Emma, Sophie)
	Emotions making participation difficult (Anouk)	
<b>14. Behavioural regulation</b>		
	Guidance does not help to participate weekly (Emma)	Resistance training as part of the weekly schedule (Anouk)

TABLE 5: BARRIERS AND MOTIVATORS AGE GROUP 55-64 ACCORDING THE 14 DOMAINS OF THE THEORETICAL DOMAIN FRAMEWORK

### 6.3.2. Age group 65-79

TDF Domain	Barriers	Motivators
<b>1. Knowledge</b>		
	Unfamiliar with resistance training (Tess, Hugo)	Familiar with resistance training (Tess, Hugo, Tim, Lieke)
	Unknowing about resistance training initiatives (Hugo)	Experience in resistance training (Tim, Lieke)
	Unsure about knowing the correct information (Tim)	
<b>2. Skills</b>		
	Physical problems (Tess)	<b>None identified</b>
	Less strength than before (Tim)	
<b>3. Social/Professional role and identity</b>		
	Social identity (Tim)	Appropriateness of resistance training (Tess, Tim, Lieke)
	Age (Lieke)	
<b>4. Beliefs about capabilities</b>		
	Lack of perseverance (Tess, Tim)	Good perseverance (Hugo, Lieke)
	Self-efficacy (Lieke)	Confidence to participate in resistance training (Tim)
	Perceived competence (Tess)	Perceived competence (Hugo, Lieke)
<b>5. Optimism</b>		
	Being pessimistic about resistance training participation (Tess)	Positive attitude regarding resistance training participation (Hugo, Lieke)
		Resistance training being beneficial (Lieke, Tim)
<b>6. Beliefs about consequences</b>		
	Experiencing pain (Lieke, Tess)	Social contact (Hugo, Lieke)
	Risk of injuries (Hugo, Tim)	Strengthen the muscles (Tess, Tim)
	Deterioration (Tim)	Stronger bones (Tim, Lieke)
		Better flexibility (Lieke)
		Muscular ppearance (Lieke)
		Prevention of falls, injuries, or deterioration (Tess)
		Feeling great (Lieke)
<b>7. Reinforcement</b>		
	<b>None identified</b>	Information (Hugo)
		Financial (Hugo)
<b>8. Intentions</b>		
	Having other priorities (Lieke, Hugo, Tim)	Intention to do resistance training (Tim)
	Resistance training is not appealing (Tim)	Keep on going if possible (Lieke)
	No intention to do resistance training (Hugo)	
	Unnecessary to participate in resistance training (Tim)	
<b>9. Goals</b>		
	Not being able to do resistance training anymore (Tim, Lieke)	Staying healthy (Tim, Lieke)
		To stay in shape (Tim, Lieke)
		Maintenance of the body (Tim)
<b>10. Memory, attention and decision processes</b>		
	<b>None identified</b>	<b>None identified</b>
<b>11. Environmental context and resources</b>		
	Air-conditioning in gyms (Tess)	Time available to participate in resistance training (Tess, Tim)
	Distance to facilities (Tess, Hugo, Tim)	Available guidance at facilities (Tim, Hugo, Tess)
	Groups becoming smaller (Tess, Hugo)	Affordability of resistance training (Tim)
	No transportation (Tess)	Available transportation (Lieke, Tim)
	Unfavourable program times (Hugo)	
<b>12. Social influences</b>		
	Does not want to exercise on command (Tim)	Positive reactions of others (Tess, Hugo, Tim, Lieke)
	Having enough acquaintances (Tim)	Social support (Tess, Hugo, Lieke)
	Presence of others in the gym (Tim)	Having your own opinion and not listening to others (Tim, Lieke)
<b>13. Emotions</b>		
	Not enjoying resistance training (Lieke, Tim, Tess)	Enjoying resistance training (Tess)
<b>14. Behavioural regulation</b>		
	<b>None identified</b>	Resistance training as part of the weekly schedule (Lieke)
		Adjusted exercises (Tim)

**TABLE 6: BARRIERS AND MOTIVATORS AGE GROUP 65-79 ACCORDING THE 14 DOMAINS OF THE THEORETICAL DOMAIN FRAMEWORK**

### 6.3.3. Age category 80+

TDF Domain	Barriers	Motivators
<b>1. Knowledge</b>		
	Unknowing about consequences of resistance training (Mila)	Experience in resistance training (Mila, Luuk, Jasmijn, Lauren) Procedural knowledge (Lauren)
<b>2. Skills</b>		
	Physical problems (Jasmijn, Anna, Lauren, Luuk)	Being able to do resistance training exercises (Mila, Jasmijn)
<b>3. Social/Professional role and identity</b>		
	Age (Jasmijn, Anna, Luuk, Mila)	<b>None identified</b>
<b>4. Beliefs about capabilities</b>		
	Perceived competence (Jasmijn, Anna, Lauren, Luuk, Mila)	Confidence to participate in resistance training (Luuk, Lauren) Beliefs (Jasmijn, Mila) Self-efficacy (Mila)
<b>5. Optimism</b>		
	Being pessimistic about resistance training participation (Anna)	Resistance training being beneficial (Jasmijn, Luuk) Positive attitude regarding resistance training participation (Anna)
<b>6. Beliefs about consequences</b>		
	Risk of falling (Jasmijn)	Social contacts (Mila)
	Risk of injuries (Anna, Luuk, Lauren)	Muscle benefits (Mila, Lauren, Luuk, Anna)
	Experiencing pain (Anna)	Feeling fitter (Lauren, Luuk,
	Muscles will protest (Jasmijn)	Prevention of falls, injuries and deterioration (Jasmijn)
<b>7. Reinforcement</b>		
	Financial (Lauren, Luuk)	Financial (Lauren, Luuk)
<b>8. Intentions</b>		
	Unnecessary to participate in resistance training (Anna)	Keep on going if possible (Jasmijn, Mila, Luuk, Anna)
	Having other priorities (Anna, Lauren, Luuk, Mila)	
	No intention to do resistance training (Mila)	
<b>9. Goals</b>		
	Not being able to do resistance training anymore (Lauren, Luuk)	To stay in shape (Jasmijn, Anna, Lauren, Luuk) Maintenance of the body (Anna, Luuk) Physical complaints (Lauren)
<b>10. Memory, attention and decision processes</b>		
	<b>None identified</b>	<b>None identified</b>
<b>11. Environmental context and resources</b>		
	Affordability of facilities (Lauren)	Time available to participate in resistance training (Anna, Mila)
	No guidance or a change in guidance (Anna)	Available guidance at facilities (Anna, Lauren)
	Distance to facilities (Anna)	Accessibility of facilities (Anna, Jasmijn)
	Groups becoming smaller (Jasmijn)	Affordability of resistance training (Luuk) Transportation (Mila, Lauren, Luuk, Jasmijn) Possibility to do it at home (Mila)
<b>12. Social influences</b>		
	Negative reactions of others (Jasmijn, Anna, Mila)	Social contact (Jasmijn, Mila, Anna, Lauren)
	Having enough acquaintances (Mila)	Having your own opinion and not listening to others (Luuk)
	Other people with dementia participating (Anna)	Positive reactions of others (Lauren, Luuk)
	No social contact during resistance training (Luuk)	
<b>13. Emotion</b>		
	<b>None identified</b>	Enjoying resistance training (Jasmijn, Anna, Mila, Luuk)
<b>14. Behavioural regulation</b>		
	<b>None identified</b>	Self-motivation (Jasmijn) Resistance training as part of the weekly schedule (Lauren, Luuk) Adjusted exercises (Luuk, Anna)

