ORIGINAL REPORT

DIFFERENCES IN ABILITY TO PERFORM ACTIVITIES OF DAILY LIVING AMONG WOMEN WITH FIBROMYALGIA: A CROSS-SECTIONAL STUDY

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Objective: To investigate whether the Assessment of Motor and Process Skills (AMPS), the physical function subscales of the Fibromyalgia Impact Questionnaire (FIQ PF) and the 36-item Short Form (SF-36 PF) can identify subgroups of women with fibromyalgia with clinically relevant differences in ability to perform activities of daily living.

Design: Cross-sectional study.

Subjects: A total of 257 women with fibromyalgia.

Methods: Participants were evaluated with the AMPS (measuring activities of daily living motor and activities of daily living process ability), FIQ and SF-36. AMPS independence cut-offs were used to divide the participants into 4 subgroups. Clinically relevant differences between subgroups were investigated based on the AMPS, FIQ PF and SF-36 PF.

Result: Participants in the 4 AMPS-derived subgroups demonstrated clinically relevant differences in observed activities of daily living motor and process ability. Neither the FIQ PF nor the SF-36 PF could differentiate between subgroups with clinically relevant differences in AMPS activities of daily living process ability.

Conclusion: Activities of daily living process skills reflect underlying organizational and adaptive capacities of the individual and are relevant targets for interventions aiming at improving activities of daily living ability. Since self-report instruments do not capture differences in activities of daily living process ability, clinicians should include observations-based assessment of activities of daily living ability in order to individualize interventions offered.

Key words: ADL; functional ability; physical function; subgrouping; AMPS; FIQ; SF-36; fibromyalgia; chronic widespread pain.

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INTRODUCTION

The ability to perform activities of daily living (ADL) is a fundamental aspect of functional ability and a core outcome in clinical pain research and rheumatology (1, 2). The assessment of functional ability is traditionally based on patient-administered questionnaires (3–5). However, in studies of women with fibromyalgia (6–8), self-report has been complemented with observation-based evaluations of ADL ability. These observation-based evaluations were conducted with a standardized instrument, the Assessment of Motor and Process Skills (AMPS) (9). AMPS measures 2 aspects of ADL ability; ADL motor skills (moving self and objects) and ADL process skills (organizing time, space and objects and adapting actions) (9). A study involving 257 women with fibromyalgia, recruited from a tertiary outpatient clinic, showed that approximately 95% of the women demonstrated decreased ADL motor ability (i.e. below the AMPS ADL competence cut-off) and 40% demonstrated decreased ADL process ability as measured by the AMPS (7). That is, while women with fibromyalgia predominantly display ADL motor skill deficits, a fairly large proportion also demonstrates ADL process skill deficits, indicating different ADL ability profiles across patients (6, 7). The subgroup of women with ADL process skill deficits probably needs specific interventions designed to increase efficiency in organizing time, space and objects and adapting actions during ADL task performance, which suggests a need for differentiated interventions.

In order to provide differentiated interventions, clinicians need instruments that can identify clinically relevant differences in ADL task performance. Although the AMPS manual provides independence cut-offs for ADL motor and ADL process ability, it is unknown whether application of these cut-offs in women with fibromyalgia will result in subgroups in which the observed differences in ADL ability are of clinical relevance. In settings with limited access to observation-based evaluations of ADL ability it is of interest to determine whether self-report questionnaires can be used to differentiate between persons with clinically relevant differences in ADL ability. The Fibromyalgia Impact Questionnaire (FIQ) and 36-item Short Form (SF-36) are the most frequently used questionnaires in fibromyalgia populations. Both questionnaires contain a

physical function subscale used to evaluate ADL ability (10). However, these instruments do not provide cut-offs for different levels of ADL ability.

The aim of this study was two-fold; the first objective was to investigate whether sub-grouping of women with fibromyalgia based on the AMPS ADL motor and ADL process independence cut-offs would result in clinically relevant differences in the observed ADL ability across groups; the second objective was to investigate whether the women in the AMPS-derived subgroups demonstrated clinically relevant differences in self-reported ADL ability when assessed with the FIQ and SF-36 physical function subscales.

MATERIAL AND METHODS

Study design and setting

For this cross-sectional study, participants were consecutively recruited from a tertiary outpatient clinic at the Department of Rheumatology, Frederiksberg Hospital, Denmark, from March 2007 to March 2009. Prior to entering an interdisciplinary rehabilitation programme, to which the participants had been referred, their ADL ability was evaluated based on the AMPS, FIQ and SF-36.

