

# Self-Reported vs Measured Physical Fitness in Older Women

This article was published in the following Dove Press journal:  
*Clinical Interventions in Aging*

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**Purpose:** The main purpose of the study was to determine the level of correlation between self-reported and measured physical fitness.

**Patients and Methods:** In this cross-sectional study, we recruited 120 older women aged  $\geq 60$  years. Self-reported physical fitness was assessed on a scale from 1 to 10, where higher score indicated better physical fitness perception. Objective measure included seven physical fitness tests: 1) waist circumference, 2) chair stand in 30 sec, 3) arm curl in 30 sec, 4) 2-min step test, 5) chair sit-and-reach test, 6) back scratch test and 7) 8-feet up-and-go test. Correlation between the two measures was analyzed by using Spearman coefficient ( $p \leq 0.05$ ).

**Results:** In the whole sample, self-reported physical fitness was associated with chair stand in 30 sec ( $r=0.39$ ,  $p<0.001$ ), arm curl in 30 sec ( $r=0.54$ ,  $p<0.001$ ), 2-min step test ( $r=0.43$ ,  $p<0.001$ ), chair sit-and-reach test ( $r=0.39$ ,  $p<0.001$ ), back scratch test ( $r=0.36$ ,  $p<0.001$ ) and 8-feet up-and-go test ( $r=-0.29$ ,  $p<0.001$ ). No significant correlation between self-reported physical fitness and waist circumference was found ( $r=0.03$ ,  $p=0.786$ ). Overall physical fitness (sum of all physical fitness z-scores) was strongly correlated with self-reported physical fitness ( $r=0.63$ ,  $p<0.001$ ).

**Conclusion:** This study shows that self-reported measure of physical fitness is moderately correlated to objectively measured physical fitness in relatively healthy older women.

**Keywords:** performance, aging, perception, correlation, variance

## Introduction

In the last 50 years, the population of people aged  $\geq 60$  years has increased by 2%, with estimation that the number will increase to 22% by 2050.<sup>1</sup> Older adults are facing many health-related consequences, including twice as many disabilities and four times as many physical limitations as people who are aged  $<60$  years.<sup>2</sup> Therefore, a few modifiable factors, like physical fitness should serve to prevent from future diseases and maintaining independence and quality of life.<sup>3</sup>

Physical fitness is considered one of the most important health markers<sup>4</sup> and a significant predictor of all-cause mortality.<sup>5</sup> Previous evidence has reported that physical fitness includes: 1) body composition, 2) cardiorespiratory, 3) musculoskeletal and 4) motor fitness.<sup>6</sup> All components can be measured through objective methods including laboratory and field-based testing.<sup>7</sup> However, such protocol is not often feasible in population-based studies, due to high costs and time-consumation.

Another potential way to estimate the level of physical fitness comes from self-reported measures. In population-based studies, such measurement can be a cost-and-time effective way to collect the data. Previous studies conducted among youth<sup>7-9</sup>

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and general populations<sup>10–13</sup> has shown conflicting results, where self-reported physical fitness is negatively<sup>8</sup> and positively<sup>7–9,13</sup> associated with objectively measured physical fitness. On the other hand, only a handful of studies have explored the aforementioned associations in adults and older adults.<sup>14–16</sup> Specifically, van Heueven et al<sup>14</sup> showed weak to moderate associations between self-reported items and performance-based tests, where the strongest association was observed between self-report items and physical fitness endurance test. Another study conducted among 108 participants (mean age 53.5±8 years) showed that objectively measured physical fitness assessed with analogous Senior Fitness Test battery was moderately-to-strongly associated with SRFit survey items.<sup>15</sup> In the same study, the participants took approximately 10 mins to complete the SRFit questionnaire,<sup>15</sup> which can be a time-consuming limitation in population-based studies. Another study showed that endurance test had the strongest correlation with self-reported measure, while flexibility and strength test had the lowest correlations.<sup>16</sup> Therefore, a single-item perception may be a potential substitute to determine the level of objectively measured physical fitness. Most recently, a study by Štefan et al<sup>9</sup> used a single-item question among adolescents for perceived physical fitness as follows: “How would you rate your physical fitness?” Ranging from 1 to 10 (higher score denoted better physical fitness). They showed moderate associations between the two measures in boys and girls.<sup>9</sup> By using the same methodology, we hypothesized that a single-item question might be a quicker and equally valid way to perceive physical fitness and it would be positively associated with objectively measured physical fitness.

