Reliability of the Canadian Occupational Performance Measure in Children with Physical Disabilities of Arabic Context

Running title: Arabic COPM in Children with Disability

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Abstract

Objectives: Although the Canadian Occupational Performance Measure (COPM) is available in more than 20 languages in 35 countries, its reliability with children with physical disabilities hasn't been examined yet. Hereby, this study aimed to examine the inter-rater and test-retest reliability of the Arabic-COPM in children with physical disabilities.

Methods: A convenient sample of parents of children with physical disabilities was recruited from private rehabilitation societies and centers in Jordan from October 2020 to August 2021. For inter- rater reliability, one hundred parents of children with physical disabilities completed Arabic-COPM twice by two independent raters. For test-retest reliability, a sample of them (30 parents) completed the Arabic COPM after 2-weeks of the first interview. Parents were asked to identify the five most important problems their children perceived during daily life and to score performance and satisfaction for each identified problem.

Results: Inter-rater and test-retest reliabilities were examined by intra-class correlations (ICC), Bland-Altman, and Cohen's Kappa. Inter-rater reliability, performance-ICC, and satisfaction-ICC scores were 0.84 and 0.80, respectively. Test-retest reliability, performance-ICC, and satisfaction- ICC scores were 0.83 and 0.91, respectively. Inter-rater agreement, both raters similarly prioritized 73% of the problems identified by parents, and Bland-Altman agreement scores were -1.69 to 1.60 and -1.03 to 0.98 for performance and satisfaction means scores, respectively. Cohen's kappa coefficient of the five identified problems were (0.22±0.10) and (0.19±0.16) for inter-rater and test- retest reliability data, respectively. In addition, parents prioritized problems that were more related to the daily activity (82-85% of the total problems) with much concern for mobility followed by the dressing and eating functions subcategory.

Conclusion: This study's findings provided evidence of excellent inter-rater and test-retest reliability of the Arabic-COPM, which may serve as a promising instrument to promote a family-centered approach to pediatric rehabilitation.

Keywords: Arabic; Canadian occupational performance measure; Reliability; Inter-rater agreement; Cchildren with disability

Introduction

Physical disability in children exists in a wide range of non-progressive developmental disorders associated with the immature development of neural tissues, such as Cerebral Palsy (CP) and Spina Bifida (SB) [1]. Children with physical disabilities experience limitations in performing daily activities that lead to impaired ability to transfer, stand, or walk, thus diminishing their functional independence [2,3]. Improvement in functional

performance and community participation are important goals for any rehabilitation program, especially in the last few decades, where pediatric rehabilitation programs tend to be increasingly focused on a family-centered approach [4,5] that implies addressing the difficulties experienced by parents of children with disabilities [6] in a wide variety of daily activities and their performance quality [7]. In family-centered practice, the family is engaged in all aspects of service delivery, from determining treatment goals, agreeing on effective treatment plans, and achieving the desired treatment outcome. The task of the therapist is to be attentive to the needs of the parents related to their children and to provide all the knowledge required to make informed decisions [8], and one of the well-known outcome measures that address the families' perspective is the COPM [9].

The COPM is a client-centered measure developed by Law et al. [10]. It is available in more than 20 languages and more than 35 countries [11]. It has been extended to describe and quantify both the qualitative and quantitative aspects of functional performance, the role of life, the environment, and the needs of individuals. It encourages clients to address their thoughts and problems freely with their therapist so that they can be analyzed and resolved [12]. The clients share their perceptions of personal performance and satisfaction in these areas of concern. Consequently, the cooperation between the client and the therapist ensures that the client participates in the evaluation and treatment plan and engages in the intervention process [13].

The inter-rater reliability of the COPM was examined in groups of patients with a range of different medical disorders [14-16]. The intra-class Correlation Coefficient (ICC) of the performance and satisfaction of the COPM in clients with chronic obstructive pulmonary disease (COPD) showed excellent reliability for performance and satisfaction (r = 0.92, r = 0.90, respectively) [14]. Besides, excellent reliability was reported in another study that examined the reliability of COPM in Taiwanese clients with psychiatric disorders, r = 0.84 for performance and r = 0.84 for satisfaction [15], and in a study that examined the reliability of COPM in clients with stroke (r = 0.89 for performance and r = 0.88 for satisfaction) [16].