Participants

Females over 18 years of age and diagnosed with fibromyalgia according to the 1990 American College of Rheumatology (ACR) classification criteria (11), were considered eligible. Exclusion criteria were: concurrent psychiatric disorders not related to the pain disorder and not being fluent in Danish.

Data sources and measurements

To characterize the participants' disease severity and the overall impact of fibromyalgia, data from the FIQ pain and fatigue subscales and the FIQ total score were used (12). The SF-36 Physical Composite Score (PCS) and a Mental Composite Score (MCS) were used to characterize participants' perceived health-related quality of life (13, 14).

Assessment of Motor and Process Skills (AMPS). The AMPS (9) is a standardized observation-based assessment instrument used to measure the quality of ADL task performance. The AMPS has demonstrated sound psychometric properties when applied to women with chronic widespread pain, including fibromyalgia (6). The AMPS evaluation is conducted by a calibrated AMPS rater (an occupational therapist who has demonstrated valid and reliable administration and scoring of the AMPS). First, the AMPS rater performs an interview to identify ADL tasks of relevance to that person's daily life (e.g. meal preparation and household management's tasks). Then the person evaluated chooses and performs at least 2 well-known and relevant standardized ADL tasks of appropriate challenge. During the task performance the AMPS rater observes 2 domains of ADL task performance operationalized and defined through observable and goal-directed actions, i.e. 16 ADL motor skills and 20 ADL process skills (9). ADL motor skills are those actions a person performs in order to move self and task objects during ADL task performance. ADL process skills are actions observed as the person: (*i*) selects, interacts with and uses tools and materials during task performance; (*ii*) logically carries out steps of an ADL task; and (*iii*) modifies the performance when problems occur. ADL motor skill deficits increase the demands on the ADL process skills that reflect underlying organizational and adaptive capacities of the individual (e.g. the ability to use compensatory strategies). Therefore the ADL process ability measure is a reflection of how effectively a person is currently able to organize and adapt actions to effect ADL task performance in a manner that is effortless, efficient, safe and independent (15).

When the AMPS rater has observed the performance of the 2 chosen standardized ADL tasks, the quality of the ADL task performance is scored according to criteria in the AMPS manual (9). Each ADL skill item is scored in terms of ease, efficiency, safety and independence using a 4-point ordinal rating scale. The AMPS rater uses a personal copy of a many-faceted Rasch-based computer-scoring software (16), to convert the ordinal ADL scores into 2 overall linear ADL ability measures; 1 for ADL motor ability and 1 for ADL process ability. These ADL ability measures are expressed in logistically transformed probability units adjusted for rater severity as well as ADL task and skill item difficulty (9, 17). The lower the person's measure is on the ADL motor scale, the more clumsiness, physical effort, and/or fatigue the person is demonstrating during ADL task performance. The lower the person's measure is on the ADL process scale, the less efficient the person is during ADL task performance (9).

The ADL ability measures can be interpreted from a criterion-referenced perspective by means of competence and independence. While the AMPS ADL competence cut-offs are used to identify persons demonstrating increased effort and/or efficiencies during ADL task performance, the independence cut-offs are used to predict persons in need of assistance to live in the community. As a previous study (7) showed that almost all women with fibromyalgia (95%) recruited from a tertiary setting had ADL motor ability measures below the ADL motor competence cut-off at 2.00 logits, it was decided to use the ADL motor and ADL process independence cut-offs for identifying different ADL ability profiles across subgroups. The ADL motor independence cut-off for determining need for assistance is 1.50 logits (sensitivity 0.67, specificity 0.72, i.e. 67% of an independent sample was correctly classified and 72% of a sample in need of assistance was correctly classified). Similarly, the ADL process independence cut-off for determining the need of assistance is 1.00 logits (sensitivity 0.81, specificity 0.70) (9). Evidence suggests that the ADL motor ability scale may be the most accurate for predicting need for assistance in person with musculoskeletal conditions (18). However, the accuracy of the predictions are enhanced (83% correctly classified) when both the ADL motor and ADL process ability measures are below the independence cut-offs (9, 18).

Fibromyalgia Impact Questionnaire (FIQ). FIQ is a disease-specific questionnaire, composed of 10 subscales, designed to evaluate how persons with fibromyalgia report their health status affected by the condition (FIQ total) (12). More severely impacted persons with fibromyalgia obtain a FIQ total score > 70 out of a maximum score of 100 (19). The first item of the FIQ is the physical function (FIQ PF) subscale, used to evaluate a person's perceived ability to perform 10 tasks (shopping, laundry, preparing meals, washing dishes, vacuuming, making beds, walking several blocks, visiting friends, yard work, and driving a car). The responses are rated on a Likert scale from 0 = *always able to do* to 3 = *never able to do*. The responses are summed and divided by the number of valid scores and then standardized on a scale ranging from 0 to 10 (i.e. multiplied by 3.33). Ten indicates the highest level of disability. The subscales used to assess pain and fatigue are based on 100-mm visual analogue scales (12).