Therefore, the main purpose of the study was to determine the level of correlation between self-reported and objectively measured physical fitness.

## Materials and Methods

### Study Participants

In this cross-sectional study, we recruited older adults ≥60 years from five neighborhoods in the city of Zagreb. More detailed description of the study methodology, sample size and inclusion criteria are based on previously published data that can be found elsewhere.<sup>17</sup> In brief, we spread the information about the main aims and benefits of the study via posters. We based our sample on 120 older women. All participants had given a written informed consent before entered the study. All procedures performed in this study

were anonymous and according to Declaration of Helsinki, also approved by the Faculty of Kinesiology, University of Zagreb, Croatia (Ethical code number: 2019).

### Estimated Physical Fitness

Senior Fitness Test was used to assess the level of physical fitness,<sup>18</sup> a set of tests aiming to measure different components of motor and functional abilities in older individuals. The test battery is composed of 6 tests as follows: 1) chair stand in 30 sec, 2) arm curl in 30 sec, 3) 2-min step test, 4) chair sit-and-reach test, 5) back scratch test and 6) 8-foot up-and-go test. In addition, we measured waist circumference between the last rib and umbilicus and entered it in the model. More detailed description has been published previously.<sup>18</sup> In addition, we objectively measured height and weight (using Seca portable stadiometer and scale) and asked the participants about their chronological age.

### Self-Reported Physical Fitness

Perceived physical fitness was measured with one item: “How would you rate your physical fitness?” Ranging from 1 (very poor fitness) to 10 (excellent fitness).<sup>9,13</sup> In addition, we explained that their physical fitness included strength, endurance, flexibility and agility abilities. Studies have shown that this measure is significantly correlated with objectively measured physical fitness and perceived well-being.<sup>9,13,19</sup>

### Data Analysis

Data are presented as mean (SD) for normally distributed or median (25–75 interquartile range) for not normally distributed variables. We used Spearman’s coefficient with 95% confidence interval to calculate the associations between self-reported (independent) and objectively measured (dependent) physical fitness. In scatterplot diagrams, the middle line represents the best fit line (coefficient), while the lines below and above represent 95% confidence intervals. First, we calculated associations between self-reported physical fitness and each physical fitness test. To get overall objectively measured physical fitness index, we calculated *z*-scores for each physical fitness test. Then, we summed all *z*-score values. In addition, we calculated age-specific correlations between self-reported and measured physical fitness as follows: (1) 60–65 years, (2) 66–70 years, (3) 71–76 years and (4) >76 years. To check for multicollinearity, we used the variance inflation factor (VIF). The VIF value was <2.5 indicating no multicollinearity between physical fitness tests. Significance was set up at  $p < 0.05$  and it was two-

sided (2-sided). All the analyses were performed in Statistical Package for Social Sciences Software, ver. 22 (IBM Corp., Armonk, NY, USA).

## Results

Basic descriptive statistics of the study participants are presented in Table 1. Our main findings of the associations between self-reported and objectively measured physical fitness are presented in Figures 1 and 2 for the whole sample. Specifically, self-reported physical fitness was significantly and positively correlated with chair stand in 30 sec ( $r=0.39, p<0.001$ ), arm curl in 30 sec ( $r=0.54, p<0.001$ ), 2-min step test ( $r=0.43, p<0.001$ ), chair sit-and-reach test ( $r=0.39, p<0.001$ ), back scratch test ( $r=0.36, p<0.001$ ) and 8-feet up-and-go test ( $r=-0.29, p<0.001$ ). Waist circumference was not significantly correlated with self-reported physical fitness ( $r=0.03, p=0.768$ ). Finally, overall physical fitness was strongly correlated with self-reported physical fitness ( $r=0.63, p<0.001$ ). In addition, for older women aged 60–65 years, self-reported physical fitness was significantly and positively correlated with arm curl in 30 sec ( $r=0.45, p=0.016$ ), chair sit-and-reach test ( $r=0.35, p=0.05$ ), back scratch test ( $r=0.38, p=0.047$ ) and overall physical fitness ( $r=0.47, p=0.013$ ), while no significant correlations with waist circumference ( $r=-0.05, p=0.786$ ), chair stand in 30 sec ( $r=0.27, p=0.160$ ), 2-min step test ( $r=0.26, p=0.188$ ) and 8-feet up-and-go test ( $r=-0.26, p=0.180$ ) were observed. For older women aged 66–70 years, self-reported physical fitness was significantly and positively correlated with chair stand in 30 sec ( $r=0.50, p=0.004$ ), arm curl in 30 sec ( $r=0.72, p<0.001$ ), 2-min step test

