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Pragmatic evaluation of older adults' physical activity in scale-up studies: Is the single-item measure a reasonable option?

Heather M. Macdonald[1,2], Lindsay Nettlefold[1], Adrian Bauman[3], Joanie Sims-Gould[1,2], Heather A. McKay[1,2]

1 Centre for Hip Health and Mobility, Vancouver Coastal Health Research Centre, 7th Floor Robert H.N. Ho Research Centre, 795-2635 Laurel St, Vancouver, BC V5Z 1M9, Canada

2 Department of Family Practice, University of British Columbia, 3rd Floor David Strangway Building, 5950 University Boulevard, Vancouver, BC V6T 1Z3, Canada

3 Sydney School of Public Health, University of Sydney, Charles Perkins Centre, Building D17, Camperdown, NSW 2006, Australia.

Corresponding author

Prof. Heather A. McKay

795-2635 Laurel St

Vancouver, BC V5Z 1M9, Canada

Tel: 1-604-675-2585

Fax: 1-604-675-2576

heather.mckay@ubc.ca

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Abstract

We assessed convergent validity and responsiveness to change of the single item physical activity measure in adults aged 60 years and older at baseline (n=205) and 6 months (n=177) of Choose to Move, a health promotion program. We used Spearman correlations to examine associations between physical activity as measured by the single item measure and CHAMPS questionnaire at baseline and for 6-month change in all participants, and sex and age (60-74 years, $\geq$ 75 years) subgroups. We used effect size to assess responsiveness to change in physical activity for both tools. Baseline physical activity by the single-item measure correlated moderately with CHAMPS physical activity in all participants, and subgroups. Correlations were weaker for change in physical activity. Effect size for physical activity change was larger for the single-item measure than CHAMPS. The single-item measure is a valid, pragmatic tool for use in intervention and scale-up studies with older adults.

Keywords: self-report questionnaire, scale-up science, intervention trials

Introduction

To achieve population-level health benefits, physical activity interventions that work in controlled settings must be effectively implemented at scale (Milat et al., 2013). While the need for scale-up studies is widely recognized (Milat et al., 2011; Reis et al., 2016), of 400 unique physical activity interventions involving older adults published since 1990, fewer than 2% specifically evaluated scale-up (Gray et al., 2021). Multilevel scale-up studies are complex, rife with methodological challenges and often involve diverse stakeholder groups. Investigators must focus on how effectiveness can be retained during scale-up while adapting implementation processes to context (community or organizational) as a means to sustain feasibility and acceptability. Stakeholders often include government, whose focus is also on cost-effectiveness of intervention delivery (Milat et al., 2013; Nutbeam & Bauman, 2006). Thus, for evaluation of scale-up studies, a pragmatic measurement approach (Gaglio et al., 2014; Glasgow, 2013; Glasgow & Riley, 2013) may be most appropriate. The overall goal remains to generate rigorous results that are relevant to and inform key stakeholders (Glasgow & Chambers, 2012).

Pragmatic physical activity trials need to consider measurement tools that are feasible to use in real-world settings and emphasize setting-specific context and appropriateness (Stange et al., 2012). Criteria for pragmatic measures include reliability and validity, feasibility (i.e., brief, low respondent and staff burden, easy to score and interpret), sensitivity to change, and public health relevance, among others (Estabrooks et al., 2012; Glasgow, 2013; Glasgow & Riley, 2013). Ultimately, "health promotion measures should be as scientifically sound as population-level measurements, be theory-informed, have strong policy implications, and be amenable to change" (Bauman et al., 2006).

Pragmatic evaluation of physical activity most often involves self-report questionnaires, as these are an inexpensive and simple method of collecting data from a large sample. Across the plethora of self-report tools currently used to assess older adults' physical activity, the type of data collected and the way physical activity is classified varies (Falck et al., 2016; Forsen et al., 2010; Sattler et al., 2020; van Poppel et al., 2010). Further, many self-report tools are not appropriate for large scale-up studies as they have substantial respondent burden, need interviewer assistance and lack evidence to support responsiveness (i.e., ability of an instrument to detect change in physical activity over time (Mokkink et al., 2010; Terwee et al., 2010)).