36-item Short Form (SF-36). The SF-36 is a generic questionnaire composed of 8 subscales developed to assess health-related quality of life, expressed in a Physical Composite Score (PCS) and a Mental Composite Score (MCS) (20). The PCS and MCS ordinal scale scores are transformed into linear scales ranging from 0 to 100 and standardized to reflect a general population (US) mean of 50 (± 10). Measures of 0 indicate the worst possible health status, and 100 is the best health status. The SF-36 physical function (SF-36 PF) subscale includes questions related to the following tasks; do vigorous and moderate activities, lift or carry groceries, climb 1 or several flights of stairs, make beds, walk 1 block or more than 1 mile and bathe or dress. The questions on the SF-36 PF subscale are scored on a 3-point Likert scale from 1 = *limited a lot* to 3 = *not limited at all*. The raw scores are added and transformed to yield a single overall score for physical function, ranging from 0 to 100. Low scores indicate that the person is limited a lot, and high scores indicate that the person performs all types of tasks (20).

Procedures

The FIQ and SF-36 were posted to the study population. Participants completed the questionnaires at home and were asked to return the completed questionnaires on the first day of the rehabilitation programme. AMPS raters from the Department of Occupational Therapy, Frederiksberg Hospital performed the AMPS evaluations at the outpatient clinic prior to the participants entering the rehabilitation programme. Based on the AMPS evaluations participants were divided into 4 subgroups using the AMPS ADL motor and ADL process independence cut-offs. Group A: ADL motor ability < 1.50 logits and ADL process ability < 1.00 logits. Group B: ADL motor ability < 1.50 logits and ADL process ability ≥ 1.00 logits. Group C: ADL motor ability ≥ 1.50 logits and ADL process ability < 1.00 logits. Group D: ADL motor ability ≥ 1.50 logits and ADL process ability ≥ 1.00 logits.

Statistical analysis

The SPSS program version 19.0 (21) was used for statistical analysis. Normally distributed interval scale data were analysed using parametric statistics and reported in means and standard deviations (SD). Differences between subgroups were evaluated based on one-way analysis of variance (ANOVA). It was reasoned that the subgroups of women with higher levels of ADL motor ability measures would contain few participants and the statistically

Table I. *Baseline characteristics in the overall study population and study participants subgrouped based on Assessment of Motor and Process Skills (AMPS) independence cut-offs*

	Total	Group A	Group B	Group C	Group D	Group difference* F; df; p-value	Significant differences between groups** Group	Difference	p-value
Participants, n (%)	257 (100)	93 (36)	116 (45)	14 (6)	34 (13)				
Age, mean (SD)	45.39 (9.83)	46.11 (9.95)	46.18 (9.38)	47.65 (10.94)	39.76 (9.01)	422.72; 3; 0.004	A/B	0.07	1.00
							A/C	1.54	1.00
							A/D	6.35	*0.04*
							B/C	1.47	1.00
							B/D	6.42	*0.00*
							C/D	7.89	0.06
						χ²; df; p-value	Group	Difference	p-value
FIQ total, median	61.97	67.69	60.72	65.61	51.85	18.13; 3;	A/B	6.97	*0.01*
Quartiles	50.39–74.75	55.93–79.78	49.90–72.65	45.54–78.31	35.97–64.99	0.00	A/C	2.08	0.57
Min–Max	2.88–97.40	12.70–97.40	19.70–95.47	14.76–95.00	2.88–80.89		A/D	15.84	*0.00*
							B/C	4.89	0.69
							B/D	8.87	*0.01*
							C/D	13.76	0.10
FIQ pain, median	7.50	8.00	7.35	7.20	6.60	9.90; 3;	A/B	0.65	*0.05*
Quartiles	5.80–8.60	6.30–8.75	5.65–8.50	5.75–8.83	4.90–7.85	0.019	A/C	0.80	0.81
Min–Max	0.00–10.00	0.90–10.00	0.20–10.00	3.50–9.20	0.00–9.80		A/D	1.40	*0.00*
							B/C	0.15	0.85
							B/D	0.75	0.08
							C/D	0.60	0.35
FIQ fatigue, median	8.60	9.00	8.40	8.65	7.90	7.96; 3;	A/B	0.60	*0.03*
Quartiles	7.20–9.50	8.10–9.58	7.18–9.33	6.43–9.83	5.43–9.23	0.047	A/C	0.35	0.63
Min–Max	1.30–10.00	2.80–10.00	3.00–10.00	1.30–9.90	1.40–10.00		A/D	1.10	*0.01*
							B/C	0.25	0.87
							B/D	0.50	0.22
							C/D	0.75	0.51
SF-36 PCS, median	26.71	25.78	26.62	30.68	28.63	10.27; 3;	A/B	0.84	0.42
Quartiles	22.57–30.94	21.87–30.47	22.60–30.51	27.42–34.02	23.03–34.64	0.016	A/C	4.90	*0.01*
Min–Max	8.79–50.68	8.79–40.79	11.02–43.78	20.49–34.02	14.70–50.68		A/D	2.85	*0.05*
							B/C	4.06	*0.01*
							B/D	2.01	0.09
							C/D	2.05	0.50
SF-36 MCS, median	40.78	37.43	41.11	43.53	49.04	10.21; 3;	A/B	3.68	0.43
Quartiles	31.20–50.40	30.31–48.40	30.77–49.73	24.99–50.84	36.70–56.23	0.017	A/C	6.10	0.87
Min–Max	14.90–66.59	16.10–64.91	17.26–64.71	14.90–56.73	20.42-66.59		A/D	11.61	*0.00*
							B/C	2.42	0.73
							B/D	7.93	*0.01*
							C/D	5.51	0.06

