Discriminative Validity of the Core Outcome Set Physical Self-Sufficiency in a Population of Older Adults

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"ONDERGETEKENDE

Yvonne Johanna Constantina Dockx,

bevestigt hierbij dat de onderhavige verhandeling mag worden geraadpleegd en vrij mag worden gefotokopieerd. Bij het citeren moet steeds de titel en de auteur van de verhandeling worden vermeld."

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ABSTRACT

Aim To assess the discriminative validity of the Core Outcome Set Physical Self-Sufficiency (PSS) in a population of Dutch older adults (≥ 65 years) with different levels of PSS. Secondary objective was to assess to what extent the domains 'coping', 'empowerment' and 'health literacy' contribute to the Core Outcome Set PSS in addition to the domain 'physical capacity' in a population of Dutch older adults.

Methods This validation study had a cross-sectional design. A population of 200 community-dwelling older adults and older adults recruited in residential care facilities were evaluated by the Core Outcome Set PSS and a reference variable for PSS. The Core Outcome Set PSS contains measurements on the four domains of PSS: physical capacity, coping, empowerment and health literacy. Because no gold standard for PSS exists, a proxy indicator was used: group membership based on help needed in (instrumental) activities of daily living ((i)ADL) and living situation, resulting in three groups. Ordinal logistic regression was used with main outcome prediction accuracy of the Core Outcome Set PSS on the proxy indicator for PSS.

Results The model based on the Core Outcome Set PSS had an overall prediction accuracy of 68 percent. For older adults living at home and depending on help in (i)ADL, prediction accuracy was 58 percent. Only physical capacity measured with Short Physical Performance Battery was significantly associated with group membership. Adding health literacy with coping or empowerment to a model with physical capacity improved the model significantly ($p<0.01$).

Conclusion Physical Self-Sufficiency can be measured with the Core Outcome Set PSS. Discriminative validity of the Core Outcome Set PSS is moderate. A model including physical capacity, health literacy and coping seems to be optimal, based on the current composition of measurement instruments.

Clinical Relevance It is recommended to remove the measurement of empowerment from the Core Outcome Set PSS. Furthermore, other factors, like environmental aspects, seem to be important to incorporate before using the Core Outcome Set PSS in further research or in clinical practice.

Keywords: Physical Self-Sufficiency, Core Outcome Set, elderly, validity

INTRODUCTION

One of the goals of the current healthcare system is to facilitate self-sufficiency and independent living as long as possible.[1] Therefore, the focus in care for older adults is switching from treatment of impairments to early detection of problems and maintaining a certain level of self-sufficiency.[2,3] This enables older adults to keep participating in activities of daily living.[2] At this moment, approximately 50 percent of older adults in Europe experience problems in physical functioning.[4] In the near future, this percentage will increase due to demographic and lifestyle factors.[5] When physical limitations increase, participating in activities of daily living becomes harder and living in the own home environment becomes challenging.[6] Problems in physical functioning potentially cause diminished self-sufficiency and reduced quality of life. Moreover, it will lead to increasing costs in healthcare.[1,7]

An important part of self-sufficiency is the physical aspect. Physical self-sufficiency (PSS) is defined as the ability of people to function physically safe and independent from another person, within their own context (Molenaar et al. 2019, in preparation). In addition to physical capacity, the domains coping, empowerment and health literacy also are related to the ability to function physically safe and independent (Molenaar et al. 2019, in preparation). Therefore, PSS should be seen as an interaction between physical capacity, coping, empowerment and health literacy and is influenced by one's context, including their home environment, social environment and neighbourhood.

To objectify PSS, a Core Outcome Set has been developed for a population of older adults (Molenaar et al. 2019, in progress). This Core Outcome Set theoretically comprises each of the domains of PSS and is designed to assist professionals in identifying, monitoring and supporting older adults who have (or are at risk for) limitations in PSS. To enable professionals to use the Core Outcome Set PSS in clinical practice, the performance of this set needs to be assessed.[8] In order to identify and monitor older adults with limitations in PSS, the Core Outcome Set must be able to discriminate between older adults with different levels of PSS. Therefore, the primary objective of this study was to assess the discriminative validity of the Core Outcome Set Physical Self-Sufficiency in a population of Dutch older adults (≥ 65 years of age) with different levels of physical self-sufficiency. Because no gold standard exists for the assessment of PSS that could be used to validate the newly developed Core Outcome Set, the level of PSS was determined by whether older adults live independently without help, independently with help, or in a residential care facility. There is ample evidence for the relationship between physical capacity and independent functioning.[9] However, little is known regarding the interaction of all domains of PSS on independent functioning. The secondary objective was to assess to what extent the domains 'coping', 'empowerment' and 'health literacy' contribute to the Core Outcome Set Physical Self-Sufficiency in addition to the domain 'physical capacity' in a population of Dutch older adults (≥ 65 years of age).

METHODS

Study Design

This study was a cross-sectional validation study.

