Gender Differences in Physical Fitness Relevant for the Community Wise Intervention

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Abstract

With an ageing population, the need for interventions supporting elderly well-being increases. Community Wise is such an intervention and focusses on areas with low socioeconomic status (SES), where inhabitants stand increased risk for challenges to their well-being. The present study aimed to find suggestions for further fine tuning of the intervention. To do so, it explored gender differences in objective and subjective physical fitness. It then tried to show the importance of especially subjective fitness and its potentially positive effect on social and physical activity. The Community Wise intervention consists of 12 weekly sessions, stimulating social activity and physical fitness, and increasing self-management abilities. The effects of the intervention were studied with a pretest-posttest experimental design. Medium effect sizes for pre- and post-intervention gender differences in subjective physical fitness suggest significant differences at larger sample sizes (d = .434 and d = .487). Pre-intervention subjective physical fitness was positively correlated with social activity (n = 53, ρ = .26, p = .029) and pre- to post-intervention change in leg strength (n = 39, ρ = .29, p = .035). Although established gender differences were not significantly reproduced, the results do support the suggestion that subjective physical fitness might have a positive influence on social activity and strength exercises. Suggestions for further research were made.

Keywords: gender differences, subjective physical fitness, objective physical fitness, social activity, self-efficacy, mobility

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With increasing age, people come to face new challenges in life. Amongst these challenges are ageing-related reductions in physical fitness and social acitivty (Ruiz-Montero et al., 2016; RIVM, n.d.). Aside from the general physical deterioration that comes with age, elderly people tend to be less physically active the older they get (Suryadinata et al., 2020). This can have detrimental consequences because physical activity is associated with reduced inflammation markers and rates of chronic illnesses (Handschin & Spiegelman, 2008), and can help against stress and anxiety (*How to Look After Your Mental Health Using Exercise*, n.d.). Social activity is threatened by loss of friends and loved ones and there are increases in loneliness due to a decrease in social activity (RIVM, n.d.). Social activity is a precursor to social support, which in turn can both reduce the negative effect of stressful events and increase the benefits of positive events (Gable & Bedrov, 2022). Both physical fitness and social activity function as protective factors and are important for an individual's overall well-being.

Reductions in physical fitness are also indirectly related to reductions in social activity. This relationship is mediated by mobility, an individual's ability to get out of the house and go places. In the study of Giesel and Rahn, on the relation between mobility and social participation, low physical fitness was shown to be a risk factor for lower mobility. Lower mobility is reflected in the lower frequency and duration of trips that elderly people make. Leaving their house less often and not being able to go far reduces the options for activities and destinations. Without sufficient nearby alternatives for activities, the reduction in mobility negatively affects the amount of social activity (Giesel & Rahn, 2015).

A part of the population that stands increased risk of lower physical fitness and social activity are the inhabitants of areas with a low socioeconomic status (SES). Individuals with a

low SES are reported to have lower self-perceived health, more health problems and higher rates of disability, as compared to individuals with a higher SES. This is partly explained by the higher prevalence of unhealthy behavior such as smoking, as well as by difference in coping strategies and self-management abilities (Van Lenthe et al., 2004). Moreover, low SES is associated with an accelerated loss of walking ability, negatively impacting elderly mobility (Stringhini et al., 2018). And women with low SES show reduced sport activity in comparison to women with higher SES (Meyer et al., 2004).

The high rate of ageing in the Netherlands increases the need to support elderly individuals with ageing-related reductions in physical fitness and social activity. Based on the theory of Self-management of Well-being (Steverink et al., 2005), Community Wise is a neighborhood intervention especially developed to support elderly inhabitants of low SES areas. In 12 weekly group sessions, it aims to stimulate physical fitness and social activity, and improve self-management abilities to increase resilience. Previous studies on the results of Community Wise show positive outcomes, with increases in aerobic endurance, leg strength, and loneliness (Vorstman, 2020). Although Community Wise borrows techniques from the successful SMW group intervention focused on improving well-being for elderly women (Kremers et al., 2016), the current intervention did not differentiate its approach based on gender. In hopes to offer suggestions for further finetuning of the intervention, the present study explores gender differences in physical fitness.

Previous research has established that objective physical health and fitness tends to be lower for women than for men. Although these differences do converge with increasing age, women mostly keep experiencing more limitations in activities of daily living (ADL), compared to men (Carmel & Bernstein, 2003). Differences in physical fitness are related to men generally

having higher physical activity levels compared to women throughout most of their lives, with significant differences until the age of 65+. The higher prevalence of physical activity is partly explained by gender differences in social norms. Masculine character traits work as positive moderator for levels of physical activity and tend to be more prevalent in males (Matud & Díaz, 2020).