TABLE 7: BARRIERS AND MOTIVATORS AGE GROUP 80+ ACCORDING THE 14 DOMAINS OF THE THEORETICAL DOMAIN FRAMEWORK

## 6.4. Most important barriers and motivators according respondents

All respondents were also asked what their most important reason to participate or not to participate in resistance training would be. An overview of the answers of all respondents can be found in *Table 8*. down below.

Regarding the most important reason to participate in resistance training for respondents within age category 55-64 was to stay in shape (Lotte, Sophie, Anouk) and to tackle health related issues (Emma). Likewise, to stay in shape was also mentioned by Lieke and Tim within the age category 65-79. Other Respondents (Tess & Hugo) within this age category mentioned affordability of resistance training and social contact with others as most important reason to participate in resistance training. Moreover, to stay in shape was also mentioned by three out of five respondents (Anna, Lauren, Luuk) within the 80+ age category. Lauren as well as Luuk both also mentioned tackling health related issues also as important reason to participate in resistance training besides staying in shape.

In general, the most important reason to participate in resistance was to stay in shape, which was mentioned by 8 out of 13 respondents. This highlights the importance of healthy ageing and being able to do your daily activities without any problems. Moreover, it also shows similarities in reasons to participate in resistance training between different age subgroups of older Dutch adults.

Regarding the most important reasons to not participate in resistance training, respondents within the age category 55-64 all mentioned different reasons why they would not participate in resistance training. Respondents mentioned having other priorities during the week (Emma), not seeing the necessity of resistance training (Lotte), problems with the distance and accessibility of facilities (Sophie), and not having the time to participate in resistance training (Anouk). However, respondents within the age category 65-79 mentioned similar reasons why they would not participate in resistance training. Both Tess and Hugo mentioned that problems with distance and transportation to facilities would result in them not participating in resistance training. Tim and Lieke both mentioned health or pain and a medical advice to not participate in resistance training as most important reason why they would not participate in resistance training. Moreover, four out of five respondents (Anna, Mila, Lauren, Luuk) within the age category 80+ mentioned physically not being able to do resistance training anymore as most important reason why they would not participate in resistance training. The other respondent (Jasmijn) mentioned the risk of injuries as most important reason why she would not participate in resistance training.

In general, the most important reason to not participate in resistance training anymore was not being physically able to do resistance training, which was mainly mentioned by the respondents of the 80+ age category. This was also in line with what both Tim and Lieke (65-79) category) mentioned, who said that health problems or a medical advice would be the reason to not participate in resistance training anymore. However, there are certainly differences in reasons to not participate in resistance training within the different age sub groups of older Dutch adults.

Name respondent	Most important reason to participate in resistance training	Most important reason to not participate in resistance training
<b>Age category 55-64</b>		
Emma	To tackle health related issues	Having other priorities during the week
Lotte	To stay in shape	Not necessary to do resistance training
Sophie	To stay in shape	Distance and accesibility of facilities
Anouk	To stay in shape	No time to participate in resistance training
<b>Age category 65-79</b>		
Tess	Social contact with others	Distance and transportation to facilities
Hugo	Affordability of resistance training	Distance and transportation to facilities
Tim	Building muscles and to stay in shape	Pain or medical advice to not participate in resistance training
Lieke	To stay in shape	Health problems or a medical advice to not participate in resistance training
<b>Age category 80+</b>		
Jasmijn	To get fit	Risk of injuries
Anna	To stay in shape	Pain or physically not being able to do resistance training anymore
Mila	Social contact with others	Physically not being able to do resistance training anymore
Lauren	To stay in shape and tackle health related issues	Physically not being able to do resistance training anymore
Luuk	To stay in shape and tackle health related issues	Physically not being able to do resistance training anymore

**TABLE 8: MOST IMPORTANT BARRIERS AND MOTIVATORS TO PARTICIPATE IN RESISTANCE TRAINING**

## 7. DISCUSSION

### 7.1. Major findings

The aim of this study was to systematically identify motivators and barriers of different age subgroups of older Dutch adults to participate in resistance training using the Theoretical Domain Framework of Behaviour Change. A wide range of barriers and motivators were identified which influenced older adults participation in resistance training.

#### 7.1.1. Barriers and motivators to participate in resistance training

The findings of this study suggest that there are many barriers as well as motivators for older adults to participate in resistance training based on the 14 domains of the Theoretical Domain Framework of Behaviour Change. In particular the domains (6) beliefs about consequences, (11) environmental context and resources, and (12) social influences identified many barriers as well as motivators to participate in resistance training within all age groups. Nevertheless, there were also some domains where no barriers or motivators were identified within the different age groups. The first age group (55-64) did not identify any barriers regarding goals. The 65-70 group did not identify barriers regarding reinforcement, memory, attention and decision processes, behavioural regulation. They also did not identify motivators regarding memory, attention and decision processes. The 80+ group did not identify any barriers regarding memory, attention and decision processes, emotion, and behavioural regulation, and did not identify any motivators regarding social/professional role and identity and memory, attention and decision processes.