( $r=0.45, p=0.010$ ), back scratch test ( $r=0.58, p<0.001$ ), 8-feet up-and-go test ( $r=-0.43, p=0.013$ ) and overall physical fitness ( $r=0.71, p<0.001$ ). No significant correlations between self-reported physical fitness and waist circumference ( $r=-0.12, p=0.527$ ) and chair sit-and-reach test ( $r=0.30, p=0.094$ ). For older women aged 71–76 years, self-reported physical fitness was significantly and positively correlated with arm curl in 30 sec ( $r=0.47, p=0.015$ ), 2 min-step test ( $r=0.41, p=0.039$ ) and overall physical fitness ( $r=0.56, p=0.003$ ), while no significant correlations with waist circumference ( $r=0.20, p=0.315$ ), chair stand in 30 sec ( $r=0.27, p=0.185$ ), back scratch test ( $r=0.33, p=0.095$ ), chair sit-and-reach test ( $r=0.15, p=0.468$ ) and 8-feet up-and-go test ( $r=-0.23, p=0.267$ ) were observed. Finally, in older women aged >76 years, self-reported physical fitness was significantly and positively correlated with chair stand in 30 sec ( $r=0.35, p=0.044$ ), arm curl in 30 sec ( $r=0.37, p=0.029$ ), 2-min step test ( $r=0.40, p=0.020$ ), chair sit-and-reach test ( $r=0.55, p<0.001$ ) and overall physical fitness ( $r=0.66, p<0.001$ ), while no significant correlation with waist circumference ( $r=-0.04, p=0.832$ ), back scratch test ( $r=0.19, p=0.271$ ) and 8-feet up-and-go test ( $r=0.02, p=0.892$ ) were observed.