Population

Participants were community-dwelling older adults as well as older adults, living in residential care facilities in the Netherlands. Data were collected from February until May 2019. Identification of eligible older adults was done by district nurses and physiotherapists. Also, recruitment took place by inviting older adults to participate through local newspapers and social media. Older adults could be included if they were 65 years or over and were able to understand verbal and written instructions in Dutch. Older adults with severe cognitive impairments which hindered completing the questionnaires, were excluded.

Study procedure

Older adults were asked to come to a local test location or were offered a home visit to complete the measurements consisting of physical examinations and questionnaires. After giving written informed consent, they were guided through the approximately 60-minute test-procedure. Physical examinations were conducted by trained researchers and students with different (clinical) expertise and background, for example physiotherapy, occupational therapy and human movement sciences. Participants could complete the questionnaires themselves but were offered help from a member of the research team when needed. The test-procedure included (1) the measurements of the Core Outcome Set PSS, (2) measurement of a reference variable to validate the Core Outcome Set, and (3) a general questionnaire for demographic characteristics. The following section contains a description of the Core Outcome Set and the reference variable.

(1) Core Outcome Set Physical Self-sufficiency

The Core Outcome Set PSS includes tools representing the four domains of PSS: physical capacity, coping, empowerment and health literacy. In the development process of this Core Outcome Set PSS, recommendations from the Guideline for Selecting Outcome Measurement Instruments for Outcomes included in a Core Outcome Set were followed.[10] The choice of specific measurement tools was determined by clinimetric properties of existing instruments representing the domains, their usability in the home-environment, availability in Dutch and multiple consensus meetings of the research group. Adjustments were made after pilot testing, based on the experiences of the researchers and the older adults who were tested.

The Core Outcome Set PSS contains four domains:

Physical capacity

Physical capacity was defined as the composite of all the physical capacities a person can draw on (generally described in terms of body system functions such as strength, balance).[11] Physical capacity was measured by four physical tests. The *Short Physical Performance Battery* (SPPB) is recommended to assess physical capacity in older adults.[12,13] The SPPB consists of three subscales: balance, gait speed and lower extremity strength.[12,13] To test static balance more extensively, the *Frailty and Injuries Cooperative Studies of Intervention Techniques (FICSIT-study)* measurement instrument FICSIT-4 was added to the SPPB. It measures the ability to maintain balance over a diminishing base of support.[14] Because dynamic balance during walking is also an important component of physical capacity,[15] the *Timed Up and Go test (TUG)* was added to the measurements. The TUG measures the time needed to stand up from a chair, walk three meters, turn, walk back and sit down. Furthermore, hand grip strength was measured three times for each hand with a *JAMAR hand-held dynamometer*, because this reflects overall muscle strength.[16] The maximum value in kilograms was administered.[17]

Coping

For coping the *COFLEX questionnaire* was used, based on the following definition of the domain: Ability of the individual to use both assimilative and accommodative coping strategies to deal with stressors in different situations (versatility and reflective coping).[18] This results in two scores, one for each aspect.

Empowerment

Empowerment was seen as the discovery and development of one's inherent capacity to be responsible for one's own life.[19] People are empowered when they have sufficient knowledge to make rational decisions, sufficient control and resources to implement their decisions, and sufficient experience to evaluate the effectiveness of their decisions.[19] The *Patient Activation Measure (PAM)* is recommended to measure the concept of empowerment.[20] The PAM-13 consists of thirteen statements on a four-point Likert scale and results in four levels of patient activation.[21]

Health literacy

Health literacy was defined as people's knowledge, motivation and competences to access, understand, appraise and apply health information.[22] This enables them to make judgements and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course. The *Newest Vital Sign (NVS-D)* is a six-question tool to assess one's level of health literacy by determining an individual's ability to find and interpret information on an ice-cream nutrition label.[23]

Clinimetric properties of the included measurement instruments are described in table 1.

Table 1: Clinimetric properties Core Outcome Set Physical Self-Sufficiency

Domain	Instrument	Target population	Clinimetric properties
Physical capacity	SPPB	Older adults[12]	Predictive for developing disability and identifies subgroups who have high and low risk of disability (AUC .75).[12,24] Cut-off points are scores of four and nine.[25] Good intrarater reliability (ICC .88 - .92) and high construct and concurrent validity.[12]
	FICSIT-4	Older adults[14]	Moderate to good reliability (Interclass Pearson correlations .25 to .74).[14] Good concurrent validity.[14]
	TUG	People with hip and knee osteoarthritis, patients with stroke and older adults with dementia[26,27]	Good reliability (ICC .75 to .99).[26,27] Good construct and convergent validity.[26,28] The cut-off point for independent walking is 20 seconds.[29] When it is impossible to complete the TUG, a fictive score of 240 seconds is registered.[29]
	JAMAR	General population and community-dwelling older adults[30,31]	Excellent intra- and interrater reliability (ICC .98 and .94).[30] Good test-retest reliability (ICC .91 for right and .95 for left hand).[31] MCID is 6.5 kilogram.[32]
Coping	COFLEX	Patients with chronic reumatoïd arthritis[18]	Acceptable internal consistency (Crohnbach's α of respectively .88 and .70 for the subscales).[18] Construct validity good for the versatility scale.[18]
Empowerment	PAM-13	Older adults and older adults with multimorbidity	Good internal consistency (Crohnbach's α of .88).[21,33] Good construct validity.[33,34]
Health literacy	NVS-D	Older adults	Good internal consistency (Chronbach's α of .76).[23] Cut-off point between adequate and inadequate health literacy is a score of four or more.[23]