The following tables give an overview of the most frequently mentioned barriers and motivators of each age group. Only barriers and motivators mentioned by >75% of the total participants of each age group are displayed in the tables.

#### Age group 55-64:

TDF Domain	Barriers	Motivators
1. Knowledge	-	Familiar with resistance training
	-	Experience in resistance training
2. Skills	-	Having enough strength
5. Optimism	-	Positive attitude regarding participation
	-	Resistance training being beneficial
6. Beliefs about consequences	Injuries	Muscle related benefits
	Experiencing pain	-
7. Reinforcement	Financial support	-
9. Goals	-	To stay in shape
10. Memory, attention and decision processes	Decision to not participate in resistance training	Decision to participate in resistance training
11. Environmental context and resources	-	Available guidance at facilities
	-	Accessibility of facilities
12. Social influences	-	Positive reactions of others

TABLE 9: MOST FREQUENTLY IDENTIFIED BARRIERS AND MOTIVATORS - AGE GROUP 55-64

### Age group 65-79:

TDF Domain	Barriers	Motivators
1. Knowledge	-	Familiar with resistance training
3. Social/professional role and identity	-	Appropriateness of resistance training
8. Intentions	Having other priorities	-
11. Environmental context and resources	Distance to facilities	Available guidance at facilities
12. Social influences	-	Positive reactions of others
	-	Social support
13. Emotion	Not enjoying resistance training	-

TABLE 10: MOST FREQUENTLY IDENTIFIED BARRIERS AND MOTIVATORS - AGE GROUP 65-79

### Age group 80+:

TDF Domain	Barriers	Motivators
1. Knowledge	-	Experience in resistance training
2. Skills	Physical problems	-
3. Social/Professional role and identity	Not appropriate for the age	-
4. Beliefs about capabilities	Perceived competence	-
6. Beliefs about consequences	Having other priorities	Muscle benefits
8. Intentions	-	Keep on going if possible
9. Goals	-	To stay in shape
11. Environmental context and resources	-	Transportation
12. Social influences	-	Social contact
13. Emotion	-	Enjoying resistance training

TABLE 11: MOST FREQUENTLY IDENTIFIED BARRIERS AND MOTIVATORS - AGE GROUP 80+

Comparing the most frequently mentioned barriers by participants of each age group, it is noticeable that there are many differences and only a few similarities between the age groups in barriers to participate in resistance training. Likewise, comparing motivators to participate in resistance training of each age group shows some similarities, but again many differences. These results highlight a difference in barriers as well as in motivators to participate in resistance training between different age subgroups of older Dutch adults.

In addition, looking at the barriers and motivators that were mentioned by all respondents within a age group shows also some differences and similarities. Within the age group 55-64 being familiar with resistance training was identified as a motivator by all respondents in this study, highlighting the importance of the knowledge domain. This was also identified by all respondents within the age group 65-79 as a motivator to participate in resistance training. Moreover, they also identified positive reactions of others as a motivator to participate in resistance training, showing the importance of social support (social influence) as a motivator. At last, no motivators were identified by all respondents in the age group 80+, however perceived competence was identified by all of them as a barrier. Respondents of this age group mainly had concerns about not being able to do resistance training anymore.



### 7.1.2. Comparison of results with literature review

Comparing the most frequently identified barriers and motivators of the literature review (Table 12; identified by at least 3 out of 4 studies) with the most frequently identified barriers and motivators of this study (paragraph 7.1.2.; tables 9, 10, and 11) shows similarities in barriers as well as motivators. In terms of individual factors, participants of this study also identified physical problems (poor health) and experiencing pain as barriers to participate in resistance training. Regarding motivators, health and muscle related benefits were also identified as a motivator to participate in resistance training. Moreover, participants also identified having other priorities (other obligations) as a barrier, however a lack of social support and nobody to participate with was not identified as a barrier within this study. Motivators identified in the literature review mainly consisted of social benefits and encouragement of others. This was also in line with the most frequently mentioned motivators in this study, which were positive reactions of others and social contact.

Also, only barriers and no motivators were identified regarding environmental factors in the literature review, which consisted of a lack of facilities, lack of age appropriate programs, and cost of facilities. These were only identified by a few respondents as barriers this study. Nevertheless, participants identified a lack of financial support as a barrier which could be linked to the cost of facilities.

Dimension	Barriers	Motivators
<b>1. Individual-level factors</b>		
	Poor health	Health benefits
	Pain	Physical function benefits
	No time	Enjoyment
		Improved well-being / feeling fit
<b>2. Social factors</b>		
	Other obligations	Social benefits
	Lack of social support	Encouragement from staff and others
	Nobody to participate with	
<b>3. Environmental factors</b>		
	Lack of facilities	None
	Lack of age appropriate programs	
	Cost of facilities	

**TABLE 12: OVERVIEW OF MOST FREQUENTLY IDENTIFIED BARRIERS AND MOTIVATORS ACCORDING TO THE LITERATURE REVIEW**

It is noticeable that this study identified barriers as well as motivators to participate in resistance training that were not identified in the literature review. For example this study identified resistance training not being appropriate for older adults as a barrier to participate, which was mainly mentioned by participants of the 80+ group. Moreover, having a positive attitude towards resistance training participation was identified as a motivator to participate mainly by respondents of the 55-64 group. Also having experience in resistance training or being familiar with resistance training was also identified by participants of different age groups as a motivator to participate in resistance training.

Nevertheless, looking at the results of Burton et al. (2016) shows some similarities. Results suggested that GP's and health professionals should be encouraged to promote resistance training participation, especially among the older adults to address issues as injuries, pain, and other health related problems. Although this was not frequently mentioned by respondents, some of the respondents explained that they would do resistance training if their GP recommended it.

Moreover, according to Burton et al. (2017a) preventing deterioration (disability, reducing the risk of falls, building (toning) muscles, feeling more alert and better concentration were motivators specific to resistance training. These were also identified as motivators within this study, although not as most frequently mentioned by respondents. Regarding barriers, increased risk of a heart attack, stroke or death, and looking to muscular were barriers specific to resistance training, which were only partly identified as barriers within this study. However, it is noticeable that looking to muscular was identified as a motivator by respondents in this study, even though it was identified as a barrier in the literature review. Some respondents explained that a muscular appearance was nice and would motivate them to participate in resistance training, which could be due to personal preference.