## Discussion

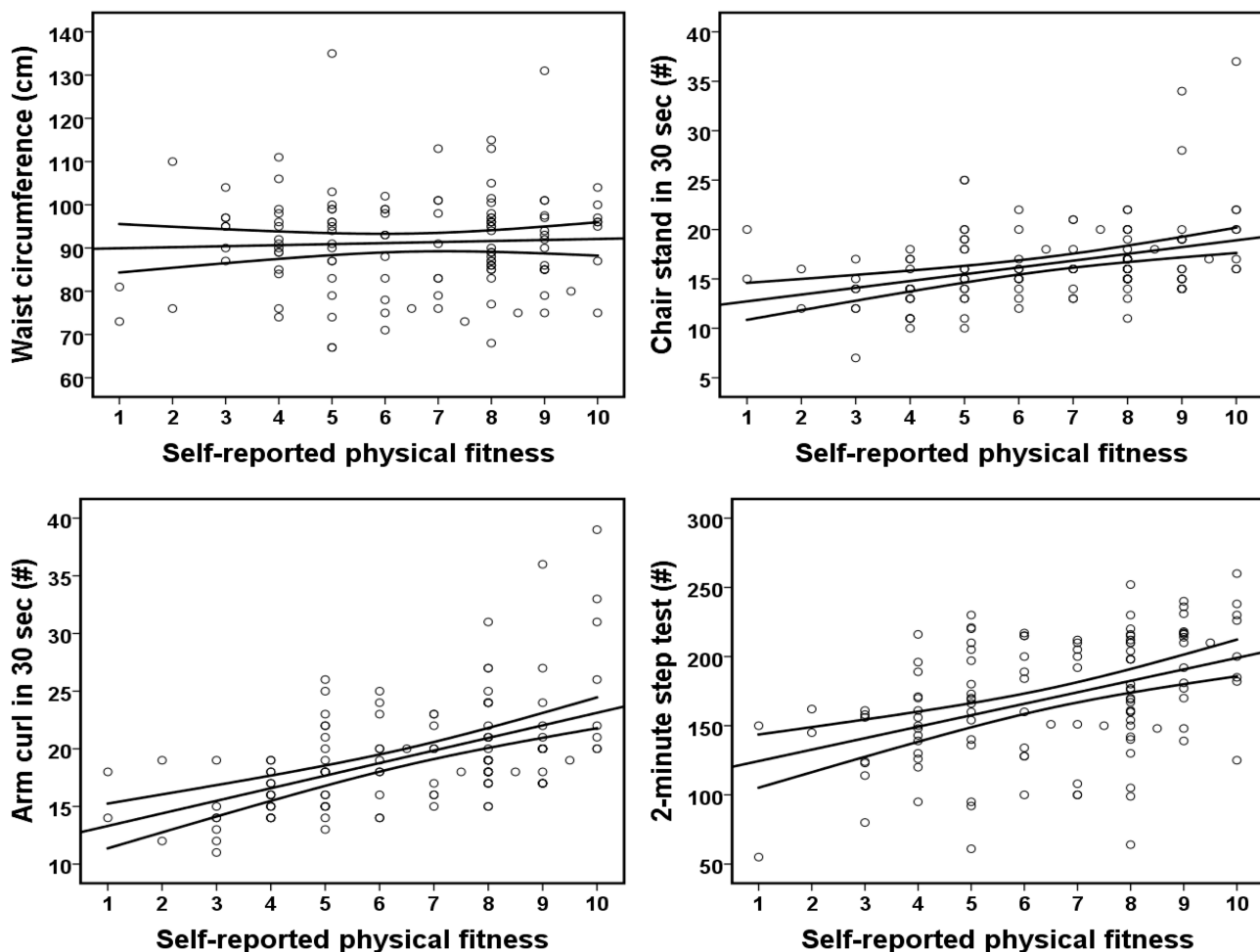
The main purpose of the study was to determine the level of correlation between self-reported and objectively measured physical fitness. Our main findings are: 1) all components of objectively measured physical fitness are weakly to strongly correlated with self-reported physical fitness when observing age-specific correlations and 2) overall physical fitness was moderately to strongly correlated with self-reported physical fitness.

Our associations are stronger compared with one previous study conducted among older adults.<sup>14</sup> Specifically, van Heuvelen et al<sup>14</sup> showed that the mean correlation between objectively measured and self-reported physical fitness was  $r=0.25$  for men and  $r=0.23$  for women, with the strongest correlation between self-reported physical fitness and endurance test. In 2012, a study by Keith et al<sup>15</sup> showed that self-reported measure of physical fitness was associated with upper body strength, lower body strength, upper body flexibility, lower body flexibility, cardiovascular endurance, body-mass index and body fat percentage. On the other hand, a study by Schuler and Marzilli<sup>20</sup> showed that the correlations between self-reported and performance-based physical fitness were weak to moderate ( $r=0.01$  to

**Table 1** Basic Descriptive Statistics of the Study Participants in Older Women (N=120)

Study Variables	Mean $\pm$ SD	Min–Max (Range)
Age (years)	71 $\pm$ 7	60–86 (26)
Height (cm)	159 $\pm$ 21	148–182 (34)
Weight (kg)	70 $\pm$ 13	47–114 (67)
Waist circumference (cm)	91 $\pm$ 12	67–135 (68)
Chair stand in 30 sec <sup>#</sup>	17 $\pm$ 4	7–37 (30)
Arm curl in 30 sec <sup>#</sup>	19 $\pm$ 5	11–39 (28)
2-minute step test <sup>#</sup>	170 $\pm$ 44	55–260 (205)
Chair sit-and-reach test (cm)*	7 (1–11)	–35–24 (59)
Back scratch test (cm)*	0.8 (–8 – 4)	–27–14 (41)
8-feet up-and-go test (sec)	5 $\pm$ 1	4–10 (6)
Overall physical fitness (z-score)*	–1 (–2 – 1)	–8–9 (17)
Self-reported physical fitness (scale 1–10)*	7 (5–8)	1–10 (10)