Aside from the actual gender difference in physical fitness, women also tend to have lower evaluations of their subjective physical fitness, compared to men (Carmel & Bernstein, 2003; Meyer et al., 2004). These self-evaluations are about what someone beliefs they are physically able to do, regardless of their objective physical fitness. The gender difference in subjective physical fitness can be explained in two ways by the difference in lifetime physical activity described above. First, lower physical activity for women is associated with lower physical health and more limitations in ADL, compared to men (Carmel & Bernstein, 2003). Consequent symptoms such as joint pain and stiffness may inflate the subjective experience of physical limitations, explained by the dissatisfaction they cause with daily functioning (Daltroy et al., 1999). Second, the difference in experiences with physical activity works as a availability bias. Older males are prone to overestimation of their physical fitness, based on past athletic experience. Women have fewer instances of physical activity to base their judgement on and overestimate less (Wells et al., 2016). Although these mechanisms are by no means gender specific, they do explain how gender differences in lifetime physical activity can lead to differences in subjective physical fitness.

It is this gender difference in subjective physical fitness that could have implications for further fine tuning of interventions such as Community Wise. To show how a focus on subjective physical fitness could be beneficial, a similar mechanism will first be explained. McAuley and

Blissmer studied the reciprocal way that exercise self-efficacy and physical exercise participation positively influence each other (2000). Exercise self-efficacy reflects the personal belief of being able to succeed in exercise. Higher exercise self-efficacy leads to a higher exercise frequency, whilst more experience with exercise shows the individual that they are indeed able to succeed and increases exercise self-efficacy (McAuley & Blissmer, 2000). This mechanism suggests a positive effect of confidence in one's physical fitness on effort put into physical activities.

Translated to activities of daily living, this self-efficacy can be interpreted as self-evaluation of one's fitness (subjective physical fitness). Higher subjective physical fitness would then lead people to physically challenge themselves because they believe themselves physically able. This would both increase both the frequency of physical activities, as well as the effort exerted during those activities. An increase in physical activity would provide positive experiences to base one's subjective physical fitness evaluation on. Exerting more effort during physical exercise or activity should make an individual objectively fitter. More, increases in both objective and subjective physical fitness would be beneficial for mobility, either by physically allowing an individual to move more, or by making them believe they can. The increase in mobility would subsequently facilitate social activity (Giesel & Rahn, 2015). Thus, assuming subjective physical fitness works in a similar way to exercise self-efficacy, stimulating it would increase physical activity, which could increase both subjective and objective physical fitness. This would then indirectly stimulate social activity by increasing mobility.

With previous research demonstrating a female gender disadvantage in both objective and subjective physical fitness, female participants stand to gain more from an intervention that aims to positively stimulate subjective physical fitness (Carmel & Bernstein, 2003). To confirm that this is the case in the present study, it is hypothesized that (H1) at both pre- and posttest, female

participants of Community Wise score lower on objective and subjective measures of physical fitness, as compared to male participants.

Next, with Giesel and Rahn showing a negative effect of reduced physical fitness on mobility (2015), the relationship between physical fitness and social activity will be tested. Because of the suggested positive effect of specifically subjective physical fitness on social activity, two sub-hypotheses were established. It is predicted that at both pre- and posttest measures, social activity of Community Wise participants is (H2a) positively correlated with subjective physical fitness, but (H2b) is not correlated with the objective physical fitness measures.

Lastly, this paper tries to extent the findings of McAuley and Blissmer (2000) from a positive effect of exercise self-efficacy on the frequency of physical exercise to effort expended during exercise. More exerted effort would increase exercise intensity, which leads to improved exercise results (Mazzeo & Tanaka, 2001). It is therefore predicted that (H3) pretest subjective physical fitness is positively correlated with change in pre- to posttest measures of objective physical fitness in Community Wise participants.

The main focus of this study was to discover gender differences in the data of the Community Wise intervention, in an effort to find ways to further tailor the intervention to its participants. Based on existing literature describing gender differences in physical fitness, this study examined the potential benefits of subjective physical fitness. It hoped to suggest an increased focus on subjective physical fitness, in order to improve the effects of the Community Wise intervention on objective and subjective measures of physical fitness, indirectly stimulating social activity. Although both genders could benefit from the proposed effects, it is proposed that

especially women, with a generally lower self-evaluation of their physical fitness, stand to gain from the suggested mechanisms.

Method

Procedure and Design

Recruitment

The first step of recruitment was to map villages, neighborhoods and streets, looking for areas with high rates of elderly inhabitants with a low SES (Vorstman, 2020). The primary target group was people aged 40+ with a low SES. However, participants were not excluded based on either age or SES, so as not to disturb the natural cohesion of the participating neighborhoods. One condition was the absence of an active intervention stimulating the positive health of the prospective participants. This was checked at respective social care organizations and the municipality of the area. Inhabitants from various areas in the municipalities of Groningen, Eemsdelta (formerly Delfzijl) and Almelo were approached for a pre-intervention screening. They were notified about the house-to-house visits by way of a written notice. During these visits, assistants of the involved organizations came by to do general health checks and take questionnaires on aspects of general health in the neighborhood. Those people that were not at home at the time of the house visits, received a note in their mail inviting them for a new appointment. Alternatively, people were also allowed to join the intervention after hearing about it through neighbors or neighborhood organisations. Of those interested in participating in the intervention, 10 groups were formed, whilst trying to maintain the natural neighborhood cohesion (Vorstman, 2020).