Also Burton et al. (2017b) identified injury, illness, holidays and issues with resistance training programs, center, or staff as most commonly reported reasons to stop resistance training. Similar results were identified within this study as barriers to participate in resistance training. Respondents in this study also mentioned the importance of guidance to participate in resistance training and the accessibility of facilities, and the risk of injuries as reasons not to participate in resistance training.

At last, Pettigrew et al. (2018) also recognised the importance of personalised assistance for older people engaging in resistance training, therefore making sure that the programs are safe and accessible. Again, respondents within this study frequently mentioned the importance of guidance to participate in resistance training. Therefore ensuring access to knowledgeable, experienced and mature instructors who can emphasise the needs and wishes of older adults could be an effective approach to increase resistance training participation.

### **7.1.3. Most important reasons to participate or not to participate in resistance training**

In general, the most important reason to participate in resistance was to stay in shape for all age groups. This shows that there are clear similarities in the most important reasons why they would participate in resistance training. Looking at the most important reason why they would not participate in resistance training it was because they were not physically able to do resistance training. However, this was mainly mentioned by respondents within the 80+ group and only a few within the 65-79 group. This highlights differences between the 80+ group and the other groups regarding the most important reason not to participate in resistance training, especially within the 55-64 group who all mentioned a different reason. Nevertheless, when we compare the most important reason why older Dutch adults would participate in resistance training with the reason why they would not participate in resistance training it is noticeable that physical health is the most important reason for both. This highlights the importance of physical health of older Dutch adults in the reasoning why they would participate in resistance as well as not participate in resistance training.

## 7.2. Limitations and strengths

### 7.2.1. General limitations and strengths

One of the limitations of this study was that respondents had the tendency to talk about physical activity in general during the interviews, even when they were asked about resistance training in particular. This made the data-analysis process more difficult, since information not regarding resistance training participation had to be left out. Also the definition of resistance training was a problem for the respondents. This was noticeable during the interviews when respondents were asked if they were familiar with resistance training in general, to which they answered no. However, after explanation of the definition of resistance training in combination with examples of resistance training exercises they said that they were familiar with resistance training or even participated in a form of resistance training. This shows that older adults may have a different perception of the term resistance training, which could be of influence on the results.

Moreover, only a total of 13 respondents were interviewed representing three different age groups. According to Guest et al. (2006) at least 12 interviews are needed of a homogenous group to reach data saturation. Therefore, a larger group of respondents for each age group (e.g. >12 respondents) could yield different results regarding differences and similarities and therefore enhance the data saturation of this study. In addition, more women (10) than men (3) participated in this study, which may limit the generalizability of the findings. According to Burton et al. (2016) there are similarities as well as differences in motivators and barriers between older men and women to participate in resistance training.

Also the data analysis process was only done by one researcher. A bias of having only one coder in qualitative data analysis could be that the researcher tries to identify specific themes that were expected or overlooking data that is inconsistent with personal beliefs (Smith & Noble, 2014). Having a multi-disciplinary coding team offers different perspectives, the opportunity to discuss coding disagreements, and optimize the coding system (Berends & Johnston, 2005).

### 7.2.2. Theoretical Domain Framework

The Theoretical Domain Framework of Behaviour Change was quite large (14 domains) which resulted in a lot of data collected for each domain for three age groups (42 domains total with barriers as well as motivators). This is a lot of data to analyse by only one researcher, which resulted in time problems with the data analysis and maintaining a clear overview of the results. Also having so many domains resulted in problems with coding, since it was not always clear how to categorize themes due to the lack of clarity in definitions of the different domains and overlapping domains. This was also mentioned as a limitation by different studies using the Theoretical Domain Framework (Flannery et al., 2018; Weatherson et al., 2017; Phillips et al., 2015; Heslehurst et al., 2014). Therefore a model or framework with less domains/perspectives such as the socio-ecological model and clearer definitions would have been easier to work.

Nevertheless, one of the strengths was also the use of the Theoretical Domain Framework of Behaviour Change to categorize barriers and motivators according to the 14 domains. These 14 domains cover a lot of different influences on a certain behaviour in comparison to other models or frameworks with less domains. It therefore offered a detailed understanding of the different barriers and motivators of older Dutch adults to participate in resistance training.

### 7.3. Practical relevance & Future research

This study also identified a lot of barriers and motivators to participate in resistance training among different age groups. Resistance training promotion strategies focussing on a specific age group (e.g. 80+) could use these results to identify barriers and motivators for that age group and therefore enhance their strategy. Moreover, resistance training promotion strategies focussing on a single factor influencing resistance training participation (e.g. environmental context and resources) could use these results to see if there are differences in age groups which they should take into account. Resistance training needs to be specifically tailored to different target groups of older adults (55-64, 65-79, 80+) to improve and sustain participation rates. As Burton et al. (2016) suggested this could be done by encouraging GP's and health professionals to promote resistance training among older adults. Therefore, future research is needed to explore the role of GP's and health professionals in promoting resistance training among older adults.

Other recommendations for future research would also be to identify age-related differences in resistance training participation on a larger scale to make sure data saturation is reached. Also the demographics of the respondents were not taken into account in this study. Focussing on differences in cultural background or socio-economic status could also yield valuable results regarding resistance training participation. Moreover, gender should also be taken into account in future research as motivators and barriers could possibly differ. Therefore future studies could focus on only men or women or have equally divided age groups to allow for a fair comparison in age-related differences in barriers and motivators.

## 8. CONCLUSION

Given the importance of resistance training interventions in reducing the impact of sarcopenia on both the individual as well as the society, it is important to understand the barriers and motivators older adults identify to participate in resistance training to increase participation levels. This research provides a comprehensive overview of the different behavioural factors motivating or hindering older Dutch adults to participate in resistance training according to the 14 domains of the Theoretical Domain Framework. It also highlights age-related differences in barriers and motivators to participate in resistance training, and the most important reasons why older Dutch adults participate or not participate in resistance training. These findings can be used to guide future research, and also assist researchers, physical activity professionals, and policy makers in creating or enhancing resistance training promotion strategies to increase resistance training participation among older adults.