**Notes:** \*denotes using median (25–75th percentile range), <sup>#</sup>denotes calculating the number of repetitions.



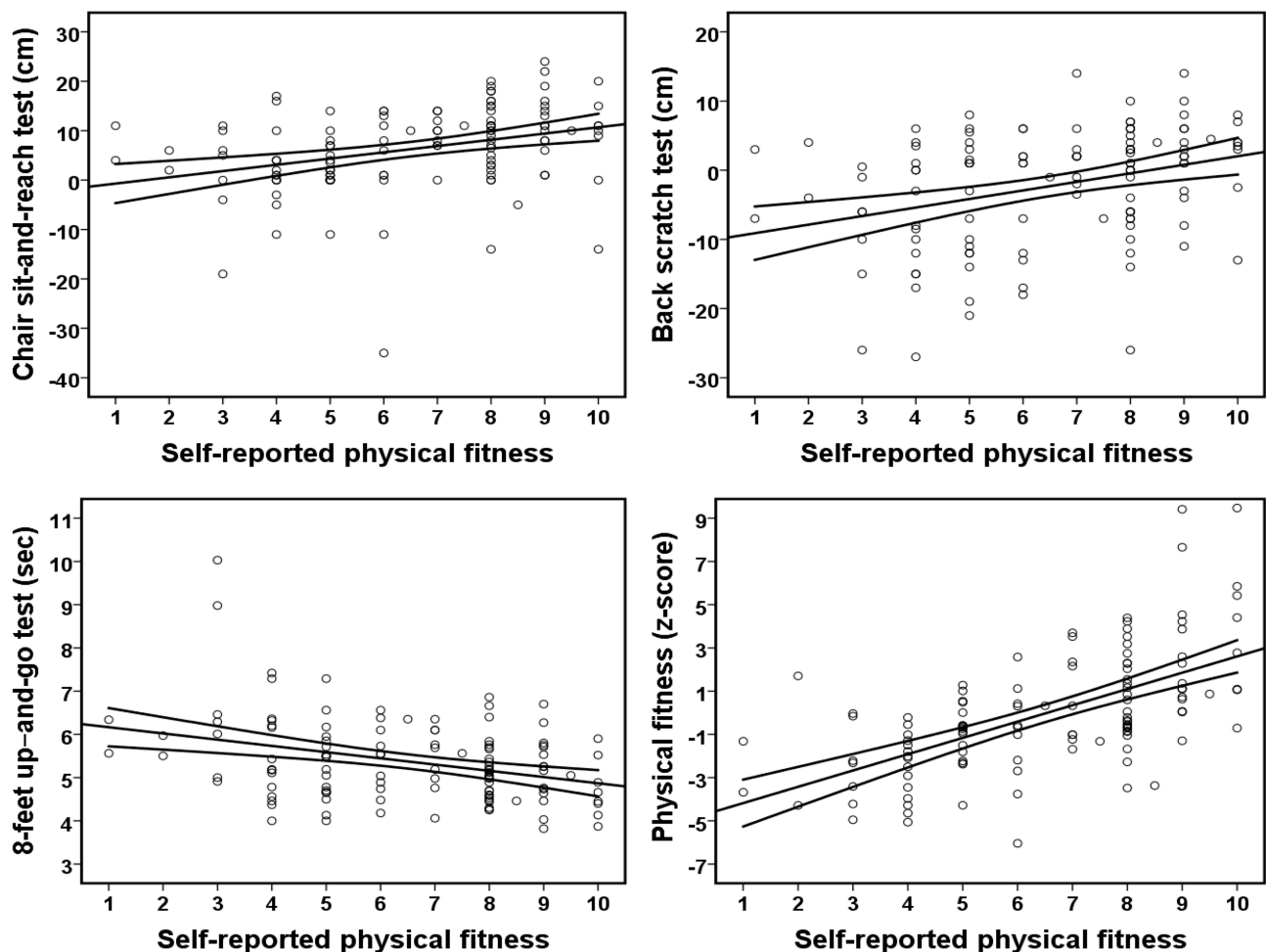
**Figure 1** The associations between self-reported physical fitness and waist circumference, chair stand in 30 sec, arm curl in 30 sec and 2-min step test in older women ( $N=120$ ).