Prior to the sessions, participants were assured of their anonymity and informed consent was obtained. The intervention was approved by the Medical Ethical Committee of the

Universitair Medisch Centrum Groningen, and was found not to fall under the Medical Research Involving Human Subjects Act (Vorstman, 2020).

Intervention

The intervention took place between September 2018 and Februari 2020, and consisted of 12 weekly sessions of 90 minutes. The elderly participants were guided through group exercises by specialists in the well-being of low SES individuals (Vorstman, 2020). The sessions of the intervention focused on the development of self-management abilities, and stimulation of physical fitness, social activity and mental resilience. For concise information concerning the individual design of the sessions, see the master thesis by Vorstman (2020). The design of the sessions is based on the theory of Self-Management of Well-being (SMW) and borrows techniques from the Socially Vital and SMW interventions (Steverink et al., 2005; Greef, 2014; Kremers et al., 2006). Sessions four, eight and 11 were focused primarily on physical activity, by working on endurance and experiencing fun with movement. The classes consisted of a warming up, strength-, aerobic-, and flexibility exercises, various game- and sport exercises, and a cooling down. Other sessions specifically aimed to improve collaboration, social cohesion, and communication skills (Internal Communication, 2021). After finishing up there was time for coffee, which gave the participants a chance to evaluate the exercises. Pretest measures were collected before the first session, and posttest measures after concluding the last session (Vorstman, 2020).

Design

The effects of the Community Wise intervention were studied using an experimental pretest posttest design (Vorstman, 2020). Data was gathered both quantitatively, with questionnaires and objective fitness tests, and qualitatively, with interviews. Measured aspects of

wellbeing included: physical fitness (objective and subjective), self-management abilities, social activity, demographic characteristics, physical and mental well-being (Vorstman, 2020). The present study made use of the age and gender of the participants, the three objective physical fitness measures, the subjective physical fitness scale, and the social activity scale consisting of questions the Self-Management Ability Scale.

Material

Demographic characteristics

General information about the participants was collected during the screening process using questionnaires (see Table 1).

Objective physical fitness

Three aspects of objective physical fitness were measured, namely aerobic endurance, leg strength and dynamic balance. These fitness aspects were respectively measured by the Two Minute Step Test, the 30-seconds Sit-To-Stand Test (Rikli & Jones, 1999), and the Timed Up-and-Go (Podsiadlo & Richardson, 1991). In the Two Minute Step Test the total amount of knee raises were counted during two minutes of walking in place. It is a valid test with high test-retest reliability (Cronbach's $\alpha = 0.88$) (Rikli & Jones, 1999). For the 30-seconds Sit-To-Stand Test the participant has to get from a sitting to a standing position without the use of their arms. The score is the total of completed tries in 30 seconds. The test shows validity and high test-retest reliability (Cronbach's $\alpha = 0.89$) (Rikli & Jones). For the Timed Up-and-Go Test it is measured how long it takes for the participant to get up, walk around a cone and return to their chair. The fastest time of two trials was recorded. The Timed Up-and-Go Test shows inter- and intra-rater reliability and is a valid measure of daily functional capacity ($r = -0.78$) (Podsiadlo & Richardson, 1991).

Subjective physical fitness

Participants reported their self-evaluation of physical fitness by filling out the physical functioning subscale of the General Health section of the Dutch RAND-36 Health Survey (Van der Zee et al., 1996). Six questions were selected from the original 10 questions in the subscale. The questions assess self-perceived impairment in daily functioning, i.e., "Are you impaired in very intense activities or participation in strenuous sports?" and "Are you impaired in walking around the neighborhood?". The physical functioning subscale has been established to be a reliable and valid measure of impairment of daily functioning (Cronbach's $\alpha = .92$) (Van der Zee et al., 1996). For the present study, reliability analyses for T0 and T1 showed a Cronbach's alpha of $\alpha = .91$ and $\alpha = .89$, respectively. Answers were recorded on a three-point scale, summed, and transformed to a total score on a 100-point scale. A lower total score represents more impairment in daily functioning.

Social activity

For the social activity scale, nine out of 30 items were selected from the six subscales of the Self-Management Ability Scale, based on their connection to social activities (see appendix). For example: "I enjoy my hobby together with others." and "Do you succeed in having fun contact with others?" (Schuurmans et al., 2005; Steverink, 2009). Answers were recorded on five- or six-point Likert scales. After the scores were transformed to 20-point scales, they were combined, averaged, and multiplied by five to create a 100-point scale. After the transformation, higher scores related to higher levels of social activity. A total of four of the nine questions were allowed to be left unanswered. A reliability analysis of the nine selected items showed the same internal consistency at both T0 and T1 (Cronbach's $\alpha = 0.87$).

Analysis

Selection criterium

Descriptive analysis of the age of participants showed that all participants under 60 were female. Due to the negative influence that increased age tends to have on physical fitness (RIVM, n.d.), only data from participants aged 60 and above was used for the analyses. By doing so, possible advantages of the younger female participants over the older male participants were excluded, thereby not confounding the results.