*Group differences in age were analysed using analysis of variance (ANOVA), while groups differences on FIQ and SF-36 were analysed using the Kruskal–Wallis test. Statistically significant group differences were defined as $p < 0.1$.
**Multiple group comparisons in age were performed using Independent samples *t*-test, while multiple group comparisons on FIQ and SF-36 were performed using the Mann-Whitney *U* test.
Statistically significant differences (in italic) in the *post-hoc* analyses were defined at $p < 0.05$.
AMPS: Assessment of Motor and Process Skills: FIQ: Fibromyalgia Impact Questionnaire: FIQ total: overall impact of the fibromyalgia. SF-36: 36-item Short Form: PCS: Physical Composite Score: MCS: Mental Composite Score.

significant differences between the 4 subgroups (A, B, C and D) were therefore defined at $p < 0.1$ in order to decrease the risk of type II error (failing to detect a difference). Thus, when the ANOVA yielded $p < 0.1$, multiple group comparisons were performed using Independent samples t-test. Skewed or ordinal scale data were analysed using non-parametric statistics and reported in medians, quartiles, minimum (min.) and maximum (max.) values. Differences between subgroups were evaluated based on the Kruskal–Wallis test. Statistically significant subgroup differences were defined as $p < 0.1$. Thus, when the Kruskal–Wallis analyses yielded $p < 0.1$, multiple group comparisons were performed using the Mann-Whitney U test. Statistically significant differences in the *post-hoc* analysis were defined at $p < 0.05$.

In order to determine clinically relevant group differences in observed ADL ability, the general guidelines described in the AMPS manual were applied (9). According to the AMPS manual a difference of ≥ 0.3 logits indicates a clinically relevant difference in ADL motor and/or ADL process ability (9). To determine clinically relevant group differences in self-reported ADL ability based on the FIQ PF and the SF-36 PF subscales, the criterion of a 0.5 SD was applied (22). In a comparable study sample a 0.5 SD equated to 1.12 points on the FIQ PF subscale and 10.00 points on the SF-36 PF subscale (23).

RESULTS

Baseline characteristics of the 257 participants distributed into the 4 AMPS-derived subgroups A ($n = 93$), B ($n = 116$), C ($n = 14$) and D ($n = 34$) are shown in Table I. The majority ($n = 209$; 81%) of the participants was distributed into group A

and B, based on an ADL motor ability measure below the 1.50 logits independence cut-off. Only 13% of the participants were allocated to group D having an ADL motor ability measure ≥ 1.50 logits and an ADL process ability measure ≥ 1.00 logits. Overall, the participants in group A reported higher levels of disease impact (FIQ total; $p < 0.00$), higher levels of pain (FIQ pain; $p < 0.00$) and fatigue (FIQ fatigue; $p < 0.01$), and lower levels of mental and physical health-related quality of life (SF-36 MCS; $p < 0.00$ and PCS; $p < 0.05$) compared with the participants in group D.