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## APPENDIXES

### Appendix A. Theoretical Domain Framework – domains and constructs

Theoretical Domain Framework	
Domain (definition) 14x	Constructs 84x
1. Knowledge (An awareness of the existence of something)	-Knowledge (including knowledge of condition/scientific rationale) -Procedural knowledge -Knowledge of task environment
2. Skills (An ability or proficiency acquired through practice)	-Skills -Skills development -Competence -Ability -Interpersonal skills -Practice -Skill assessment
3. Social/professional role and identity (A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting)	-Professional identity -Professional role -Social identity -Identity -Professional boundaries -Professional confidence -Group identity -Leadership -Organisational commitment
4. Beliefs about capabilities (Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use)	-Self-confidence -Perceived competence -Self-efficacy -Perceived behavioural control -Beliefs -Self-esteem -Empowerment -Professional confidence



<p>5. Optimism</p> <p>(The confidence that things will happen for the best or that desired goals will be attained)</p>	<p>-Optimism</p> <p>-Pessimism</p> <p>-Unrealistic optimism</p> <p>-Identity</p>
<p>6. Beliefs about Consequences</p> <p>(Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation)</p>	<p>-Beliefs</p> <p>-Outcome expectancies</p> <p>-Characteristics of outcome expectancies</p> <p>-Anticipated regret</p> <p>-Consequents</p>
<p>7. Reinforcement</p> <p>(Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus)</p>	<p>-Rewards (proximal/distal, valued/not valued, probable/improbable)</p> <p>-Incentives</p> <p>-Punishment</p> <p>-Consequents</p> <p>-Reinforcement</p> <p>-Contingencies</p> <p>-Sanctions</p>
<p>8. Intentions</p> <p>(A conscious decision to perform a behaviour or a resolve to act in a certain way)</p>	<p>-Stability of intentions</p> <p>-Stages of change model</p> <p>-Transtheoretical model and stages of change</p>
<p>9. Goals</p> <p>(Mental representations of outcomes or end states that an individual wants to achieve)</p>	<p>-Goals (distal/proximal)</p> <p>-Goal priority</p> <p>-Goal/target setting</p> <p>-Goals (autonomous/controlled)</p> <p>-Action planning</p> <p>-Implementation intention</p>
<p>10. Memory, attention and decision processes</p> <p>(The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives)</p>	<p>-Memory</p> <p>-Attention</p>

	<ul style="list-style-type: none"> <li>-Attention control</li> <li>-Decision making</li> <li>-Cognitive overload/tiredness</li> </ul>
<p>11. Environmental context and resources</p> <p>(Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour)</p>	<ul style="list-style-type: none"> <li>-Environmental stressors</li> <li>-Resources/material resources</li> <li>-Organisational culture/climate</li> <li>-Salient events/critical incidents</li> <li>-Person × environment interaction</li> <li>-Barriers and facilitators</li> </ul>
<p>12. Social influences</p> <p>(Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours)</p>	<ul style="list-style-type: none"> <li>-Social pressure</li> <li>-Social norms</li> <li>-Group conformity</li> <li>-Social comparisons</li> <li>-Group norms</li> <li>-Social support</li> <li>-Power</li> <li>-Intergroup conflict</li> <li>-Alienation</li> <li>-Group identity</li> <li>-Modelling</li> </ul>
<p>13. Emotion</p> <p>(A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event)</p>	<ul style="list-style-type: none"> <li>-Fear</li> <li>-Anxiety</li> <li>-Affect</li> <li>-Stress</li> <li>-Depression</li> <li>-Positive/negative affect</li> <li>-Burn-out</li> </ul>

14. Behavioural regulation  (Anything aimed at managing or changing objectively observed or measured actions)	-Self-monitoring  -Breaking habit  -Action planning
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## Appendix B. Interview Questions

### 0 Introductie

- Sport u gedurende een normale week?
  - Andere vormen van fysieke activiteit? Bijvoorbeeld tuinieren of fietsen.
- Bent u bekend met krachttraining?
  - Wat weet u hierover?

### Kracht- en gewichtstraining:

*Kracht- en gewichtstraining bestaat vooral uit oefeningen die de spieren belasten door middel van een tegenwerkende kracht of gewicht, denk hierbij aan lichaamsgewicht oefeningen, weerstandsbanden, losse gewichten, en gewichtstraining machines. Kracht- en gewichtstraining oefeningen worden hoofdzakelijk uitgevoerd in sportscholen en fitnesscentra, maar kunnen ook thuis uitgevoerd worden.*

*(Voorbeelden oefeningen)*

### 1 Knowledge

- Zou u weten wat u zou moeten doen bij krachttraining?
  - Bijvoorbeeld welke oefeningen u zou moeten doen en hoe vaak?
  - (Eventueel voorbeelden van oefeningen laten zien)
- Wat zijn volgens u voordelen van krachttraining?
  - Bijvoorbeeld fit worden, afvallen, sociaal contact, mentaal, sterker

### 6 Beliefs about consequences

- Wat zijn volgens u de nadelen of consequenties van krachttraining?
  - Denk hierbij aan een gespierd uiterlijk krijgen, blessures, pijn of andere gezondheidsklachten of problemen

### 2 Skills

- Wat denkt u over uw eigen vaardigheden als kracht, balans en uithoudingsvermogen betreft deelname aan krachttraining?
  - Weerhouden deze u van deelname aan krachttraining?
  - Zou u fysiek in staat zijn om deel te nemen aan krachttraining?

### 4 Beliefs about capabilities

- Wat denkt u over uw doorzettingsvermogen betreft deelname aan krachttraining?
  - Zou u het een langere periode vol kunnen houden
  - Voelt u zich zelfverzekerd om deel te nemen aan krachttrainingen

### 3 Social/professional role and identity

- Wat vindt u ervan dat krachttraining minstens twee keer per week aangeraden wordt voor 55 plussers?
  - Vindt u krachttraining een geschikte vorm van fysieke activiteit voor 55 plussers?
  - Ziet u zichzelf als iemand die aan krachttraining doet? Waarom wel of niet?

### 12 Social influences

- Wat zouden andere mensen, wiens mening u waardeert, vinden als u deel zou nemen aan krachttraining?
  - Denk hierbij aan familie, vrienden en kennissen
  - Beïnvloed de mening van andere uw deelname aan krachttraining?