Statistical analyses

Descriptive statistics were used to create an overview of the demographic characteristics of the participants. All analyses were performed using IBM SPSS Statistics 28.

Potential differences between male and female participants in objective and subjective measures of physical fitness, at both T0 and T1, will be analyzed using either independent samples t-tests or Mann-Whitney U tests. The dependent variables are leg strength, dynamic balance, aerobic endurance, and subjective physical fitness. The means for these variables are compared for the independent variable gender. Differences will be considered significant with two-sided *p*-values below .05. Cohen's *d* was calculated to estimate the effect size, differentiating between small ($d = 0.2$), medium ($d = 0.5$) and large ($d = 0.8$) effect sizes (Cohen, 2013).

Next, the relationships between social activity and both objective (leg strength, dynamic balance, aerobic endurance) and subjective measures of physical fitness, at both T0 and T1, will be analyzed using both Pearson's correlation and Spearman's correlation coefficients. Correlations between social activity and subjective physical fitness will be considered significant with one-sided *p*-values below .05. Correlations between social activity and objective measures of physical fitness will be considered significant with two-sided *p*-values below .05.

Lastly, the relationships between pretest subjective physical fitness and pre- to posttest change in objective measures of physical fitness (leg strength, dynamic balance, aerobic endurance) will be analyzed using either Pearson's correlation or Spearman's correlation coefficient. Correlations will be considered significant with one-sided *p*-values below .05.

Respective test use will be decided on after checking the assumptions. For the independent samples t-test: continuous dependent variable, dichotomous independent variable, independence of observations, no significant outliers, normally distributed subsamples, homogeneity of variances. For the Mann-Whitney U test: continuous/ordinal dependent variable, dichotomous independent variable, independence of observations, similarly distributed subsamples. For Pearson's correlation: continuous variables, linear relationship, no significant outliers, normally distributed variables. For Spearman's correlation: ordinal/interval/ratio variables, paired observations, monotonic relationship.

Assumptions will be checked using descriptive statistics, visual inspection of QQ-plots and boxplots, Levene's test for equality of variances, and the deviation from linearity function.

Results

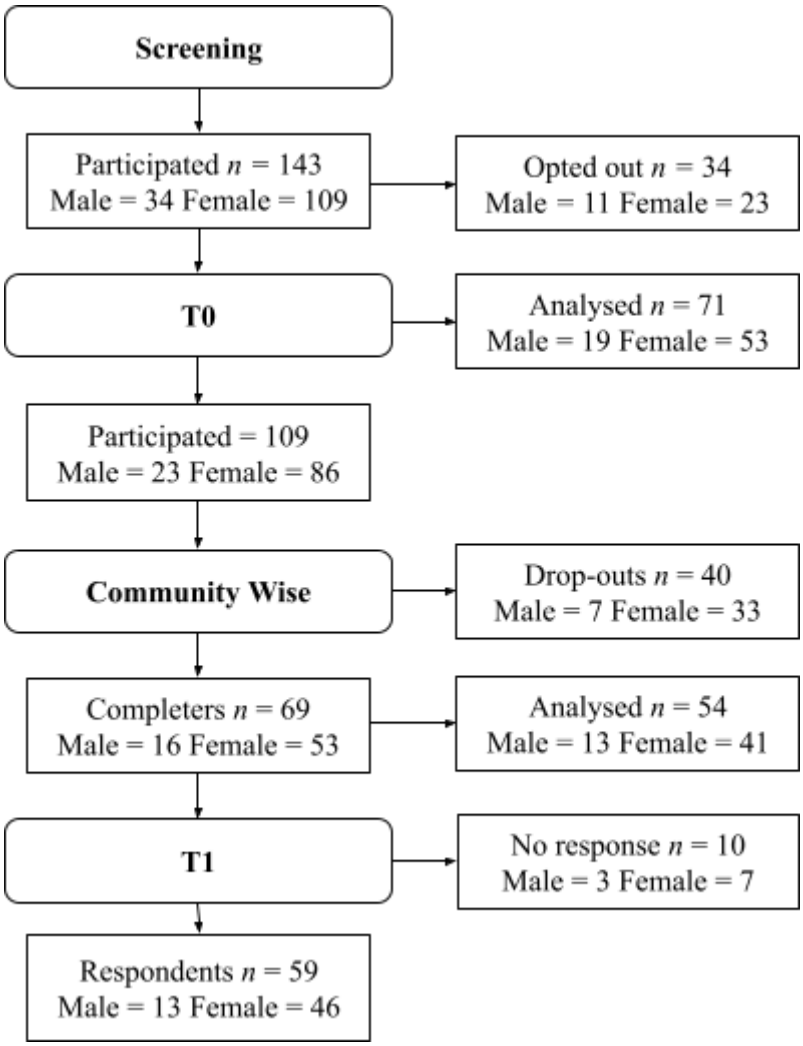
Participants

At first, 143 participants received the health screening. In total there were 109 participants that decided to participate in the intervention. Participants' age ranged from 25 to 97 (M = 72.9 and SD = 13.9). However, for the current study only participants aged 60 and above were included in the analyses, resulting in an age range from 60 to 97 (M = 77.1 and SD = 8.2). The flowchart of participants includes how many participants were excluded at both T0 and T1 (see Figure 1). Ultimately, 69 participants followed the complete Community Wise intervention, and 40 participants dropped out during the intervention (male = 7 and female = 33). Table 1

gives a general overview of the demographic characteristics, but only for the participants analyzed in the current study. Figure 1 shows how many male and female participants participated in each stage of the intervention, including how many participants were included in the analyses at both T0 and T1.