AMPS ADL ability measures, SF-36 PF and FIQ PF subscale scores for the total group and the 4 subgroups are shown in Table II. The Kruskal–Wallis test yielded overall statistically significant group differences in AMPS ADL motor ($p < 0.00$) and ADL process ability measures ($p < 0.00$). *Post-hoc* Mann-Whitney U tests revealed statistically significant differences between groups with median AMPS ADL ability measures below and above the 1.50 logit ADL motor and the 1.00 logit ADL process independence cut-offs, respectively. Furthermore, these group differences were also clinically relevant (i.e. ≥ 0.3 logits) (Table II). The Kruskal–Wallis test yielded overall statistically significant differences in the FIQ PF ($p < 0.00$) and the SF-36 PF ($p < 0.00$) subscale scores across groups. The differences between the median FIQ PF subscale score

Table II. *Group differences in ability to perform activities of daily living (ADL) when evaluated with the Assessment of Motor and Process Skills (AMPS), the 36-item Short Form physical function subscale (SF-36 PF) and the Fibromyalgia Impact Questionnaire physical function subscale (FIQ PF) (n = 257)*

	Total	Group A	Group B	Group C	Group D	Group difference* χ^2; df; *p*-value	Group	Significant differences between groups** Difference	*p*-value
AMPS							A/B	0.15	*0.01*
Motor, median	1.07	0.91	1.06	1.65	1.66	121.65; 3; 0.00	A/C	**0.74**	*0.00*
Quartiles	0.74–1.41	0.48–1.14	0.73–1.27	1.57-1.78	1.56- 1.94		A/D	**0.75**	*0.00*
Min–Max	0.04–2.82	0.04–1.48	0.06–1.49	1.52-2.02	1.50-2.82		B/C	**0.59**	*0.00*
							B/D	**0.60**	*0.00*
							C/D	0.01	0.77
AMPS process, median	1.09	0.81	1.23	0.84	1.37	189.74; 3; 0.00	A/B	**0.42**	*0.00*
Quartiles	0.85–1.26	0.65–0.89	1.11–1.44	0.77–0.96	1.22–1.58		A/C	0.03	0.13
Min–Max	0.12–2.18	0.12–0.99	1.00–2.18	0.53–0.98	1.05–.190		A/D	**0.56**	*0.00*
							B/C	**0.39**	*0.00*
							B/D	0.14	*0.01*
							C/D	**0.53**	*0.00*
FIQ PF, median	5.67	6.25	5.56	5.00	4.51	13.57; 3; 0.00	A/B	0.69	*0.02*
Quartiles	3.73–7.00	4.46–7.41	3.58–6.67	3.48–7.17	2.00–6.05		A/C	1.25	0.29
Min–Max	0.00 – 9.00	0.00–9.00	0.00–8.89	0.67–9.00	0.00–8.00		A/D	**1.74**	*0.00*
							B/C	0.56	0.92
							B/D	1.05	*0.03*
							C/D	0.49	0.27
SF-36 PF, median	40.00	40.00	40.00	55.00	55.00	20.82; 3; 0.00	A/B	0.00	0.66
Quartiles	25.00–60.00	25.00–52.50	25.00–55.00	37.50–71.25	40.00–66.25		A/C	**15.00**	0.24
Min–Max	0.00–95.00	0.00–80.00	0.00–80.00	22.22–85.00	10.00–95.00		A/D	**15.00**	*0.05*
							B/C	**15.00**	0.14
							B/D	**15.00**	*0.01*
							C/D	0.00	0.75

*Group differences in AMPS, FIQ PF and SF-36 PF were analysed using the Kruskal–Wallis test and statistically significant group differences were defined as $p < 0.1$.

**Multiple group comparisons in AMPS, FIQ and SF-36 were performed using the Mann-Whitney U test.

The statistically significant differences (in italic) in the *post-hoc* analyses were determined by $p < 0.05$ and clinically relevant differences (in bold) were > 0.3 logits in AMPS and > 0.5 SD for the FIQ and SF-36.

of participants in group A and participants in groups C and D (i.e. groups with median ADL motor ability measures below and above cut-off, respectively) were clinically relevant (i.e. > 0.5 SD). Finally, the differences between the median SF-36 PF subscale scores of participants in groups A and B and participants in groups C and D were clinically relevant (i.e. > 0.5 SD) (Table II). Thus, the FIQ PF and SF-36 PF subscales could differentiate participants with clinically relevant differences in AMPS ADL motor ability measures, but did not capture clinically relevant differences in AMPS ADL process ability, i.e. the questionnaires could not differentiate between participants in group A and B or between participants in group C and D, respectively.

DISCUSSION

This is the first study to investigate whether women with fibromyalgia, classified into subgroups based on the AMPS ADL motor and ADL process independence cut-offs, demonstrate clinically relevant differences in observed ADL ability. Furthermore, the study evaluated whether the most frequently used self-report instruments; the FIQ PF and SF-36 PF subscales could capture clinically relevant differences in ADL ability across the AMPS-derived subgroups.