### 13 Emotion

- Ziet u krachttraining als een plezierige of onplezierige vorm van fysieke activiteit?
  - Waardoor komt dat?
  - Speelt angst een rol in uw deelname aan krachttraining?
    - Durft u nog deel te nemen aan krachttraining?
- Spelen andere emoties nog een rol in uw deelname aan krachttraining?

### 5 Optimism

- Als we kijken naar uzelf ziet u krachttraining als iets wat voordelig of nadelig is voor u en waardoor komt dat?
  - Ziet u het als iets wat te uitdagend is of juist niet? Waardoor komt dat?

### 8 Intentions

- Heeft u nog de intentie om deel te nemen aan een vorm van krachttraining?
  - Is er een bewuste reden om waarom u wel of niet deel te nemen aan krachttraining?
    - Bijvoorbeeld medisch advies

### 10 Memory, attention and decision processes

- Wat voor prioriteit zou u deelname aan krachttraining geven in vergelijking tot andere wekelijkse bezigheden
  - Denk hierbij aan andere verplichtingen en verantwoordelijkheden
  - Bewuste keuze waarom u wel of niet deelneemt

## 9 Goals

- Wat zou voor u het belangrijkste doel zijn om juist wel deel te nemen aan krachttraining?
  - Bijvoorbeeld verbetering gezondheid, afvallen, mentaal, sociaal contact

## 11 Environmental context and resources

- Welke factoren uit de omgeving beïnvloeden uw deelname aan krachttraining?
  - Bijvoorbeeld de faciliteiten, afstand, geen passende programma's
  - Ontbreekt er iets om deel te nemen aan krachttraining volgens u?
    - Financieel, materiaal, transport begeleiding

## 7 Reinforcement

- Wat zou u persoonlijk stimuleren om juist wel deel te nemen aan krachttraining?
  - Denk hierbij aan kortingen of geld
  - Aanmoediging van anderen, aangepaste programma's

## 14 Behavioural regulation

- Wat zou u helpen om er een gewoonte van te maken om aan krachttraining te doen?
  - Bijvoorbeeld begeleiding, een trainingspartner of groepslessen
  - Beloningen

Wat zijn voor u de belangrijkste redenen om wel deel te nemen aan krachttraining?

Wat zijn voor u de belangrijkste redenen om niet deel te nemen aan krachttraining?

Dit is het einde van het interview. Is er iets wat u nog wilt toevoegen wat niet besproken is?

## Appendix C. Letter of information for implied consent

### English letter of information for implied consent



### **Letter of information for implied consent**

### **Exploring barriers and motivators to participate in resistance training**

#### **Introduction**

I am Rico Moorman, a master student Health & Society at the Wageningen University. I am doing research on motivators and barriers regarding resistance training participation among different age subgroups of older Dutch adults. I am going to give you information and invite you to be part of this research. If anything in this consent form is unclear, please tell me and I will take the time to explain.

#### **Purpose and objectives of the research**

Resistance training is an important form of physical activity that enhances the ability to undertake daily activities, delays age related deterioration, and reduces fall accidents. The purpose of this research is therefore to explore motivators and barriers to participate in resistance training among older Dutch adults aged 55 and over.

#### **Participant selection**

You have been invited to take part in this research because you meet the criteria and therefore can contribute to a better understanding of what motivates or hinder older adults to participate in resistance training. Your participation in this study is entirely voluntary, thus it is your choice whether to participate or not. Moreover, it is allowed to stop participating at any given point during this research, even if you agreed earlier.

#### **Procedures**

If you agree to take part in this research project, you will be asked to participate in a semi-structured interview that will take up to 30 minutes. During the interview the interviewer will sit down with you at a comfortable location. If preferred the interview can also take place in your home or another preferred location. If you do not wish to answer any of the questions during the interview, you may so and the interviewer will move on to the next question. No one else but the interviewer will be present unless you would like someone else to be there.

All information recorded is confidential, and no one else besides the interviewer and supervisor will access the information documented during your interview. The entire interview will be tape-recorded, but no-one will be identified by name on the tape. The recordings will be deleted after the research has been completed.

## Risks

If you feel uncomfortable with any of the questions please say so. You do not have to answer any questions or take part in the interview if you do not wish to. You also do not have to give us any reason for not responding to any questions or refusing to take part in the interview.

## Confidentiality

Any personal information about you will not be shared with anyone outside of the research team. All of the information that we collect from this research project will be kept private.

## Anonymity

Your answers during the interview will be kept anonymous during the data analysis and the publication of the study results. No identifiable information will be asked during the interview.

## Who to contact

If you have any questions feel free to contact: M: [rico.moorman@wur.nl](mailto:rico.moorman@wur.nl) or T: +31641472602

In addition you may verify the ethical approval of this research by contacting the Social Sciences Ethics Committee:

## Conditions of participation

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study:

### Participant

Name of Participant:

Date:

Signature:

### Researcher

Name of Researcher:

Date:

Signature:



## **Dutch letter of information for implied consent**



### **Informatiebrief onderzoek**

Interview over redenen om wel of niet deel te nemen aan kracht- en gewichtstraining

#### **Introductie**

Geachte Heer/Mevrouw

Mijn naam is Rico Moorman (22) en ik zit in de laatste fase van mijn master gezondheid en maatschappij aan de Wageningen Universiteit. Voor afronding van mijn opleiding ben ik bezig met een onderzoek naar verschillen in redenen om wel of niet deel te nemen aan kracht- en gewichtstraining tussen verschillende leeftijdsgroepen van (oud) volwassenen.

Kracht- en gewichtstraining is namelijk een belangrijke vorm van fysieke activiteit voor (oud) volwassenen aangezien het leeftijd gerelateerde achteruitgang tegen gaat, het vermogen om dagelijkse activiteiten uit te voeren verbetert en valongevallen vermindert. Ondanks dat het een belangrijke vorm van fysieke activiteit is nemen veel (oud) volwassenen nog niet deel aan de norm om twee keer per week deel te nemen aan spier- en bot versterkende oefeningen, zoals bijvoorbeeld kracht- en gewichtstraining.

Nu is er al wel onderzoek gedaan naar verschillende redenen om wel of niet deel te nemen aan kracht- en gewichtstraining onder (oud) volwassenen, maar wordt er geen onderscheid gemaakt tussen (oud) volwassenen van bijvoorbeeld 65 en 80(+). Dit wil ik dan ook graag onderzoeken en naar aanleiding hiervan zou ik u een aantal vragen willen stellen.