To address these challenges, a number of simple, single-item measures were designed to assess physical activity of specific populations, including older adults (Gill et al., 2012; Grimby et al., 2015; Milton et al., 2013; Portegijs et al., 2017). We highlight the 'single-item measure', a reliable, valid and pragmatic tool developed to assess whether respondents meet current U.K. physical activity guidelines--at least 30 min of moderate-to-vigorous physical activity on five or more days of the week (Milton et al., 2011; Milton et al., 2013). The single-item measure demonstrated acceptable criterion (vs. accelerometry) (Milton et al., 2013; O'Halloran et al., 2020) and concurrent (vs. the Global Physical Activity Questionnaire and UK Active People survey) (Milton et al., 2011) validity in adults. The single-item measure also showed potential to assess change in physical activity, compared with accelerometry over seven days in a sample of 120 adults (O'Halloran et al., 2020). As yet, there is no evidence to support that the single-item measure is a valid and responsive tool to assess change in older adults' physical activity.

We recently reported positive change in health outcomes after we implemented Choose to Move (CTM) - a six-month health promotion program for older adults--at scale across British Columbia, Canada (McKay et al., 2018). We used the single-item measure to assess change in

physical activity in our province-wide cohort (provincial cohort; n=458). In the subset cohort of participants who received the more comprehensive set of measures (comprehensive cohort; n=209), we also administered the Community Health Activities Model Program for Seniors physical activity self-report questionnaire (CHAMPS), originally designed to assess "... the types and intensity levels of physical activity that are meaningful and appropriate for older adults, including lighter (e.g., leisurely walking, water exercises, stretching) as well as more vigorous activities" (Stewart et al., 2001). As we scale-up CTM into more communities across BC, and move towards online data collection, we seek to determine whether the single-item measure is a valid measure of older adults' physical activity.

Therefore, in the current study, we aimed to; i. determine convergent validity of the single-item measure to assess frequency of physical activity in older adults compared with the CHAMPS questionnaire, and ii. assess responsiveness of the single-item measure to detect change in older adults' physical activity.

Methods

Study design and participants

For our analyses, we used data from CTM, a 6-month health promotion program that enhanced older adults' physical activity, mobility and social connectedness (McKay et al., 2018). We describe CTM study design and participant recruitment in more detail elsewhere (McKay et al., 2018). Briefly, CTM adopted key elements of the effective Community Healthy Activities Model Program for Seniors (CHAMPS; choice-based, telephone assisted approach), one of few older adult interventions implemented at scale across diverse communities (Stewart et al., 2006; Stewart et al., 1997). CTM targets low active (< 150 min of moderate to vigorous physical activity (MVPA)/week) and is comprised of three core elements delivered by trained activity

coaches: 1) a 60 min one-on-one consultation with an activity coach to create an individualized Action Plan customized to each participant's interests, ability and access to community-based physical activity resources; 2) four 60-min Motivational Group Meetings; 3) regular telephone check-ins. CTM is not a prescriptive program but rather aims to enhance older adults' overall level of physical activity.

Of 534 participants (from 56 CTM programs delivered across BC between January 2016 and May 2017), 458 consented to participate in the province-wide evaluation (86%) and completed the single-item physical activity questionnaire at baseline. From this provincial cohort, 209 older adults enrolled in CTM programs in proximity to Metro Vancouver also consented to a more comprehensive evaluation that included completing the single-item measure and the CHAMPS questionnaire. We use data from the subset of participants who completed both questionnaires for our analyses (comprehensive cohort). Participants were aged 60 years and older, English speaking and low physically active at baseline (self-reported < 150 min/wk of PA). They had no contra-indications to physical activity participation (Get Active Questionnaire (Canadian Society for Exercise Physiology, 2017) or physician clearance).

The University of British Columbia (UBC) and Simon Fraser University (SFU) Clinical Research Ethics Boards (H15–02522 (UBC) and 22,015 s0614 (SFU)) approved all study procedures. All participants provided informed written consent prior to the start of the study. Data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at UBC (Harris et al., 2019; Harris et al., 2009).

Demographics, anthropometry and mobility

Participants completed a baseline demographic survey which we used to determine age group (60-74 years, ≥ 75 years), sex (male, female), ethnicity, educational attainment (secondary school or less, at least some trade/technical school or college, at least some university), number of chronic diseases (0, 1, ≥2) and self-rated health (very poor, poor, fair, good, excellent). At baseline, we also measured height to the nearest 0.1 cm using a portable stadiometer (Seca Model 214, Hanover MD, USA) and weight to the nearest 0.1 kg using a portable electronic scale (Seca model 840, Hanover MD, USA); we calculated body mass index (BMI, kg/m^2) as weight / $height^2$.