SPPB = Short Physical Performance Battery; FICSIT = Frailty and Injuries Cooperative Studies of Intervention Techniques; TUG = Timed Up and Go test; COFLEX = Coping Flexibility questionnaire; PAM = Patient Activation Measure; NVS-D = Dutch Newest Vital Sign; AUC = Area Under the Curve; ICC = Intraclass Correlation Coefficient; MCID = Minimal Clinically Important Difference

(2) Reference Variable

To validate the Core Outcome Set PSS a reference variable was used. Because no gold standard for PSS exists, a proxy indicator was composed based on two conditions. First, the definition of PSS includes 'independent from another person', so help needed in (instrumental) activities of daily living ((i)ADL) was included in the proxy indicator. This was determined based on the *Groningen Activity Restriction Scale (GARS-3)*, since GARS-3 showed adequate discriminative validity in a population of older adults.[35] This eighteen item questionnaire gives an indication of disabilities in the domains of personal care and domestic activities by registering if a person can do activities in three categories: with no effort (score one), with effort (score two) or only with help of others (score three).[35] When people score three on one or more of the items, they need some kind of help with personal care or domestic activities.

Second, as the definition of PSS includes 'functioning physically safe, within the own context', *living situation* was part of the proxy indicator. A difference was expected in level of PSS between people living independently and people living in a residential care facility. The main reason for admission to a residential care facility is the presence of substantial limitations in activities of daily living.[1] These are influenced by multi-morbidity, physical impairments, a low

sense of self-management, and diminished social support.[1] A substantial part of this influencing factors is related to the concept of PSS.

This combination of help needed in (i)ADL and living situation results in three levels of (impairments in) PSS. These are described in figure 1.

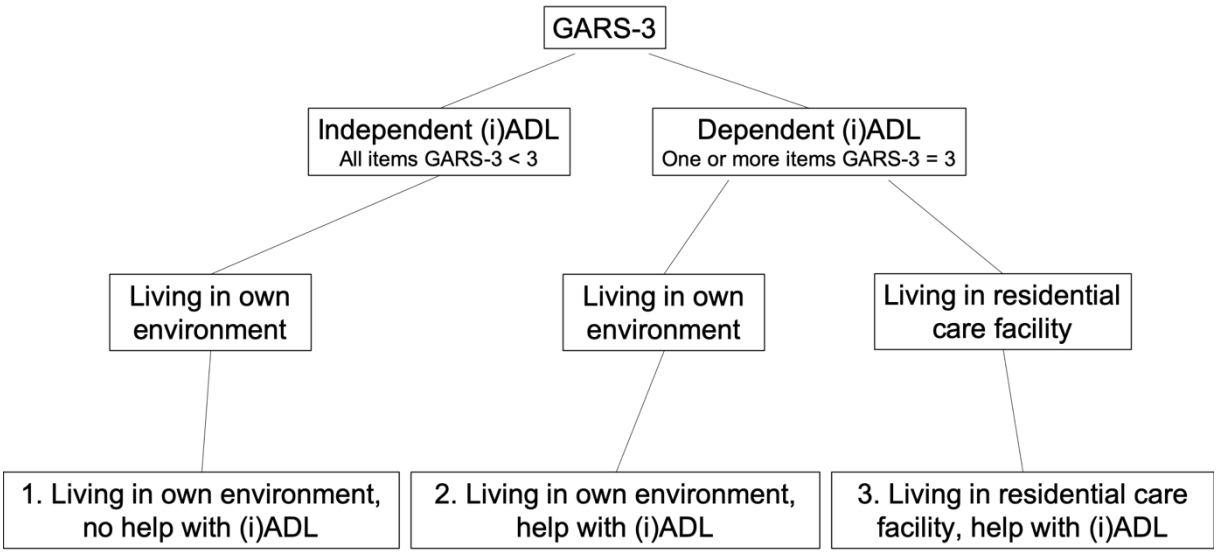

Figure 1: Operationalization of proxy indicator for (impairments in) PSS, based on the combination of GARS-3 and living situation
GARS-3 = Groningen Activity Restriction Scale, (i)ADL = (instrumental) Activities of Daily Living

Statistical analyses

Descriptive statistical analyses were conducted on participant's age, gender, educational level, presence of morbidities and type of residence. Demographic characteristics and scores on the Core Outcome Set were calculated by mean and standard deviation or median and interquartile range for continuous variables and proportions for categorical variables. Differences between groups were calculated by One-way ANOVA for normally distributed continuous variables, Kruskal-Wallis for not normally distributed variables and Chi-square test for categorical variables.