Figure 1

Flowchart Participants



Note. n = number of participants. 'Analyzed' *n* = participants selected based on age over 60.

Table 1

Demographic Characteristics Participants Aged over 60

Characteristics	**Male**	**Female**	**Total**
Sex *n*	33	89	122
Age *M (SD)*	78.6 (8.77)	76.6 (7.90)	77.1 (8.15)
Education *n*			
Low	3	11	14
Middle	11	31	42
High	2	3	5
Missing	17	44	61
Income *n*			
Makes ends easily	11	28	39
Exactly makes ends	6	19	25
Just makes ends	0	1	1
Missing	16	41	57
Marital status *n*			
Married	11	16	27
Not married	7	37	44
Missing	15	36	51
Nationality			
Dutch (other)	18 (1)	48 (4)	71
Missing	14	37	51

Note. n = Number of participants. *M* = Mean. *SD* = Standard Deviation. Age is given in years.

Quantitative analyses

Assumptions

For the analyses of hypothesis 1, comparing mean objective and subjective physical fitness scores between male and female participants, none of the variables complied with all assumptions of the independent samples t-test. The variables did comply with the assumptions of the Mann-Whitney U test.

For the analyses of hypothesis 2a, looking at the relationship between social activity and subjective physical fitness, Spearman's correlation coefficient was used due to non-normality of subjective physical fitness. All variables comply with the assumptions for Spearman's correlation coefficient.

For the analyses of hypothesis 2b, looking at the relationship between social activity and objective measures of physical fitness, T0 balance and T1 balance and endurance did not comply with the assumption of normality. T1 leg strength showed significant outliers. For the analyses of these variables, Spearman's correlation coefficient was used. The other variables did comply with the assumptions of Pearson's correlation coefficient.

For the analyses of hypothesis 3, looking at the relationship between pretest subjective physical fitness and pre- to posttest change in objective measures of physical fitness, Spearman's correlation coefficient was used due to non-normality of subjective physical fitness. The variables complied with the assumptions of Spearman's correlation coefficient.

Gender differences in physical fitness measures

A series of independent samples t-tests and Mann-Whitney U tests was conducted to determine if there were significant differences in subjective or objective measures of physical fitness between male and female participants of Community Wise (see Table 2 & 3).

Mann-Whitney U tests were used for significance of the differences, but t-tests were included for description of non-significant differences. The results showed that there were no significant differences in mean scores between male and female participants. Only gender differences in pre- and posttest subjective physical fitness showed an effect size larger than Cohen's $d = .200$ (T0: $d = .434$ and T1: $d = .487$). In combination with non-significant results, the less than small effect sizes for the other gender differences are not relevant to mention.

Table 2

Independent Samples T-Tests Outcomes comparing Male and Female Participants on Measures of Physical Fitness

	n	*M*	*SD*	*t (df)*	*p*	*d*	95% CI
T0 Subjective Physical Fitness				1.47 (54)	*	.434	(-5.79 - 38.5)
Male	16	67.2	42.4				
Female	40	53.3	36.3				
Missing	66						
T1 Subjective Physical Fitness				1.61 (54)	*	.487	(-4.37 - 40.5)
Male	15	68.9	38.8				
Female	41	53.7	35.6				
Missing	66						
T0 Leg Strength				-.47 (107)	*	-.102	(-2.31 - 1.42)
Male	29	11.8	4.87				
Female	80	12.3	4.14				
Missing	13						

T1 Leg Strength				-.19 (39.5)	*	-.045	(-2.77 - 2.29)
Male	13	12.6	3.10				
Female	42	12.9	5.90				
Missing	67						
T0 Dynamic Balance				-.85 (107)	*	-.184	(-4.71 - 1.89)
Male	29	8.17	4.17				
Female	80	9.58	4.14				
Missing	13						
T1 Dynamic Balance				.13 (49)	*	.040	(-2.27 - 2.58)
Male	13	7.84	2.67				
Female	38	7.69	4.04				
Missing	71						
T0 Aerobic Endurance				-.80 (100)	*	-.177	(-25.4 - 10.9)
Male	28	61.6	37.5				
Female	74	68.9	42.5				
Missing	20						
T1 Aerobic Endurance				.47 (48)	*	.154	(-27.7 - 44.4)
Male	12	97.9	42.4				
Female	38	89.5	57.2				
Missing	72						

Note. *Subsample* = non-normal. *n* = Number of participants. *M* = Mean. *SD* = Standard deviation. *t* = T-statistic. *df* = Degrees of freedom. *d* = Cohen's effect size. CI = Confidence interval of the difference in mean score. * = For *p*-values, see Table 3.