Participants completed two mobility assessments. First, participants self-reported their capacity for mobility as no/any difficulty walking 400m or climbing one flight of stairs (Simonsick et al., 2008). Second, participants completed the Short Performance Physical Battery (SPPB) standardized test that evaluates standing balance, walking speed and timed chair stands (summary score, range 1-12 with scores < 10 indicating presence of mobility limitation) (Guralnik et al., 2000).

Single-item physical activity questionnaire

At baseline and at the six-month follow-up, participants completed the single-item physical activity questionnaire, which asks respondents "In the past week, on how many days have you done a total of 30 minutes or more of physical activity, which was enough to raise your breathing rate? This may include sport, exercise, and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job" (Milton et al., 2011). We obtained a measure of physical activity frequency--the number of days in the last week that participants accumulated 30 minutes or more of physical activity (maximum value of 7).

The single-item questionnaire previously demonstrated strong reproducibility (r_s=0.72-82) in a sample of 480 adults aged 18 to 64 years from England, Scotland and Wales, and modest to weak concurrent validity when compared with the Global Physical Activity Questionnaire (r=0.53) and the UK Active People Survey (r=0.33-0.48) (Milton et al., 2011). In addition, the single-item measure demonstrated acceptable criterion validity when compared against MVPA by accelerometry (r=0.46-0.57) in a sample of 66 adults aged 39 years, on average (Milton et al., 2013).

CHAMPS questionnaire

A trained research assistant administered the CHAMPS questionnaire to participants at baseline and six months. This tool provided physical activity outcome variables (e.g., total activity, MVPA, sedentary time) for the CHAMPS intervention (Stewart et al., 1997) that aimed to increase physical activity levels of community-dwelling older adults. The CHAMPS questionnaire includes 41 items, and asks respondents if they engaged in specific activities over the past four weeks. If so they report the number of times per week (frequency) they did the activity, and the approximate duration (in hours) of participation in a week (Stewart et al., 2001). We applied the CHAMPS scoring algorithms to calculate physical activity frequency (times/week) of *all* exercise-related activities and *moderate* intensity ($\geq$ 3 METs) activities. Unlike the single-item questionnaire, there is no maximum value for the CHAMPS frequency outcomes. In previous studies, the CHAMPS questionnaire demonstrated acceptable measurement properties in older adults including test-retest reliability (over 1 week (Cyarto et al., 2006) and 6 months (Hekler et al., 2012)), and validity (concurrent (Hekler et al., 2012), construct (Stewart et al., 2001) and predictive (Cyarto et al., 2006)).

Statistical analysis

We performed all analyses using Stata v15.1 (StataCorp, College Station, TX USA). We summarize descriptive characteristics of the CTM comprehensive cohort using means and standard deviation for continuous variables and frequency (%) for categorical variables. To assess convergent validity, the extent to which two measures or tools capture a common construct (Basset Jr. & Fitzhugh, 2009; Kelly et al., 2016), we used Spearman's rank correlations. We compared physical activity frequency at baseline from the single-item measure with physical activity frequency from the CHAMPS questionnaire (for all physical activity and moderate physical activity) in the total sample and separately by sex and age group (subgroup analyses). We repeated this analysis for 6-month change in physical activity frequency. We used the following thresholds to interpret the Spearman's rho coefficient: 0–0.20 = poor correlation, 0.21-0.40 = fair correlation, 0.41-0.60 = moderate/acceptable correlation, 0.61-0.80 = substantial correlation, 0.81-1.0 = near perfect correlation (Landis & Koch, 1977). We used the *bootstrap* method in Stata to generate confidence intervals for the Spearman correlations.

To compare responsiveness to change in physical activity between the single-item measure compared with the CHAMPS questionnaire, we determined effect size (Cohen's d) as the mean of individual change scores divided by the pooled standard deviation of the baseline and follow-up scores. We interpreted these effect sizes as: less than 0.20 = trivial, 0.20 to less than 0.50 = small, 0.50 to less than 0.80 = moderate, and 0.80 and greater = large (Cohen, 1988).