To determine discriminative validity of the Core Outcome Set PSS, reflected by the ability of the Core Outcome Set to predict the level of PSS for three different subgroups, ordinal logistic regression was performed. First, the assumptions for logistic regression were tested. After that a model was built with group membership as dependent variable. All scores of the Core Outcome Set PSS were entered as predictor variables in the ordinal regression model using 'forced entry terms'. Based on the rule of thumb of ten events per variable (EVP) for logistic regression analysis and eight included variables, a sample size of a minimum of 80 people in each group was optimal.[36]

To meet the second objective of the study, likelihood statistics of subsequently a null-model, a model with only physical capacity and models with physical capacity and respectively (combinations of) coping, empowerment or health literacy were tested for improvement of the model using a likelihood ratio (LR) test (X^2 test). P-value <0.05 was considered significant.

When missing values occurred in the dependent or one of the predictor variables, these cases were excluded from the analysis.

Statistical analyses were performed using IBM Statistical Package for the Social Sciences (SPSS, version 24,0 Armork, New York, USA).

Ethics

The study protocol was approved by the Research Ethics Committee of Utrecht University of Applied Sciences (reference number 85_000_2019). No person identifying data was incorporated in the dataset.

RESULTS

Population

In total 200 older adults were recruited to participate in this study. Eight persons were excluded because of severe cognitive impairments. One person living independently, did not complete the GARS questionnaire and therefore, could not be included in one of the groups. Thirteen older adults had missing values on predictor variables and were excluded from the analyses. Finally, a total of 178 persons were included for analyses. Demographic characteristics are presented in table 2. Sixty-six persons lived independently without help in activities of daily living. In the second group, independently living older adults who were dependent on help in at least some daily activities, sixty-nine persons were included. Forty-three older adults living in a residential care facility became the third group. Mean age was 80.2 years. Age significantly differed between the three groups. Independently living people without help had significantly fewer medical conditions, compared to the other groups. Gender and educational level did not differ between groups.

Table 2 Demographic characteriscics

Participant Characteristics	Total n=178		Independent living No help with (i)ADL n=66		Independent living Help with (i)ADL n=69		Living in residential care facility n=43	
Age in years at study participation (mean, sd)	80.19 (8.05)		76.50 (6.40)*		80.77 (7.30)*		84.93 (8.85)*	
Gender (n, %)								
male	72	40.4%	32	48.5%	26	37.7%	14	32.6%
female	106	59.6%	34	51.5%	43	62.3%	29	67.4%
Educational level (n,%)								
none	1	0.6%	1	1.5%	0	0.0%	0	0.0%
primary	121	68.0%	42	63.6%	47	68.2%	32	74.4%
secondary	38	21.3%	15	22.7%	13	18.8%	10	23.3%
tertiary	18	10.1%	8	12.1%	9	13.0%	1	2.3%
Type of residence in case of independent living (n,%)								
Independent alone	80	59.3%	39	59.1%	41	59.4%		
Independent with other(s)	55	40.7%	27	40.9%	28	40.6%		
No. of medical conditions (n,%)								
none	12	6.7%	9*,†	13.6%	2*	2.9%	1†	2.3%
one or two	73	41.1%	38*,†	57,6%	23*	33.3%	12†	27.9%
two or more	93	52.2%	19*,†	28,8%	44*	63.8%	30†	69.8%

(i)ADL = (instrumental) activities of daily living; n = number of participants; no. = number; % = percentage

*,† = significant difference between groups $p < 0.05$

Physical self-sufficiency

Results on instruments of the Core Outcome Set are presented in table 3, both for the total sample as well as for the different groups. All instruments showed significant differences between groups. Significant differences between all three groups were found on all instruments for physical capacity and health literacy. For COFLEX Versatility and PAM-13 a significant difference was found between both groups living independently and the group living in a residential care facility.

Table 3 Core Outcome Set Physical Self-Sufficiency

Measurement instrument		Total	Independent living No help with (i)ADL	Independent living Help with (i)ADL	Living in residential care facility
	n	178	66	69	43
Physical Capacity					
SPPB (median, IQR)		9 (6)	10.5 (3)*	8 (5)*	3 (4)*
FICSIT-4 (median, IQR)		18 (13)	23 (6)*	18 (10)*	5 (11)*
TUG (median, IQR)‡		10.19 (6.76)	8.50 (3.08)*	10.71 (5.53)*	22.43 (14.19)*
not able to perform TUG (n)		10	0	3	7
JAMAR (median, IQR)		28 (16.25)	30 (12.5)*	27 (13.5)*	18 (11)*
Coping					
COFLEX Versatility (median, IQR)		26 (8)	28 (9)*	26 (8)†	24 (7)*,†
COFLEX Reflective coping (median, IQR)		11 (4)	11.5 (3)	12 (4)	10 (4)
Empowerment					
PAM-13 (median, IQR)		63.1 (21.8)	67.8 (21.8)*	65.5 (18.2)†	58.1 (16.6)*,†
Health Literacy					
NVS-D (median, IQR)		2 (3)	4 (4)*	2 (4)*	1 (2)*

n = number of participants; (i)ADL = (instrumental) activities of daily living; SPPB = Short Physical Performance Battery; TUG = Timed Up and Go test; COFLEX = Coping Flexibility questionnaire; PAM = Patient Activation Measure; NVS-D = Dutch Newest Vital Sign; IQR = interquatile range; sd = standard deviation; *,† = significant difference between groups $p < 0.05$; ‡ Median, IQR for group who completed TUG measurement

Discriminative validity Core Outcome Set Physical Self-Sufficiency

While testing the assumptions for ordinal logistic regression, the FICSIT-4 was excluded from the analysis due to multicollinearity. The TUG was excluded from the analysis, because not all participants were able to perform this test, resulting in a fictive score of 240. This caused too much outliers to include the TUG in the analysis. All other measurement instruments of the Core Outcome Set were included as predictor variables.