Table 3

Mann-Whitney U Tests Outcomes Comparing Non-Normal Subsamples on Measures of Physical Fitness

Variable	T0		T1	
	z	*p*	*z*	*p*
Subjective Physical Fitness	-1.66	.097	-1.61	.108
Leg Strength	0.80	.426	0.27	.788
Dynamic Balance	0.34	.731	-0.88	.381
Aerobic Endurance	0.71	.476	-0.42	.674

Note. z = Z-statistic. p = one-sided significance.

Correlations physical fitness measures and social activity

The relationship between subjective physical fitness and social activity was assessed at both T0 and T1, using Spearman's correlation coefficient. The analyses showed a significant correlation between subjective physical fitness and social activity in pretest data ($n = 53$, $\rho = .26$, $p = .029$). Analysis of posttest data for these variables showed no significant relationship ($n = 55$, $\rho = -.03$, $p = .427$). The relationship between objective physical fitness measures and social activity was assessed at both T0 and T1, using either Pearson's or Spearman's correlation coefficient. Respective coefficient use depended on normality of the variables. The analyses showed no significant correlations between social activity and objective measures of physical fitness (see Table 4).

Table 4

Simple Bivariate Correlations between Social Activity and Objective Measures of Physical Fitness

Variable	T0				T1			
	n	*r*	*ρ*	*p*	*n*	*r*	*ρ*	*p*
Leg Strength	51	-.03	-	.803	48	-	-.02	.915
Dynamic Balance	65	-	-.14	.259	44	-	.14	.356
Aerobic Endurance	65	-.09	-	.481	43	-	-.21	.171

Note. n = Number of participants. r = Pearson's correlation. ρ = Spearman's correlation. p = two-sided significance.

Relation subjective fitness and change in objective fitness

The relationship between pretest subjective physical fitness and pre- to posttest change in objective measures of physical fitness was assessed using Spearman's correlation coefficient. Only pre- to posttest change in leg strength showed a significant positive correlation with pretest subjective physical fitness (n = 39, ρ = .29, p = .035). Pre- to posttest change in dynamic balance (n = 35, ρ = -.18, p = .147) and aerobic endurance (n = 33, ρ = -.12, p = .249) showed non-significant correlations with pretest subjective physical fitness.

Discussion

This present study explored gender differences in physical fitness potentially influencing the effects of the Community Wise intervention, in hopes of providing suggestions for further research to ultimately improve the intervention. Based on previously established gender differences in both objective and subjective measures of physical fitness, it was expected that the

female participants of the Community Wise intervention would show both lower objective physical test scores, as well as evaluate their own physical fitness lower than the male participants (Carmel & Bernstein, 2003). Next, based on the positive relation between physical fitness and mobility, it was expected that participants would be more socially active the fitter they were. This relationship was expected exclusively for subjective evaluation of fitness, in light of the suggested similarity between subjective physical fitness to exercise self-efficacy. This similarity implies that it's the participant's belief in, or own evaluation of, their ability that drives their behavior. Lastly, assuming the moderating effect of subjective physical fitness, it was expected that participants that evaluated their fitness higher would exert more effort during physical exercise, thereby improving their results.

The results of this study showed no significant gender differences in either objective or subjective measures of physicial fitness and did not support Hypothesis 1. However, the medium effect sizes for the gender difference in pre- and post-intervention subjective physical fitness suggests that a significant difference may be found when a larger sample size is used. This would be in line with existing research showing gender differences in subjective physical fitness, with men evaluating their physical fitness higher than women (Wells et al., 2016). If women indeed have lower self-evaluations of their physical fitness, they would stand to gain more from an increased focus on stimulating subjective physical fitness. The absence of significant gender differences in the objective measures of physical fitness could be explained by the findings of Carmel and Bernstein, showing that gender differences in physical fitness tend to decrease with increasing age (2003). This is also supported by a study of Milanović et al., looking at fitness changes between young elderly (60-69) and old elderly (70-80). They found that physical fitness

decreases more for men than for women, making up for the gender difference found at younger age (2013).

With a positive relationship between subjective physical fitness and social activity at T0 but no relationship at T1, the results provided support for half of Hypothesis 2a. This is in line with the findings of Giesel and Rahn, showing that higher fitness is positively related to mobility, indirectly facilitating social participation (2003). Absence of relationships between social activity and leg strength, dynamic balance, and aerobic endurance provided support for Hypothesis 2b. Together, the results for these hypotheses seem to support the idea that it is indeed the participant's own evaluation of their physical fitness that drives their behavior. Although objective impairment would obviously limit a person's activities in certain ways, it ultimately comes down to how physically able they perceive themselves to be. This finding is in line with the earlier compared study on exercise self-efficacy from McAuley and Blissmer, showing a positive influence on the frequency of exercise (2000).

However, the absence of a relationship between subjective physical fitness and social activity is contradictory. Visual inspection comparing the pre- and post-intervention distributions for subjective physical fitness and social activity even shows them to stay roughly equal. No alternative explanation could be found in existing literature. Future research is necessary to provide further support for the potential positive relationship between subjective physical fitness and social activity, and to explain why a relationship was found initially, but not after the intervention.