Results

At baseline, 204 participants (98%) from the CTM comprehensive cohort had complete single-item and CHAMPS questionnaire data. Participants were mostly women (74%), white (78%) and were living with two or more chronic conditions (49%) (Table 1).

We present median values for physical activity frequency from the single-item and CHAMPS questionnaires at baseline and 6-month follow-up in Table 2. At baseline, physical activity frequency as determined by the single-item measure was moderately associated with frequency of moderate physical activity and all physical activity by the CHAMPS questionnaire (r_s=0.55, p<0.001). We also observed similar moderate correlations at baseline in the subgroup analyses by sex and age group (r_s=0.39-0.55, p<0.01).

For assessment of change in physical activity, we observed significant fair to moderate correlations between 6-month change values by the single-item measure and the CHAMPS questionnaire in all groups (r_s=0.33-0.43, p<0.05), except the $\geq$ 75 years age group. We provide effect sizes for change values from the single-item measure and the CHAMPS questionnaire in Table 3. Responsiveness to change was moderate for the single-item measure (Cohen's d=0.42-0.72), but small for the CHAMPS questionnaire (all physical activity and moderate activity; Cohen's d=0.05-0.48). In subgroup analyses, we observed larger effect sizes for the single-item measure for women and older adults aged 60-74 years.

Discussion

Physical activity researchers are tasked with choosing the most appropriate and robust self-report questionnaire to assess efficacy of physical activity interventions, health benefits of physical activity or age-related trajectories in physical activity. This task becomes more challenging as interventions are implemented and evaluated at scale. We extend the current literature by demonstrating that a pragmatic, single-item measure can assess physical activity and change in physical activity in large intervention trials with older adults. The need for a

parsimonious tool escalates as scale-up proceeds or for remote data collection, when it may no longer be feasible to administer long, often burdensome, questionnaires.

Convergent validity of the single-item measure

We build upon previous studies that examined measurement properties of the single-item measure (Milton et al., 2011; Milton et al., 2013; O'Halloran et al., 2020; Wanner et al., 2014). We demonstrated acceptable convergent validity of the single-item measure compared against the CHAMPS questionnaire in the CTM comprehensive cohort. Correlations between measures were weak to moderate, but were similar to those reported in studies of concurrent (compared with the GPAQ) (Milton et al., 2011) and criterion (compared with accelerometry) (Milton et al., 2013; O'Halloran et al., 2020; Wanner et al., 2014) validity of the single-item measure. We note key differences between the single-item measure and CHAMPS questionnaire that likely precluded stronger associations at the baseline assessment. First, participants were asked to recall their physical activity over different time frames; the past week for the single-item measure and the past four weeks for the CHAMPS questionnaire. Second, the single-item measure excluded housework and occupational physical activity whereas the CHAMPS questionnaire captures physical activity across these domains. Third, participants may not have considered incidental physical activity (e.g., walking and stair climbing) in addition to purposeful activity when completing the single-item tool. If so, participants would have underreported their physical activity, particularly shorter bouts. In previous validation studies, the single-item measure demonstrated stronger agreement with accelerometer-derived MVPA when activity bouts were $\geq$ 10 mins (Milton et al., 2013; O'Halloran et al., 2020). In contrast, participants may have overestimated their MVPA on the CHAMPS questionnaire, particularly when reporting time spent in gardening and household activities (Hekler et al., 2012). Fourth and finally, whereas the

single-item measure asks respondents about the number of days they participated in a total of 30 minutes or more of physical activity, the CHAMPS questionnaire does not set a limit on the duration of physical activity and frequency of physical activity is recorded in number of sessions, not number of days per week. Measurement error may therefore be higher with the CHAMPS questionnaire if respondents have difficulty recalling the number of individual sessions of physical activity (Reeves et al., 2010).

There are many considerations when choosing an appropriate questionnaire to assess physical activity of older adults--especially if there are plans to scale-up the intervention in future. The time commitment to complete the CHAMPS questionnaire—added on to time required to complete other measures--can be burdensome for some older adults (Cyarto et al., 2006). In our study, participants required 15-30 minutes to complete the interviewer-administered CHAMPS questionnaire and less than one minute to complete the single-item measure at baseline and follow-up; interviewer assistance was not required for the single-item measure. Thus, it was feasible for us to assess both the larger CTM provincial cohort and the comprehensive cohort using the single-item measure. As we scale-up CTM across BC in four phases [2016-2021] and adapt CTM for the home environment in response to COVID-19 [March 2020], the single-item questionnaire also provides a feasible online measurement option.