The study showed that subgrouping participants by AMPS independence cut-offs resulted in clinically relevant differences in observed ADL ability across all 4 subgroups. Thus, both the independence cut-off on the ADL motor and the ADL process scale of the AMPS could be used to divide the sample into subgroups with clinically relevant differences in ADL ability.

By using the SF-36 PF subscale it was possible to differentiate participants with AMPS ADL ability measures below and above the ADL motor independence cut-off. However, it could not differentiate participants in subgroups with similar levels of ADL motor ability, but different levels of ADL process ability. The FIQ PF subscale could differentiate participants with the lowest level of observed ADL ability (i.e. ability measures below both the ADL motor and ADL process independence cut-offs) from those with ability measures above the ADL motor independence cut-off. Thus, the FIQ PF subscale could not identify clinically relevant differences in ADL ability in participants with higher levels of ADL motor and/or ADL process ability. These findings are supported by a previous Rasch-based evaluation of the FIQ by Wolfe et al. (10), suggesting that the FIQ PF subscale is inadequate for differentiating between persons with intermediate disability scores, as the scale is non-linear, with compression in the middle and expansion at the ends of the scale.

Among the 3 instruments applied in this study, the FIQ PF subscale seemed the least useful to identify subgroups with clinically relevant differences in ADL ability. Both the SF-36 PF subscale and the AMPS ADL motor scale could identify subgroups with clinically relevant differences in ADL motor ability. As both scales address physical aspects of ADL ability, for instance the ability to lift and carry objects (e.g. groceries) and mobility, they probably capture group differences in

physical ADL ability. However, in a study by Amris et al. the SF-36 PF subscale and the AMPS ADL motor scale have been reported to correlate only moderately ($r = 0.37$, $p = 0.000$) (24). A potential explanation for this was that self-reported functional ability assessed with the SF-36 PF subscale was more influenced by pain and persons' psychosocial profiles, than that assessed with the observation-based AMPS ADL ability measures (25). Thus, it cannot be expected that the 2 scales identify the same aspects of ADL ability.

Finally, the AMPS ADL process scale was the only scale that could be used to identify clinically relevant differences in ADL process ability in this sample. Almost half of the participants (42%) had difficulties organizing and adapting their actions. The other half of the study population appeared more competent in using strategies making ADL task performance more effortless, efficient, safe and independent (15). This aspect of ADL ability was not captured by any of the self-report instruments.

According to present and previous study findings (7, 25, 26), "typical" women with fibromyalgia show increased physical effort and/or fatigue (i.e. decreased ADL motor ability) when performing relevant and familiar ADL tasks. Similar to a previous study population (7), approximately half of this study sample (42%), in addition to ADL motor skill deficits, showed inefficiencies (i.e. decreased ADL process ability) during ADL task performance, which enhanced the likelihood of needing assistance (9). That is, a rather large percentage of this population seems to be in need of interventions addressing their difficulties with organizing time, space and objects and adapting actions during ADL task performance. The results of this study suggest that the AMPS evaluation adds information of relevance to intervention planning, i.e. indicates whether intervention strategies need to address physical effort and/or inefficiencies during ADL task performance. For instance, if clinicians identify ADL process skill deficits in women with fibromyalgia, it could be relevant to offer interventions in which persons are taught how to organize and adapt ADL task performance as a means to overcome ADL motor skill deficits, and thus improve ADL ability. As the use of compensatory strategies has been shown to improve overall ADL ability and independence (27–29), it seems relevant for clinicians to consider using a compensatory model in persons with fibromyalgia. The ability to differentiate intervention strategies to subgroups showing different organizational and adaptive capacities was not possible based on self-reported questionnaires in this study.

This study demonstrated that only a minority of the participants had ADL motor and ADL process ability measures above the AMPS independence cut-offs. Participants in this subgroup were significantly younger and had lower levels of self-reported disease impact. As the severity of fibromyalgia may increase over time (30–32), these participants could be at risk of losing their current level of ADL ability. Clinicians might therefore need to consider the relevance of offering interventions focusing on maintaining or preventing loss of ADL ability when observing less pronounced ADL ability deficits in women with fibromyalgia.

Using an instrument that can identify different ADL ability profiles and specify ADL motor and/or ADL process skill deficits will probably assist in the delivery of interventions tailored to specific needs in different subgroups of women with fibromyalgia, and should thus improve functional outcomes. Based on the results of this study it seems reasonable to claim that the use of self-report questionnaires and observation-based evaluations of ADL ability do not provide clinicians with the same type of information. The notion that self-report and observation-based assessments provide distinct and complementary information is in accordance with findings from previous studies (6–8, 33–36). This supports the idea that clinicians should include observations-based assessment of ADL ability when planning the implementation of individualized interventions aiming at improving, maintaining or preventing loss of ADL ability in women with fibromyalgia.