Again, the results only partly provided support for Hypothesis 3. That there was only a significant positive relation between subjective physical fitness and change leg strength, but not with change in dynamic balance or aerobic endurance, could be potentially be explained by the

required exercise intensity to stimulate said fitness aspects. Balance and endurance exercises are often performed with lower intensity for longer duration; they do not need to be high intensity in order to see improvements. This means that with relatively low exertion the exercises can be performed properly. In contrast, strength exercises are performed at higher intensity for shorter durations (Hughes et al., 2018). Earlier it was suggested that higher subjective physical fitness, like exercise self-efficacy, lets participants exert more effort because they believe they are able to. This idea is supported by a paper from Sallis et al., showing that self-efficacy predicts adoption of vigorous intensity training (1986). This suggests a willingness to perform at higher intensity when individuals believe in their physical functioning. Strength exercises especially would benefit from this, because this extra effort helps to perform the exercises at the required intensity. Meanwhile, participants reporting lower subjective physical fitness would be less willing to exert more effort, and are therefore only able to properly perform the balance and endurance exercises. This would explain why subjective physical fitness and related willingness to exert effort show a relationship with changes in leg strength, but not with changes in dynamic balance and aerobic endurance.

Future research into the Community Wise intervention could include a questionnaire measuring self-efficacy specifically, instead of relying on subjective physical fitness. In pursuit of finding ways to improve the intervention, they could then further study how positive stimulation of self-efficacy influences the effects of physical exercises. This could for example be achieved by providing participants with positive experiences with physical exercise, which they can base their exercise self-efficacy evaluations on. This might be especially effective for female participants, since previous research has already established a male tendency to overestimate subjective physical fitness based on past experiences with sport (Wells et al., 2016).

Limitations and Future Directions

A strength of the current study is that it adds to the existing literature on positive health by examining gender differences in a novel way. Gender differences in health aspects have been previously established, but differences in the effects of an intervention promoting health were so far undocumented. Such differences as in aging processes and (perception of) quality of health beg the question of how to best provide support and stimulate health for either gender (Carmel & Bernstein, 2003; Milanović et al., 2013; Wells et al., 2012). Explorative research like the current study has the benefit of providing new suggestions for further research.

A general limitation was that the sample size was too small. This could have led to chance overrepresentation of either low or high scoring participants, possibly obscuring gender differences in physical fitness measures for example. A small sample size also has increased risk of type-II errors. This means that the null hypothesis is not rejected based on the sample, whilst it should be rejected for the population. This makes it difficult to determine whether the results are true findings (Faber & Fonseca, 2014). The small sample size also made it difficult to judge the seriousness of outliers, whilst increasing their effect on the outcome. Although present, outliers were not removed because they did not seem like unnatural scores. Lastly, especially the male subsample was small. This may have obscured possible gender differences in the analyzed variables by misrepresenting the male distribution in the population. Future version of the Community Wise intervention could try to promote male participation.

The study of the Community Wise intervention was originally not meant to investigate differences in results between male and female participants. As such, certain variables underlying possible gender differences were not measured. Future studies into differences in results of the intervention could include questionnaires on masculine/feminine traits, for

example. Masculine character traits have been shown to be positively related to physical exercise and mobility for both men and women (Matud & Díaz, 2020). Investigating these character traits could help tailoring the intervention to specific needs based on gender, for example by stimulating masculine traits in female participants.

A limitation of the current analysis is that the social activity scale was formed for this study at face value. Although the reliability analysis showed high internal consistency, it has not been confirmed whether the scale specifically measures social activity. Some of the questions could be argued to reflect social skills or subjective effort put into maintaining relationships, i.e., "Do you succeed in having nice contact with others?" and "Do you spent time and attention on maintaining good relations with people you care about?". If the scale does not accurately measure social activity, but instead a related construct, then the analyses made in this study cannot be properly used to test the hypotheses concerning social activity. An improved scale measuring social activity could also focus more on 'physical' social activity. This would exclude calling friends over the phone as social activity, for example. Such a 'physical-social activity' scale would be better suited because the present study looks at relation between subjective physical fitness and social activity, and no aspect of fitness is needed for phone calls.

Another related limitation has to do with the focus on low SES areas. Although SES was assessed by the questionnaire, the current sample size was too small to include SES as a factor in the analyses, however (Internal communication, 2023). In the current study, this had implications for the analysis of the role of mobility in the relationship between subjective physical fitness and social activity. Giesel and Rahn confirmed physical fitness to be important for mobility, but they also included variables such as SES and possession of a driver's license in their measurement of mobility (2003). Low SES neighborhoods often provide less options for entertainment and social

activities, thus increasing required travel time and making it more difficult for inhabitants to socially participate. Possession of a driver's license goes a long way to facilitating travel to social activities and entertainment, especially for inhabitants of these low SES areas. Future research with a larger sample size should therefore analyze the role of mobility whilst controlling for SES, as well as inquiring after, and controlling for, possession of driver's license.