Responsiveness of the single-item measure to change in physical activity

It is imperative that physical activity questionnaires be responsive to change in physical activity behaviours (Sattler et al., 2020; Terwee et al., 2010), to monitor changes that accompany aging or to assess change in response to an intervention. This is particularly important for broad reaching scale-up studies that may result in modest--but clinically meaningful--behaviour change

(Reeves et al., 2010). Yet despite the many self-report tools (Sattler et al., 2020), only one previous study examined responsiveness to change for a self-report physical activity questionnaire with older adults (Vandelanotte et al., 2019). The Active Australia Survey (Vandelanotte et al., 2019) found significant but weak correlations (r_s=0.2 for moderate and vigorous PA and MVPA) between 3-month change in physical activity as measured by the 8-item Active Australia Survey and accelerometry (7-day wear protocol) in older adults who participated in the Walk 2.0 trial (Kolt et al., 2017; Vandelanotte et al., 2017). O'Halloran and colleagues reported stronger correlations (r=0.36-0.40) between 7-day change in physical activity as detected by the single-item measure and accelerometry in 120 adults (O'Halloran et al., 2020). In this same cohort, effect sizes also indicated moderate to high responsiveness to change for the single-item measure--comparable to change in MVPA detected by accelerometry. The single-item measure seems a reasonable option for physical activity assessment when it may not be feasible to use objective monitoring devices.

Similarly, our results confirm the single-item measure is responsive to intervention-related changes in older adults' physical activity. Effect sizes were similar to those reported by O'Halloran and colleagues (O'Halloran et al., 2020). However, we note that effect sizes were smaller among men and older adults aged 75 years and older; both were underrepresented in our cohort. We also note that effect sizes were larger for the single-item measure as compared with the CHAMPS questionnaire (all physical activity and moderate physical activity). This finding aligns with results of our initial CTM analysis in that the single-item measure detected a significant change in physical activity among participants in our comprehensive cohort aged 75 years and older after 3 months of intervention whereas the CHAMPS questionnaire did not detect a similar significant change after 3 months (McKay et al., 2018).

While a larger effect size for the single-item measure may indicate greater responsiveness as compared with the longer, more complex CHAMPS questionnaire, we also acknowledge the limitations associated with using effect size in this context. Specifically, differences in the response scale of the two tools (8-point Likert scale for the single-item measure vs. open-ended response variable for the CHAMPS) likely contributed to greater variability in the CHAMPS scores. Since effect size is highly dependent on the standard deviation, some argue it is a more appropriate measure of magnitude of change scores rather than validity of change scores (i.e., responsiveness) (Mokkink et al., 2010; Terwee et al., 2010). Future studies would benefit from establishing objectives related to responsiveness *a priori* and formulating hypotheses regarding expected relationships between change in physical activity as determined using the single-item measure and other self-report physical activity questionnaires.

To our knowledge, CTM is the first study to use the single-item measure to evaluate response to a physical activity intervention specifically for older adults. In contrast, several intervention studies (in addition to the original CHAMPS trial) used the CHAMPS questionnaire to assess changes in older adults' physical activity (King et al., 2008; Pahor et al., 2014; Stewart et al., 2001; Zubala et al., 2017). We acknowledge that the CHAMPS questionnaire provides additional physical activity outcomes such as energy expenditure, which may be of interest in intervention trials. However, in larger scale-up studies a simple, pragmatic measure of overall physical activity may be more relevant to stakeholders and facilitate knowledge translation (Glasgow, 2013).