0.30), concluding that self-reports could not be a valid measure to assess objectively measured physical fitness. The discrepancy between the aforementioned and our study came from more heterogeneous sample (56–92 years old<sup>20</sup> vs. 60–86 years old) and size ( $N=72$ ,<sup>20</sup> vs.  $N=120$ ) and different self-reported questions regarding physical fitness. Of note, studies conducted among youth<sup>7–9</sup> and general population<sup>10–13</sup> showed similar findings to ours, where they reported significant correlations between self-reported and objectively measured physical fitness. However, most of them only used cardiorespiratory fitness as a proxy of overall physical fitness,<sup>10–12</sup> and by using other components of physical fitness (ie, body composition, musculoskeletal and motor fitness), the associations might have been different.

The level of physical fitness often declines with aging.<sup>21</sup> As we stated in the “Introduction” section, people aged  $\geq 60$  years can double their disabilities and quadruple physical limitations compared to those aged  $< 60$  years.<sup>2</sup>

Since physical fitness is associated with the risk of falls, which often leads to death in older adults,<sup>22</sup> proper screening of it should be of extreme public health interest. Previous studies have suggested that having a reliable and valid self-reported instrument to assess the level of physical fitness may have a significant practical application in clinical settings.<sup>15</sup> First, health professionals can easily screen for the level of self-reported physical fitness. Moreover, public health experts might be able to track longitudinal changes and associations of physical fitness with other health-related factors.

This study has several limitations. First, by using a cross-sectional design, we cannot conclude the causality of the correlation. Second, although we are proposing the usage of a single-item question to assess the level of physical fitness, it does not capture separate components of objectively measured physical fitness, like the SRFit questionnaire.<sup>15</sup> Third, we based our findings on a relatively small sample of participants ( $N=120$ ), and



**Figure 2** The associations between self-reported physical fitness and chair sit-and-reach test, back scratch test, 8-feet up-and-go test and overall physical fitness in older women (N=120).

larger sample size may provide with somewhat different strength of the association. Fourth, we based our study on a sample living in the urban part of the country, speaking Croatian and only White race. Fifth, we did not collect additional confounding variables, which might have led to different correlations. Sixth, we studied relatively healthy older women and a single-item question might be differently relevant for less healthy older adults. Seventh, our study only included women and by including men, correlations might have been different and we could make the generalizability for both sexes. Eighth, we did not collect more so objective measures of physical fitness (eg, calorimetry) and finally, our statistical analyses including correlations are largely descriptive in nature. Therefore, future studies should explore longitudinal associations between self-reported and objectively measured physical fitness in population-based studies and in different World regions to generate relevant and comparable data.

## Conclusions

In conclusion, our study shows that separate components of objectively measured physical fitness are weakly to strongly correlated with self-reported physical fitness in relatively healthy older women. When all physical fitness tests are combined, overall physical fitness score is strongly correlated with self-reported physical fitness. However, correlations significantly change when using age-specific categories. If self-reported measure is used in health-related settings or population-based studies among older adults, health-related professionals must be aware of different age-specific correlations between self-reported and objectively-measured physical fitness. If applicable, they should be still evaluating objective physical fitness to avoid measurement error.

## Ethical Approval

Institutional Review Board of the Faculty of Kinesiology, University of Zagreb, Croatia (Ethical code number: 2019).

## Data Sharing Statement

All the data can be assessed by reasonable request from the corresponding author.

## Informed Consent

Written.

## Acknowledgments

We would like to thank all the participants for their enthusiastic participation in the study.

## Author Contributions

All authors contributed to data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

## Funding

This paper was self-funded.

## Disclosure

The authors report no conflicts of interest in this work.

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