As presented in table 4, in the final model, only physical capacity measured with the SPPB was significantly associated with group membership. The odds of classification into the next group increased by a factor 1.64 for each point decline on the SPPB.

Table 4 Ordinal logistic regression predicting group membership

	Wald	p	OR	95% CI
Physical capacity				
SPPB	49.909	0.000	1.64	1.43 - 1.88
JAMAR	3.377	0.066	1.03	1.00 - 1.06
Coping				
COFLEX versatility	0.989	0.320	1.04	0.96 - 1.12
COFLEX reflective coping	0.000	0.983	1.00	0.88 - 1.14
Empowerment				
PAM	0.246	0.620	0.99	0.97 - 1.02
Health literacy				
NVS-D	2.619	0.106	1.03	0.97 - 1.36

Wald = Wald statistic; p = p-value; OR = Odds Ratio; CI = Confidence Interval; SPPB = Short Physical Performance Battery; TUG = Timed Up and Go test; PAM = Patient Activity Measure; NVS-D = Dutch Newest Vital Sign

Table 5 shows that this final model was able to correctly classify 68 percent of the participants into one of the predefined groups. In the group of independently living older adults without help and the group of older adults living in a residential care facility above 70

percent was classified correctly. A percentage of 58 percent correctly classified is shown in the older adults living at home, needing help with (i)ADL.

Table 5 prediction accuracy of the model

	Predicted			
	Independent living No help with (i)ADL (n)	*Independent living Help with (i)ADL (n)*	*Living in residential care facility (n)*	Percentage correct
Observed				
Independent living No help with (i)ADL (n)	48	18	0	73%
Independent living Help with (i)ADL (n)	18	40	11	58%
Living in residential care facility (n)	2	9	32	74%
Overall percentage	38%	38%	24%	68%

(i)ADL = (instrumental) Activities of Daily Living

Contribution of domains coping, empowerment and health literacy to the model

A model with physical capacity only performed less ($p \leq 0.01$) compared to models with physical capacity and one of the domains coping (LR 41.836; degrees of freedom (df) 2), empowerment (LR 39.620; df 1) or health literacy (LR 17.240; df 1). When adding more domains to a model with physical capacity and coping or empowerment, no improvements were found. After adding health literacy to the model with physical capacity, adding coping (LR 21.736; df 2) or empowerment (LR 20.962; df 1) improved the model even more ($p \leq 0.01$). Adding both instead of one did not show a significant difference.

DISCUSSION

The aim of this study was to determine discriminative validity of the Core Outcome Set PSS in a population of older adults. The model based on the Core Outcome Set PSS had an overall prediction accuracy of 68 percent, which is fairly good. It was able to distinguish between different levels of PSS for the group of independently living older adults who did not need help in (i)ADL-activities and for the group living in a residential care facility. The model performed less in the group of older adults living at home and dependent on help, despite the fact that significant differences between groups were shown on most variables. In this group the prediction accuracy was just 58 percent. This means the model has insufficient ability to distinguish between people in this group and people living at home without help or people living in a residential care facility. Therefore, discriminative validity of the Core Outcome Set PSS to distinguish different levels of PSS is moderate.

The difference in prediction accuracy between groups can be explained by several reasons. First, the group of older adults living at home, dependent on help, represents a broad range of PSS. In this category the help needed varied from just periodical help from a pedicure to almost complete help in all (i)ADL activities. Second, some people living at home and dependent on help were supported by an informal caregiver. Such environmental factors were unfortunately not included in this study. Although context is part of the definition of PSS, it is not included in the four domains of PSS on which the Core Outcome Set was based (Molenaar et al. 2019, in preparation). The role of informal caregivers has become more important in recent years and will increase even more in the future, because current policy is to keep older adults with limitations home as long as possible.[37] These factors imply that some people in the group of independently living older adults with help are functioning at almost the same level as people in one of the other groups. This might have influenced the relationship between the Core Outcome Set PSS and our proxy.

Our study revealed that PSS is mostly determined by physical capacity, measured with SPPB. This is in line with what is already known about the relationship between self-sufficiency and physical capacity.[9,11,25] However, other domains also contribute to PSS. Despite the fact that the NVS-D did not show to be a discriminative factor in distinguishing someone's level of PSS, differences in health literacy levels between groups were both significant and clinically relevant.[23] Health literacy is known to be associated with age, physical activity and participating in social activities.[38,39] In line with these results from earlier studies, the oldest group in this study showed the lowest health literacy skills. On empowerment no clinically relevant differences between groups were found.[40] All scores belonged to the same level of patient activation and measurement of empowerment did not contribute significantly to a model with all other domains. Therefore, a final model including physical capacity, health literacy and coping seems to perform optimally.