#### **Doel van het onderzoek**

Het doel van dit onderzoek is om te kijken of er verschillen zijn in redenen om wel of niet deel te nemen aan kracht- en gewichtstraining tussen verschillende leeftijdsgroepen van (oud) volwassenen in Nederland.

#### **Procedure**

Het interview zal ongeveer 20 minuten duren en plaatsvinden op een comfortabele locatie. Mocht u een vraag niet willen beantwoorden vanwege persoonlijke redenen kunt u dat aangeven en zal de onderzoeker verder gaan met de volgende vraag. Uw deelname aan het interview is compleet vrijwillig en u kunt dan ook op elk willekeurig moment aangeven dat u wilt stoppen. Verder zal alleen de onderzoeker aanwezig zijn bij het interview.

## **Anonimiteit en verantwoordelijkheid**

Het interview wordt opgenomen door middel van een audio-recorder. Informatie die u mij verteld zal enkel en alleen gebruikt worden voor dit onderzoek en vertrouwelijk behandeld worden. Om uw anonimiteit te waarborgen wordt er geen persoonlijke informatie gevraagd als naam, adres en andere persoonlijke gegevens. Alleen uw geboorte jaar wordt gevraagd om zodoende uw leeftijd te bepalen.

De opname wordt enkel alleen door mij gebruikt voor het data analyse proces en zal dan ook verwijderd worden aan het eind van dit proces. De data die hier uit volgt wordt compleet anoniem verwerkt en zal enkel door mij (Rico Moorman) en mijn begeleider (Franshelis Garcia) gelezen worden.

## **Ondertekenen Informatiebrief**

Indien u besluit deel te nemen aan dit wetenschappelijk onderzoek, dan vraag ik u om samen met mij het toestemmingsformulier te ondertekenen en te dateren.

Mochten er nog vragen zijn naar aanleiding van dit bericht, dan kunt u mij mailen ([Rico\\_moorman@wur.nl](mailto:Rico_moorman@wur.nl)) of bellen (+31641472602). Daarnaast kunt u de ethische goedkeuring van dit onderzoek verifiëren door contact op te nemen met de ethische commissie voor sociale wetenschappen: [Esther.Roquas@wur.nl](mailto:Esther.Roquas@wur.nl)

## **Formulier voor toestemming**

Ik heb de voorgaande informatie gelezen of is mij voorgelezen. Ik heb de gelegenheid gehad er vragen over te stellen en alle vragen die door mij zijn gesteld zijn naar mijn tevredenheid beantwoord.

Ik geef toestemming om mijn gegevens te gebruiken voor de doelen die in deze informatiebrief staan.

Ik vind het goed om aan dit onderzoek deel te nemen en ik ga akkoord met de opname van het interview.

### Deelnemer

Naam van de deelnemer:

Datum:

Handtekening:

### Onderzoeker

Naam onderzoeker:

Datum:

Handtekening:

## Appendix D. Resistance training exercises

### Lunge - voorkant bovenbenen billen en kuiten

#### Uitgangspositie:

In spreidstand met de voeten iets verder uit elkaar dan schouderbreedte.

- Stap met het linkerbeen naar voren en buig de knie tot 90 graden.
- Let op dat uw knie niet voorbij de tenen komt.
- Maak een verende beweging en plaats het linkerbeen weer terug naast het rechterbeen.
- Herhaal deze oefening met het rechterbeen.



#### Tips:

- Voor een betere balans: houd met één hand de rugleuning van de stoel vast.
- Bij knieklachten: stap in plaats van naar voren naar achteren. Let op dat uw knie achter uw enkel blijft.

### Romp oefening

#### Uitgangspositie:

In spreidstand met de voeten iets verder uit elkaar dan schouderbreedte. Plaats beide handen in de zij.

- Draai uw bovenlichaam rustig naar rechts en weer terug naar het midden.
- Herhaal deze oefening met een draai naar links.
- Houd uw knieën licht gebogen en uw buik ingetrokken.
- Probeer uw heupen stil te houden (ga eventueel voor een spiegel staan).



#### Variatie:

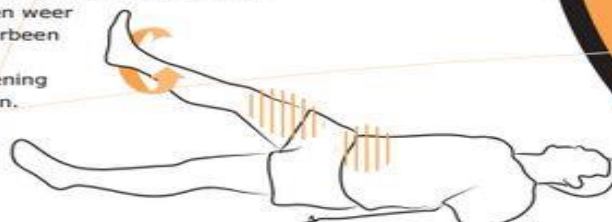
- Verzwaaar de oefening door uw handen op uw schouders te leggen.
- Strek uw armen zijwaarts op schouderhoogte.

### Voorkant bovenbenen – ½ cirkel

#### Uitgangspositie:

Liggend op de rug, strek beide benen.

- Span de beenspieren zoveel mogelijk aan.
- Til uw linkerbeen op (ongeveer 45 graden).
- Maak een kleine halve cirkel naar buiten.
- Maak daarna een halve cirkel naar binnen.
- Sluit uw linkerbeen weer aan bij het rechterbeen op de grond.
- Herhaal deze oefening met het linkerbeen.



#### Variatie:

- Verzwaaar de oefening door per keer acht halve cirkels te maken.
- Til uw been hoger op.

#### Tips:

- Houd beide billen tegen de grond en probeer de heupen stil te houden.
- Trek uw buik in en houd beide benen volledig gestrekt.
- Luister naar uw lichaam. Breng het been niet te hoog als dit te zwaar is.

## Triceps dips - achterkant bovenarmen

### Uitgangspositie:

Zittend op de grond, handen achter de billen.

- Laat de vingers naar voren wijzen.
- Buig beide armen, maar blijf de ellebogen naar elkaar toe duwen.
- Strek beide armen weer.
- Houd de schouders laag (niet inzakken).
- Let op! Strek de ellebogen niet volledig.



### Variatie:

- Verzwaar de oefening door uw handen op een verhoging te zetten, bijvoorbeeld een traptree. Blijf dicht bij de trap.
- Hoe verder u de voeten van de trap af plaatst, des te zwaarder de oefening wordt.

## Versterk de rugspieren

### Uitgangspositie:

Liggend op de buik met de handen op de rug.