Limitations

We note several limitations of our study. First, we recruited participants from the Metro Vancouver area and therefore, our sample may not represent the wider population of older adults

in BC and across Canada. Second, men and older adults ≥ 75 years were underrepresented in our cohort as were participants of non-white ethnicity and low socioeconomic status; this limits generalizability of our findings. We acknowledge that assessing validity and responsiveness is dependent on continued study of a particular instrument in different contexts. Thus, we urge that validation and responsiveness studies of the single-item measure with other populations, in the context of other interventions and compared with other physical activity instruments, be conducted. Third, while the single-item measure provides a valid measure of physical activity frequency, we acknowledge this tool does not capture other physical activity behaviours that may be of interest in pragmatic health promotion trials including physical activity duration, intensity, type and domain (Bauman et al., 2006). In particular, the single-item tool may not be sensitive enough to detect small, but meaningful, changes in light physical activity or MVPA in response to a physical activity intervention (Hupin et al., 2015; Sparling et al., 2015; Stewart et al., 2001). Finally, we did not objectively measure physical activity levels of CTM participants and could therefore not compare the single-item measure to MVPA as determined by accelerometry. A criterion standard of physical activity measurement does not currently exist (Ainsworth et al., 2003; Bauman et al., 2006), yet accelerometers are often used as the gold standard in validation studies.

Conclusion

We profess a need for a short, valid, responsive, pragmatic measure of physical activity such as the single-item measure. This is especially true as physical activity intervention trials are implemented at larger and larger scale and in environmental contexts (e.g., remote geographies; COVID-19) where in-person measures are not possible. The single-item measure is central to our evaluation as a valid self-report tool that is responsive to change in older adults' physical

activity, and can be easily administered in a variety of data collection settings, including online. As physical activity researchers are encouraged to scale-up interventions capable of having lasting positive effects at the population level (Reis et al., 2016), pragmatic tools such as the single-item measure could be used more widely in future.

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Table 1. Descriptive characteristics of the Choose to Move comprehensive cohort. Values are n (%) or mean (SD).

	Total sample (n=204)	**Women (n=151)**	**Men (n=53)**
Age category			
60-74 years	150 (74)	113 (75)	37 (70)
≥75 years	54 (26)	38 (25)	16 (30)
BMI (kg/m^2)*	30.1 (6.4)	30.4 (7.2)	29.6 (3.9)
Ethnicity (n)			
Asian	28 (14)	22 (15)	6 (11)
White	159 (78)	120 (79)	39 (74)
Other	17 (8)	9 (6)	8 (15)
Educational attainment (n)			
Secondary or less	41 (20)	34 (23)	7 (13)
Some trade, technical school or college	66 (32)	47 (31)	19 (36)
Some university	97 (48)	70 (46)	27 (51)
Chronic conditions (n)			
0	23 (11)	16 (11)	7 (13)
1	82 (40)	65 (43)	17 (32)
≥2	99 (49)	70 (46)	29 (55)
Mobility limitations (walk or stair), n (%)			
Yes	92 (45)	74 (49)	18 (34)
No	112 (55)	77 (51)	35 (66)
SPPB score, n (%)**			
< 10	63 (32)	49 (33)	14 (27)
≥10	137 (69)	99 (67)	38 (73)
Self-rated health, n (%)			
Very poor, poor or fair for age	105 (51)	74 (49)	31 (58)
Good or excellent for age	99 (49)	77 (51)	22 (42)

BMI: body mass index; *n=190; 139 women, 51 men; **n=200; 148 women, 52 men

Table 2. Median scores (interquartile range) on the single-item measure and CHAMPS questionnaire (moderate physical activity (PA) and all PA) at baseline and for 6-month change in the Choose to Move comprehensive cohort and Spearman's correlation between baseline and 6-month change scores.