A limitation of the Community Wise intervention is that the frequency of physical exercise might not be sufficient for improvement of physical fitness. Aside from some physical movement and warm-ups, the intervention contained only three sessions focused on physical exercise. More difficult to ascertain is whether the intensity of the exercises was sufficient for improvement of physical fitness. The physical exercises in the intervention varied per group, depending on physical capacities of the group's participants. This was left to the respective group's coordinator to manage. Although this might be necessary especially with frail participants, the lack of controlled stimulation might have led to insufficient intensity. Compared to Mazzeo and Tanaka's study on optimal exercise prescription for health benefits in elderly individuals, the combination of exercise frequency and intensity in the Community Wise intervention indeed seems unlikely to be sufficient (2001). They recommend 30 minutes of moderate exercise every day, which can be broken up into multiple short bouts of exercise. With more intense exercises, they reduce the frequency to three times per week. Even if the exercises were performed with high intensity, the fitness stimulation would still be lacking in terms of exercise frequency. Consequently, absence of significant results related to pre- and post-intervention change in objective physical fitness measures might be due to an inadequate physical exercise program, i.e., participants showing no improvement could have been part of a group where the exercises were not performed properly. To satisfy the recommended exercise

frequency, future versions of the intervention could include exercises that the participants can perform at home.

The freedom of the various groups' coordinators in shaping the sessions focused on physical exercise has further consequences. With each coordinator motivating and stimulating their participants in varying degrees, the potential motivational effect of subjective physical fitness on exerted effort could be obscured. A questionnaire assessing effort exerted during the physical exercises would allow future research to study the relationship between subjective physical fitness and exerted effort, whilst controlling for group membership (and therefore motivational qualities of the respective coordinators).

Taken together, a number of suggestions can be made for future research on, and alterations to the Community Wise intervention. Future studies should further investigate the positive relation between subjective physical fitness and both social activity and changes in strength. To better study gender differences in the participants, future versions of the intervention could include a questionnaire assessing masculine/feminine character traits and aim to promote participation, especially amongst men. By increasing the sample size, future studies could control for variables such as SES and mobility. To further study the effects of exercise self-efficacy and exerted effort, they too should be assessed by questionnaires. Also, to improve the quality of physical stimulation, exercise frequency could be increased by assigning exercises for at home. Lastly, as important moderator of the relation between subjective physical fitness and social activity, mobility and its underlying aspects should be included for further study.

Conclusion

Combining findings of previous research and the present study suggests that there are gender differences of importance for the effects of the Community Wise intervention. Although

the results are not conclusive enough to justify alterations to the intervention, suggestions for further research can be made. In our society with an ageing population, interventions such as Community Wise become increasingly important to maintain general wellbeing and happiness. By studying differences in, and adopting specific intervention approaches based on gender differences, elderly individuals can be supported more effectively in managing age-related reductions in wellbeing, ultimately living a healthier and happier life.

Appendix A

Questions for Social Activity Scale

Initiatief

Hoe vaak neemt u het initiatief om leuke contacten met anderen te hebben?

Antwoorden: 1 = nooit, 2 = bijna nooit, 3 = af en toe, 4 = geregeld, 5 = vaak, 6 = heel vaak

Self-efficacy

Lukt het u om leuke contacten met anderen te hebben?

Antwoorden: 1 = ik weet zeker van niet, 2 = ik denk van niet, 3 = soms wel/soms niet, 4 = ik denk van wel, 5 = ik weet zeker van wel

Investeren

Doet u wel eens iets kleins om het contact met uw kennissen goed te houden?

Antwoorden: 1 = nooit, 2 = bijna nooit, 3 = af en toe, 4 = geregeld, 5 = vaak, 6 = heel vaak.

Besteed u tijd en aandacht aan het onderhouden van een goed contact met de mensen om wie u veel geeft?

Antwoorden: 1 = nooit, 2 = bijna nooit, 3 = af en toe, 4 = geregeld, 5 = vaak, 6 = heel vaak

Positief perspectief

Verwacht u dat u, in de toekomst, voldoende gezelligheid met anderen zult hebben?

Antwoorden: 1 = nee!, 2 = nee, 3 = min of meer, 4 = ja, 5 = ja!

Multifunctionaliteit

De bezigheden waar ik plezier aan beleef, doe ik samen met anderen.

Antwoorden: 1 = nooit, 2 = bijna nooit, 3 = af en toe, 4 = geregeld, 5 = vaak, 6 = heel vaak

Mijn hobby's doe ik samen met anderen.

Antwoorden: 1 = nooit, 2 = bijna nooit, 3 = af en toe, 4 = geregeld, 5 = vaak, 6 = heel vaak

Ik doe gezellige dingen met mensen uit de buurt.

Antwoorden: 1 = nooit, 2 = bijna nooit, 3 = af en toe, 4 = geregeld, 5 = vaak, 6 = heel vaak

Variëteit

Bij hoeveel gelegenheden heeft u leuke contacten met anderen?

Antwoorden: 1 = geen, 2 = één, 3 = twee, 4 = drie of vier, 5 = vijf of zes, 6 = meer dan zes

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