This study was the first to measure PSS in older adults. Since the Core Outcome Set PSS is intended for interprofessional use in clinical practice (Molenaar 2019, in preparation), a strength of this study was the cooperation of professionals and students from different backgrounds in the measurement procedure. To determine discriminative validity, older adults with a broad range in levels of physical functioning were measured. This was an adequate representation of the Dutch population of older adults.[1] Another strength of this study was limited missing data.

There were some limitations as well. First, the level of Physical Self-Sufficiency gradually declines and there are no clear categories. However, For the proxy we used, cut-off points were determined, resulting in three groups. In the middle group a broad range of levels of physical functioning was represented, from almost no help to almost complete help in (i)ADL. With a good prediction accuracy for the other groups, the model shows ability to distinguish between older adults with different levels of PSS, if differences are large enough. Second, environmental factors were not included in this study. Literature shows an association between social support and home or social participation, which is closely linked to the definition of PSS.[42,43] In particular the presence of an informal caregiver or another form of social support is associated with a difference between living at home and living in a residential care facility.[1] The amount of social participation and the diversity in social relations influence decline in functional ability, measured on items like walking outside and walking stairs.[43] Although these items were objectified by the GARS-3, the involvement of (informal) caregivers to complete these items was insufficiently determined. Third, although patient reported outcome measures (PROMs) were the only feasible option to measure coping, empowerment and help needed in (i)ADL, the use of PROMs is accompanied by some limitations. PROMs provide subjective data and the outcome is influenced by how the participant perceives his or her situation.[44] The perceived level of coping, empowerment or help needed may not reflect the actual behaviour of the participant. Also, these questionnaires were not feasible for older adults with severe cognitive impairments. Therefore, they were excluded from this study. Finally, with 178 participants optimal sample size was not obtained. The difference between actual and optimal sample size is small and probably did not have large impact on the results, because the smallest group is still distinctive.

Before the Core Outcome Set PSS can be used in further research or in clinical practice, it is recommended to revise it to some extent. Because of high correlation with the SPPB, the FICSIT-4 can be removed from the domain physical capacity. Despite significant differences between groups, the TUG was not included in the analysis. It seems relevant to measure dynamic balance control and risk of falling additionally to the SPPB. The Floor Transfer Test may be a good alternative for TUG as well as SPPB, because of high correlation with both instruments.[45] Besides that, it is recommended to remove the PAM from the Core Outcome Set PSS. A model including physical capacity, coping and health literacy seems optimal. Without the PAM, a large part of the definition of empowerment is still covered in this model. The PAM

did not measure all aspects of empowerment. These were also represented by the NVS-D and COFLEX, because the constructs of health literacy and coping are associated with empowerment.[19,41] Bravo et al. described a conceptual model of empowerment, in which health literacy is one of the main indicators for patient empowerment.[19] They also described knowledge, skills, attitudes and self-awareness necessary to influence own health behaviour, choosing realistic goals and make an action plan to achieve these goals.[19] Coping strategies are necessary to reach goals, take actions and adapt to changing circumstances.[18] Adaptation to chronic illness is seen as one of the patient outcomes of the process of patient empowerment.[19] Furthermore, it seems important to incorporate the influence of (social) environmental factors in the Core Outcome Set PSS, such as the presence of an informal caregiver who facilitates an older person in performing activities of (instrumental) daily living. Although people with severe cognitive impairments are more likely to lose self-sufficiency, the questionnaires of the Core Outcome Set PSS were not feasible for them.[46] In clinical practice however, this is a relevant group of older adults. For future studies and use in clinical practice, it is recommended to assess which adjustments to the Core Outcome Set or measurement procedure can be made to include this group.

CONCLUSION

Physical Self-Sufficiency can be measured with the Core Outcome Set PSS. For 68 percent of older adults, the prediction of group membership by the Core Outcome Set PSS is accurate. However, the Core Outcome Set has limited ability to distinguish between older adults living at home and dependent on help in (i)ADL and other groups. This implies moderate discriminative validity of the Core Outcome Set PSS. A model including physical capacity, health literacy and coping seems to perform optimally, based on the current composition of measurement instruments. It is recommended to incorporate measurement of environmental factors in the Core Outcome Set PSS in further research to improve clinical relevance in daily practice.

REFERENCES

1. van Campen C, Iedema J, Broese van Groenou M, Deeg D. Langer zelfstandig; ouder worden met hulpbronnen, ondersteuning en zorg. Centraal Cultureel Planbureau; 2017.

2. Buist Y, de Bruin S, Rijken M, Lemmens L, van Vooren N, Baan C. Vroegsignalering bij (kwetsbare) ouderen: wat is nodig om samenwerking te verbeteren. Rijksinstituut voor Volksgezondheid en Milieu (RIVM); 2018.