- Til uw bovenlichaam een klein stukje op en laat het weer rustig zakken.
- Blijf goed naar de vloer kijken.
- Adem uit als u omhoog komt en adem in als u weer terug gaat.



### Variatie:

- Verzwaar de oefening door uw handen op de schouders te leggen of uw armen langs uw oren uit te strekken.
- Til uw bovenlichaam op, tel tot drie en ga weer langzaam terug.

## Versterk de buikspieren

### Uitgangspositie:

Liggend op de rug met de handen achter uw hoofd.

- Til uw bovenlichaam iets op en ga weer rustig liggen.
- Houd uw benen gestrekt.
- Trek uw buik goed in.

### Tips:

- Bij rugklachten: buig uw knieën en plaats de voeten op de vloer.
- Ga op een handdoek liggen. Pak twee punten van de handdoek naast uw oren vast en trek deze strak. Uw hoofd rust in de handdoek.



### Variatie:

- Til uw bovenlichaam op, draai met één elleboog schuin omhoog naar het plafond, draai terug naar het midden en ga weer liggen. Doe hetzelfde met de andere kant. Houd bij het indraaien de billen tegen de vloer.
- Met gebogen knieën: tik met beide handen uw knieën aan.



## Squat - Versterken van de bovenbeenspieren

### Uitgangspositie:

In spreidstand met de voeten iets verder uit elkaar dan schouderbreedte.

- Buig beide benen alsof u op een stoel gaat zitten.
- Duw de billen iets naar achteren maar houd het lichaam rechtop.
- Ga rustig naar beneden. Let op, dat uw knieën niet over de tenen komen.
- Kom weer rustig omhoog, maar strek de benen niet helemaal.



### Variatie:

- U kunt sneller of juist langzamer naar beneden en omhoog gaan.
- Houd de gebogen stand twee tot vijf seconden vast.
- Neem de armen zijwaarts mee tot schouderhoogte, eventueel met gewichtjes.

### Tip:

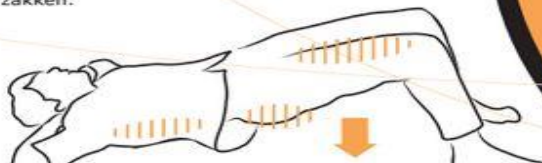
- Plaats een hand op een stoel voor u om uw evenwicht te bewaren.

## Versterken van bovenbenen, billen & rug

### Uitgangspositie:

Liggend op de rug met de benen gebogen.

- Trek uw buik in en knijp uw billen tegen elkaar.
- Duw uw heupen omhoog en laat weer rustig zakken. De billen mogen de grond niet raken.
- Laat uw heupen niet zakken.



### Variatie:

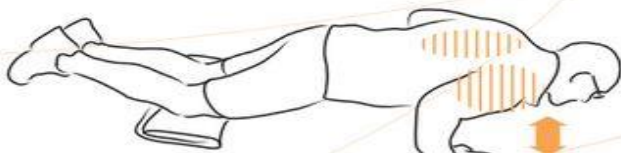
- Zet de voeten dicht bij elkaar en houd de knieën tegen elkaar.
- Maak de oefening zwaarder door de heupen omhoog te drukken en één been te strekken (bovenbenen blijven naast elkaar).

## Opdrukken - armen, schouders, borst, bovenkant rug

### Uitgangspositie:

Plaats handen en knieën op de grond, uw handen plaatst u iets achter de schouders en de knieën.

- Buig beide armen, zodat de borst naar de grond gaat.
- Houd uw rug recht.
- Kom rustig omhoog, de ellebogen blijven licht gebogen.



### Variatie:

- Plaats de knieën verder naar achteren.
- Houd de knieën los van de grond, uw lichaam is één rechte lijn.

### Tips:

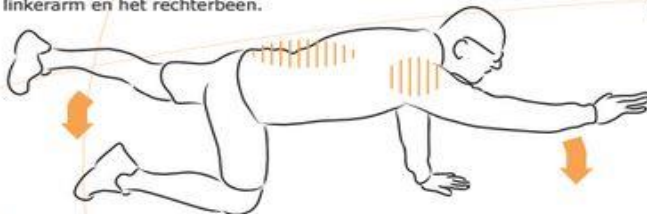
- Leg een opgevouwen handdoek onder uw knieën.
- Blijf goed naar de vloer kijken.
- Houd uw buik ingetrokken.
- Bij knie- of schouderklachten kunt u de oefening ook staand tegen een muur doen.

## Rug + schouder + coördinatie

### Uitgangspositie:

Plaats de handen en knieën op de grond. Zet de handen onder de schouders en uw knieën onder de heupen.

- Strek uw rechterarm en linkerbeen tegelijkertijd uit.
- Maak u zo lang mogelijk.
- Plaats uw arm en been terug en herhaal de oefening met de linkerarm en het rechterbeen.



### Tips:

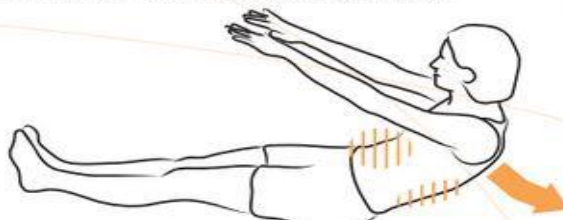
- Trek uw buik in.
- Adem uit bij het uitstrekken en adem in bij het terugplaatsen.
- Blijf goed naar de vloer kijken en houd de armen licht gebogen.
- Bij rug- of schouderklachten kunt u de oefening ook liggend op uw buik uitvoeren. Dit is dan geen balansoefening.

## Buikspieren - op- en afrollen

### Uitgangspositie:

Zittend op de grond met de benen recht naar voren. Strek de armen op schouderhoogte.

- Maak uw rug zo lang mogelijk, er ontstaat een lichte holling in de rug.
- Bol de rug en rol af tot u op de grond ligt met de armen naast uw oren.
- Breng uw armen schuin naar voren en ga rustig rechtop zitten.



### Tips:

- Kunt u niet volledig op de grond komen, doe dat dan ook niet. Maak de oefening zover u kunt en ga dan weer terug tot zitpositie.
- Komt u niet meer omhoog? Probeer dan zo ver mogelijk omhoog te komen en rol af tot u op de grond ligt. Draai vervolgens op uw zij en kom weer tot zitpositie.