Sample	n	Single-item Median (IQR)	CHAMPS moderate PA Median (IQR)	CHAMPS all PA Median (IQR)	Spearman's rho coefficient (95% CI) – single item vs. CHAMPS moderate PA	p value	Spearman's rho coefficient (95% CI) – single item vs. CHAMPS all PA	p value
Baseline								
Total	204	2 (1, 3)	3 (0, 7)	13 (8, 21)	0.55 (0.45, 0.65)	<0.001	0.55 (0.46, 0.64)	<0.001
Women	151	2 (0, 3)	3 (0, 6)	12 (7, 21)	0.53 (0.40, 0.66)	<0.001	0.55 (0.44, 0.66)	<0.001
Men	53	3 (2, 4)	6 (1, 10)	16 (9, 22)	0.46 (0.21, 0.70)	<0.001	0.50 (0.28, 0.73)	<0.001
60-74 y	150	2 (0, 3)	3 (0, 6)	12 (7, 19)	0.55 (0.42, 0.67)	<0.001	0.53 (0.41, 0.65)	<0.001
>= 75 y	54	3 (1, 4)	5 (2, 8)	18 (9, 25)	0.39 (0.13, 0.66)	0.004	0.44 (0.20, 0.68)	<0.001
SPPB < 10	63	2 (0, 3)	1 (0, 6)	11 (6, 19)	0.55 (0.36, 0.73)	<0.001	0.58 (0.43, 0.74)	<0.001
SPPB $\geq$ 10	137	2 (1, 3)	4 (1, 8)	14 (9, 21)	0.56 (0.44, 0.68)	<0.001	0.53 (0.41, 0.65)	<0.001
Mobility limitation	92	2 (0, 3)	1 (0, 6)	11 (6, 19)	0.52 (0.35, 0.67)	<0.001	0.55 (0.42, 0.68)	<0.001
No mobility limitation	112	2 (1, 3)	4 (1, 9)	15 (9, 23)	0.58 (0.45, 0.72)	<0.001	0.54 (0.41, 0.67)	<0.001
6-month Change								
Total	177	1 (0, 2)	1 (0, 5)	4 (-2, 10)	0.39 (0.25, 0.52)	<0.001	0.35 (0.21, 0.49)	<0.001
Women	127	1 (0, 2)	1 (0, 4)	4 (-1, 9)	0.40 (0.25, 0.55)	<0.001	0.35 (0.18, 0.51)	<0.001
Men	50	1 (0, 2)	1 (-1, 5)	4 (-8, 12)	0.35 (0.09, 0.62)	0.010	0.33 (0.07, 0.59)	0.013
60-74 y	133	1 (0, 3)	2 (0, 5)	5 (-1, 11)	0.41 (0.25, 0.57)	<0.001	0.43 (0.28, 0.58)	<0.001

>= 75 y	50	1 (0, 2)	0 (-1, 3)	1 (-7, 8)	0.27 (-0.03, 0.57)	0.077	0.08 (-0.22, 0.37)	0.608
SPPB < 10	53	1 (0, 2)	1 (0, 3)	1 (-2, 8)	0.31 (0.06, 0.55)	0.016	0.42 (0.21, 0.62)	<0.001
SPPB $\geq$ 10	120	1 (0, 2)	1 (-1, 5)	5 (-2, 10)	0.42 (0.26, 0.59)	<0.001	0.34 (0.16, 0.51)	<0.001
Mobility limitation	79	1 (0, 3)	1 (0, 4)	3 (-2, 11)	0.19 (-0.03, 0.42)	0.087	0.22 (0.01, 0.43)	0.039
No Mobility limitation	98	1 (0, 2)	2 (-1, 5)	4 (-2, 9)	0.51 (0.34, 0.68)	<0.001	0.45 (0.28, 0.63)	<0.001

Table 3. Responsiveness to change in physical activity of the single-item measure and the CHAMPS questionnaire (moderate physical activity (PA) and all PA) for participants in the Choose to Move comprehensive cohort as determined during effect size (Cohen's d, 95% confidence interval).

		Single-item measure	**CHAMPS – moderate PA**	**CHAMPS – all PA**
Sample	**n**	**Cohen's d (95% CI)**	**Cohen's d (95% CI)**	**Cohen's d (95% CI)**
Total	177	0.59 (0.38, 0.81)	0.34 (0.13, 0.55)	0.36 (0.16, 0.58)
Women	127	0.70 (0.45, 0.95)	0.40 (0.15, 0.65)	0.41 (0.16, 0.66)
Men	50	0.42 (0.03, 0.81)	0.21 (-0.19, 0.60)	0.34 (-0.05, 0.74)
60-74 y	133	0.72 (0.47, 0.97)	0.41 (0.16, 0.66)	0.48 (0.23, 0.73)
>= 75 y	50	0.35 (-0.05, 0.75)	0.11 (-0.29, 0.52)	0.05 (-0.36, 0.45)
SPPB < 10	53	0.67 (0.27, 1.06)	0.33 (-0.05, 0.72)	0.33 (-0.06, 0.71)
SPPB $\geq$ 10	120	0.59 (0.34, 0.85)	0.35 (0.09, 0.60)	0.38 (0.12, 0.63)
Mobility limitation	79	0.72 (0.40, 1.04)	0.34 (0.02, 0.65)	0.40 (0.08, 0.71)
No Mobility limitation	98	0.53 (0.24, 0.81)	0.36 (0.08, 0.64)	0.34 (0.05, 0.62)