3. de Carvalho IA, Epping-Jordan J, Beard JR. Integrated Care for Older People; Guidelines on community-level interventions to manage declines in intrinsic capacity. World Health Organization; 2018.

4. Verbeek-Oudijk D, Putman L. Verzorgd in Europa: kerncijfers 2013 Een vergelijking van de zorg en ondersteuning voor 50-plussers in 14 Europese landen. Centraal Cultureel Planbureau Den Haag; 2016.

5. Zantinge E, van der Wilk E, van Wieren S, Schoemaker C, Umans S. Gezond ouder worden in Nederland. Rijksinstituut voor Volksgezondheid en Milieu (RIVM); 2011.

6. Candela F, Zucchetti G, Magistro D. Individual correlates of autonomy in activities of daily living of institutionalized elderly individuals: An exploratory study in a holistic perspective. Holist Nurs Pract. 2013;27(5):284–91.

7. Groessl EJ, Kaplan RM, Rejeski WJ, Katula JA, King AC, Frierson G, et al. Health-related quality of life in older adults at risk for disability. Am J Prev Med. 2007;33(3):214-8 OD-2007/09/11.

8. Steyerberg EW, Vickers AJ, Cook NR, Gerds T, Gonen M, Obuchowski N, et al. Assessing the performance of prediction models: a framework for traditional and novel measures. Epidemiology. 2010 Jan;21(1):128–38.

9. Fried LP, Guralnik JM. Disability in Older Adults: Evidence Regarding Significance, Etiology, and Risk. J Am Geriatr Soc. 1997 Jan 1;45(1):92–100.

10. Prinsen CAC, Vohra S, Rose MR, Boers M, Tugwell P, Clarke M, et al. How to select outcome measurement instruments for outcomes included in a 'Core Outcome Set' - a practical guideline. Trials. 2016;17(1).

11. Lamb SE, Keene DJ. Measuring physical capacity and performance in older people. Best Pract Res Clin Rheumatol. 2017 Apr;31(2):243–54.

12. Mijnarends Msc DM, Meijers JMM, Halfens JG, Luiking YC, Schoberer Msc D, Jentoft AJC, et al. Validity and Reliability of Tools to Measure Muscle Mass, Strength, and Physical Performance in Community-Dwelling Older People: A Systematic Review. J Am Med Dir Assoc. 2013;14:170–8.

13. Freiberger E, De Vreede P, Schoene D, Rydwik E, Mueller V, Frändin K, et al. Performance-based physical function in older community-dwelling persons: a systematic review of instruments. 2012;

14. Rossiter-Fornoff JE, Wolf SL, Wolfson LI, Buchner DM. A Cross-sectional Validation Study of the FICSIT Common Data Base Static Balance Measures. Journals Gerontol Ser A. 1995;50A(6):291–7.

15. Kim J, Chon J, Kim H, Lee J, Yoo S, Kim D, et al. The Association Between Fall History and Physical Performance Tests in the Community-Dwelling Elderly: A Cross-Sectional Analysis. Ann Rehabil Med. 2017;41(2):239–47.

16. Roberts HC, Denison HJ, Martin HJ, Patel HP, Syddall H, Cooper C, et al. A review of the measurement of grip strength in clinical and epidemiological studies: Towards a standardised approach. Age Ageing. 2011;40(4):423–9.

17. Reijnierse EM, de Jong N, Trappenburg MC, Blauw GJ, Butler-Browne G, Gapeyeva H, et al. Assessment of maximal handgrip strength: how many attempts are needed? J Cachexia Sarcopenia Muscle. 2017;8(3):466–74.

18. Vriezekolk JE, Van Lankveld WGJMJM, Eijsbouts AMMM, van Helmond T, Geenen R, van den Ende CHMM. The coping flexibility questionnaire: Development and initial validation in patients with chronic rheumatic diseases. Rheumatol Int. 2012;32(8):2383–91.

19. Bravo P, Edwards A, Barr PJ, Scholl I, Elwyn G, McAllister M. Conceptualising patient empowerment: A mixed methods study. BMC Health Serv Res. 2015;15(1):1–14.

20. Cerezo PG, Juvé-Udina M-E, Delgado-Hito P. Concepts and measures of patient empowerment: a comprehensive review. Rev da Esc Enferm da USP. 2016;50(4):667–74.

21. Rademakers J, Nijman J, Van Der Hoek L, Heijmans M, Rijken M. Measuring patient activation in the Netherlands: Translation and validation of the American short form Patient Activation Measure (PAM13). BMC Public Health. 2012;12(1):1.

22. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: A systematic review and integration of definitions and models. 2012.

23. Fransen MP, Leenaars KEF, Rowlands G, Weiss BD, Maat HP, Essink-Bot ML. International application of health literacy measures: Adaptation and validation of the newest vital sign in The Netherlands. Patient Educ Couns. 2014;97(3):403–9.

24. Guralnik J, Ferrucci L, Simonsick E, Salive M, Wallace R. Lower-extremity Function in Persons over the Age of 70 Years as a Predictor of Subsequent Disability. N Engl J Med. 1995;(332):556–61.