There are limitations to this study that should be considered when interpreting the results. The study sample only included women; however, as fibromyalgia mainly affects women this study reflects clinical practice. The participants were recruited from a tertiary outpatient clinic and might therefore not be representative of the overall referral population. The sample characteristics indicate that the participants represent the upper end of a pain severity spectrum in which the condition has a pronounced interference in everyday life. Thus, we only identified only a few participants who displayed ADL motor and ADL process ability measures above the AMPS independence cut-offs. However, as the AMPS identified clinically relevant differences across all the subgroups we consider the sample adequate. Finally, as this study took on an exploratory approach to investigate whether the AMPS ADL independence cutoff could be used to subgroup women with fibromyalgia, no methods aiming at controlling for the overall type I error rate was used.

In conclusion, women with fibromyalgia can be divided into subgroups demonstrating clinically relevant differences in observed ADL ability based on the AMPS ADL motor and ADL process independence cut-offs. The most frequently used self-report instruments; the SF-36 PF and the FIQ PF subscales cannot substitute for observation-based assessment, as these questionnaires cannot identify clinically relevant group differences in ADL process ability. ADL process skills reflect the underlying organizational and adaptive capacities of the individual and are relevant targets for interventions aiming at improving or maintaining overall ADL ability. It is therefore recommended to include observations-based assessment of ADL ability, such as the AMPS, in the clinical assessment of women with fibromyalgia when planning to individualize the interventions offered.

The authors declare no conflicts of interest.

REFERENCES

1. Turk DC, Dworkin RH, Allen RR, Bellamy N, Brandenburg N, Carr DB, et al. Core outcome domains for chronic pain clinical trials: IMMPACT recommendations. Pain 2003; 106: 337–345.
2. Cieza A, Stucki G, Weigl M, Kullmann L, Stoll T, Kamen L, et al. ICF Core Sets for chronic widespread pain. J Rehabil Med 2004; Suppl 44: 63–68.
3. Carville SF, Choy EH. Systematic review of discriminating power of outcome measures used in clinical trials of fibromyalgia. J Rheumatol 2008; 35: 2094–2105.
4. Bellamy N. Osteoarthritis clinical trials: Candidate variables and clinimetric properties. J Rheumatol 1997; 24: 768–778.
5. Buchbinder R, Bombardier C, Yeung M, Tugwell P. Which outcome measures should be used in rheumatoid arthritis clinical trials? Clinical and quality-of-life measures' responsiveness to treatment in a randomized controlled trial. Arthritis Rheum 1995; 38: 1568–1580.
6. Wæhrens EE, Amris K, Fisher AG. Performance-based assessment of activities of daily living (ADL) ability among women with chronic widespread pain. Pain 2010; 150: 535–541.
7. Amris K, Wæhrens EE, Jespersen A, Bliddal H, Danneskiold-Samsøe B. Observation-based assessment of functional ability in patients with chronic widespread pain: a cross sectional study. Pain 2011; 152: 2470–2476.
8. Wæhrens EE, Bliddal H, Danneskiold-Samsoe B, Lund H, Fisher AG. Differences between questionnaire- and interview-based measures of activities of daily living (ADL) ability and their association with observed ADL ability in women with rheumatoid arthritis, knee osteoarthritis, and fibromyalgia. Scand J Rheumatol 2012; 41: 95–102.
9. Fisher AG. Assessment of motor and process skills. Volume 1: Developement, standardization, and administration manual. 7th edn. Fort Collins, Colorado; Three Star Press, Inc; 2010.
10. Wolfe F, Hawley DJ, Goldenberg DL, Russell IJ, Buskila D, Neumann L. The assessment of functional impairment in fibromyalgia (FM): Rasch analyses of 5 functional scales and the development of the FM Health Assessment Questionnaire. J Rheumatol 2000; 27: 1989–1999.
11. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. Arthritis Rheum 1990; 33: 160–172.
12. Burckhardt CS, Clark SR, Bennett RM. The fibromyalgia impact questionnaire: development and validation. J Rheumatol 1991; 18: 728–733.
13. Bjorner JB, Damsgaard MT, Watt T, Groenvold M. Tests of data quality, scaling assumptions, and reliability of the Danish SF-36. J Clin Epidemiol 1998; 51: 1001–1011.
14. Patel AA, Donegan D, Albert T. The 36-Item Short Form. J Amer Acad Orthopaed Surgeons 2007; 15: 126–134.
15. Fisher AG. Assessment of motor and process skills: Vol. I: Developement, Standardization, and administration manual. 6th edition. Fort Collins, Colorado; Three Star Press, Inc; 2006.
16. AMPS2005 computerscoring software. Fort Collins, Colorado; Three Star Press, Inc; 2005.
17. Fisher AG. The assessment of IADL motor skills: an application of many-faceted Rasch analysis. Am J Occup Ther 1993; 47: 319–329.
18. Merritt BK. Validity of using the Assessment of Motor and Process Skills to determine the need for assistance. Amer J Occupat Ther 2011; 65: 643–650.
19. Bennett R. The Fibromyalgia Impact Quationaire (FIQ): a review of its developement, current version, operating characteristics and uses. Clin Exp Rheumatol 2005; 23: 154–162.
20. Ware JE, Jr, Sherbourne CD. The MOS 36-item Short-Form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992; 30: 473–483.
21. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp; 2010.
22. Dworkin RH, Turk DC, Wyrwich KW, Beaton D, Cleeland CS, Farrar JT, et al. Interpreting the clinical importance of treatment outcomes in chronic pain clinical trials: IMMPACT recommenda-