25. Guralnik JM, Ferrucci L, Pieper CF, Leveille SG, Markides KS, Ostir G V., et al. Lower Extremity Function and Subsequent Disability: Consistency Across Studies, Predictive Models, and Value of Gait Speed Alone Compared With the Short Physical Performance Battery. Journals Gerontol Ser A Biol Sci Med Sci. 2000;55(4):M221–31.

26. Dobson F, Hinman RS, Hall M, Terwee CB, Roos EM, Bennell KL. Measurement properties of performance-based measures to assess physical function in hip and knee osteoarthritis: a systematic review. Osteoarthr Cartil. 2012;20:1548–62.

27. Bossers WJR, Van Der Woude LH V, Boersma F, Scherder EJA, Van Heuvelen MJG, Bossers W. Recommended Measures for the Assessment of Cognitive and Physical Performance in Older Patients with Dementia: A Systematic Review E X T R A. 2012;

28. Hafsteinsdóttir TB, Rensink M, Schuurmans M. Clinimetric Properties of the Timed Up and Go Test for Patients With Stroke: A Systematic Review. Top Stroke Rehabil. 2014 May 22;21(3):197–210.

29. Podsiadlo D, Richardson S. The Timed 'Up & Go': A Test of Basic Functional Mobility for Frail Elderly Persons. J Am Geriatr Soc. 1991;(39):142–8.

30. Peolsson A, Hedlund R, Birgitta O. Intra- and Inter-Tester Reliability and Reference Values for Hand Strength. 2001;36–41.

31. Bohannon RW, Schaubert KL. Test-retest reliability of grip-strength measures obtained over a 12-week interval from community-dwelling elders. J Hand Ther. 2005;18(4):426–8.

32. Kim JK, Park MG, Shin SJ. What is the minimum clinically important difference in grip strength? Clin Orthop Relat Res. 2013;472(8):2536–41.

33. Hibbard JH, Mahoney ER, Stockard J, Tusler M. Development and testing of a short form of the patient activation measure. Health Serv Res. 2005;40(6 I):1918–30.

34. Skolasky RL, Green AF, Scharfstein D, Boult C, Reider L, Wegener ST. Psychometric properties of the patient activation measure among multimorbid older adults. Health Serv Res. 2011;46(2):457–78.

35. Kempen GIJM, Miedema I, Ormel J, Molenaar W. The assessment of disability with the Groningen Activity Restriction Scale. Conceptual framework and psychometric properties. Soc Sci Med. 1996;43(11):1601–10.

36. Vittinghoff E, McCulloch CE. Relaxing the rule of ten events per variable in logistic and cox regression. Am J Epidemiol. 2007;165(6):710–8.

37. de Klerk M, Verbeek-Oudijk D, Plaisier I, den Draak M. Zorgen voor thuiswonende ouderen, Kennissynthese over de zorg voor zelfstandig wonende 75-plussers, knelpunten en toekomstige ontwikkelingen. Den Haag; 2019.

38. Geboers B, Reijneveld SA, Jansen CJM, de Winter AF. Health Literacy Is Associated With Health Behaviors and Social Factors Among Older Adults: Results from the LifeLines Cohort Study. J Health Commun. 2016;21(0):45–53.

39. Von Wagner C, Knight K, Steptoe A, Wardle J. Functional health literacy and health-promoting behaviour in a national sample of British adults. J Epidemiol Community Health. 2007;61(12):1086–90.

40. Greene J, Hibbard JH, Sacks R, Overton V, Parrotta CD. When Patient Activation Levels Change, Health Outcomes And Costs Change, Too. Health Aff. 2015;34(3):431–7.

41. Werbrouck A, Swinnen E, Kerckhofs E, Buyl R, Beckwée D, Wit L De. How to empower

patients? A systematic review and meta-analysis. TBM. 2018;(August):1–15.

42. Keysor JJ, Jette AM, Coster W, Bettger JP, Haley SM. Association of Environmental Factors With Levels of Home and Community Participation in an Adult Rehabilitation Cohort. Arch Phys Med Rehabil. 2006;87(12):1566–75.

43. Avlund K, Lund R, Holstein BE, Due P. Social relations as determinant of onset of disability in aging. Arch Gerontol Geriatr. 2004;38(1):85–99.

44. de Vet HCW, Terwee CB, Mokkink LB, Knol DL, de Vet HCW, Terwee CB, et al. Concepts, theories and models, and types of measurements. In: Measurement in Medicine. Amsterdam: Cambridge University Press; 2011. p. 7–29.

45. Ardali G, Brody LT, States RA, Godwin EM. Reliability and Validity of the Floor Transfer Test as a Measure of Readiness for Independent Living Among Older Adults. J Geriatr Phys Ther. 2017;1.

46. Overdorp EJ, Kessels RPC, Claassen JA, Oosterman JM. The Combined Effect of Neuropsychological and Neuropathological Deficits on Instrumental Activities of Daily Living in Older Adults: a Systematic Review. Neuropsychol Rev. 2016;26(1):92–106.