tions. J Pain 2008; 9: 105–121.

23. Amris K, Waehrens EE, Jespersen A, Stockmarr A, Bennett R, Bliddal H, et al. The Relationship between mechanical hyperalgesia assessed by manual tender point examination and disease severity in patients with chronic widespread pain: a cross-sectional study. Int J Rheumatol 2014; 2014: 417596.

24. Amris K, Waehrens EE, Stockmarr A, Bliddal H, Danneskiold-Samsoe B. Factors influencing observed and self-reported functional ability in women with chronic widespread pain: a cross-sectional study. J Rehabil Med 2014; 46: 1014–1021.

25. Jones J, Rutledge DN, Jones KD, Matallana L, Rooks DS. Self-assessed physical function levels of women with fibromyalgia: a national survey. Women's Health Issues 2008; 18: 406–412.

26. Amris K, Waehrens EE, Christensen R, Bliddal H, Danneskiold-Samsoe B. Interdisciplinary rehabilitation of patients with chronic widespread pain: primary endpoint of the randomized, nonblinded, parallel-group IMPROvE trial. Pain 2014; 155: 1356–1364.

27. Fisher AG, Atler K, Potts A. Effectiveness of occupational therapy with frail community living older adults. Scand J Occup Ther 2007; 14: 240–249.

28. Kottorp A, Hällgren M, Bernspång B, Fisher AG. Client-centred occupational therapy for persons with mental retardation: implementation of an intervention programme in activities of daily living tasks. Scand J Occup Ther 2003; 10: 51–60.

29. Hâllgren M, Kottorp A. Effects of occupational therapy intervention on activities of daily living and awareness of disability

in persons with intellectual disabilities. Austral Occupat Ther J 2005; 52: 350–359.

30. Wolfe F, Anderson J, Harkness D, Bennett RM, Caro XJ, Goldenberg DL, et al. Health status and disease severity in fibromyalgia: results of a six-center longitudinal study. Arthritis Rheum 1997; 40: 1571–1579.

31. McBeth J, Jones K. Epidemiology of chronic musculoskeletal pain. Best Pract Res Clin Rheumatol 2007; 21: 403–425.

32. Walitt B, Fitzcharles MA, Hassett AL, Katz RS, Hauser W, Wolfe F. The longitudinal outcome of fibromyalgia: a study of 1555 patients. J Rheumatol 2011; 38: 2238–2246.

33. Mannerkorpi K, Svantesson U, Broberg C. Relationships between performance-based tests and patients' ratings of activity limitations, self-efficacy, and pain in fibromyalgia. Arch Phys Med Rehabil 2006; 87: 259–264.

34. Poole JL, Atanasoff G, Pelsor JC, Sibbitt WL. Comparison of a self-report and performance-based test of disability in people with systemic lupus erythematosus. Disabil Rehabil 2006; 28: 653–658.

35. Wæhrens EE. Measuring quality of occupational performance based on self-report and observation: development and validation of instruments to evaluate ADL task performance. Departments of Community Medicine and Rehabilitation, Occupational Therapy, Umeå University, Sweden; 2010.

36. Hidding A, van Santen M, De Klerk E, Gielen X, Boers M, Geenen R, et al. Comparison between self-report measures and clinical observations of functional disability in ankylosing spondyitis, rheumatoid arthritis and fibromyalgia. J Rheumatol 1994; 21: 818–823.