The inter-rater agreement of the problems identified by the COPM ranged from moderate to high in clients with various diagnoses and disorders. For example, a previous study showed that 80% of the problems identified with the COPM by the parents of children with physical disabilities were prioritized again when they were interviewed for a second time within a week by a different interviewer [17]. Another study Eyssen et al. [18] found that 66% of the problems prioritized in the first assessment were prioritized in the second assessment too in patients with various neurological disorders.

Although the application of COPM in clinical practice and research is expanding [8,19-21] and an Arabic-COPM exists, the reliability of the Arabic-COPM when used with children with disabilities has not been examined yet. Since the COPM is used to assess the achievement of family-centered goals of children with disabilities, it is important to examine the test-retest and interrater reliability of the Arabic-COPM. Therefore, this study aims to assess the inter-rater and test-retest reliability of the Arabic-COPM application with parents of children with physical disabilities, identify the parents' priorities for activities and participation among their children with physical disabilities, and describe the parent-identified problems with the highest priority.

The study addresses the following research questions:

1. Is the Arabic-COPM a reliable instrument to be used by two assessors when evaluating the same child relating to both the quantitative (score of performance and satisfaction) and qualitative parts (prioritized problems)?

2. What is the inter- rater agreement of the prioritized problems when the Arabic-COPM is used?

3. What are the most common problems of families related to the activities and participation of their children with physical disabilities when Arabic-COPM is used?

Methods

Ethical Approval

The study design and procedures were approved by the ethics committee of King Abdallah University Hospital and Jordan University of Science and Technology (JUST-34-2020). All participants provided informed written consent before data collection.

Study Population

This is a cross-sectional study, where parents of children with physical disabilities were recruited from various centers including private and general rehabilitation centers in Amman and Irbid, two of the largest cities in Jordan. During the study period, 113 parents with children with physical disabilities were invited to participate from private rehabilitation societies and centers in Jordan during the period extended from October 2020 to August 2021, and 100 parents were successfully participated and completed the study. The reasons for the incomplete data of 13 parents were scheduling problems and failure to keep the second appointment. The inclusion criteria were parents of children with any physical disability due to non-progressive neurological disorders confirmed by a neurologist, perceived limitations in more than one activity of daily life, and no difficulty in understanding the Arabic language.

The data collection session started with the children's families being informed about the purpose and procedures of the study. All participants furnished their written informed consent to participate in the study.

COPM Assessment

The COPM is a client-centered measure used to identify major problems that face the child in daily living. The coding system developed by Pollock and Stewart [22] was used to classify the problem priorities in the performance defined by families. It included 3 main categories and 10 subcategories. The first main category was daily activities, with three subcategories (self-care, mobility, communication), the second main category was productivity with three subcategories (household, school, community), and the third main category was leisure, with four subcategories (socialization, community entertainment, quiet recreation, and physical recreation). Besides, the self-care sub-category priorities were further categorized into five minor categories: eating, dressing, bathing, toileting, and hygiene.

Procedure

The data were obtained by two independent raters who were clinical rehabilitation therapists trained to administer the COPM before collecting the data. The Arabic translation of the COPM was used. The administration of the COPM consists of five steps. In the first step, parents identified the tasks and activities their children have the most difficulty or problems with. In the second step, the parents used a scale from 1 to 10 (1 being not at all important and 10 being extremely important) to prioritize all identified problems and difficult tasks. In the third step, the parents were asked to identify the five most important problems their children perceive during daily activities. In the fourth step, parents were asked to rate their children's performance in each of the top five tasks selected out of 10 points (1 being unable to execute the action and 10 being able to perform the task perfectly). In the last step, parents rated their satisfaction with their children's work and performance (1 being not at all satisfied and 10 being totally satisfied). Mean scores were calculated for performance and satisfaction.

To assess the inter-rater reliability, 100 parents completed the Arabic version of COPM twice on the same day through a structured interview and assessment visits conducted by two independent raters (R & S) who were blinded to each other's findings. On each occasion, the COPM interview resulted in a maximum of five prioritized problems with performance and satisfaction scores for each prioritized problem (Figure 1). To examine the test-retest reliability, a random sample of 30 parents out of the 100 parents interviewed was asked to attend a third-time assessment visit after 14 days from the first assessment visit. In the third visit, parents completed the Arabic - COPM through a structured interview conducted by the same assessor (R) who interviewed them during the first assessment visit. The assessor administered the COPM and concluded with performance and satisfaction scores for each prioritized problem (Figure 1).

Figure 1: Study flow chart.
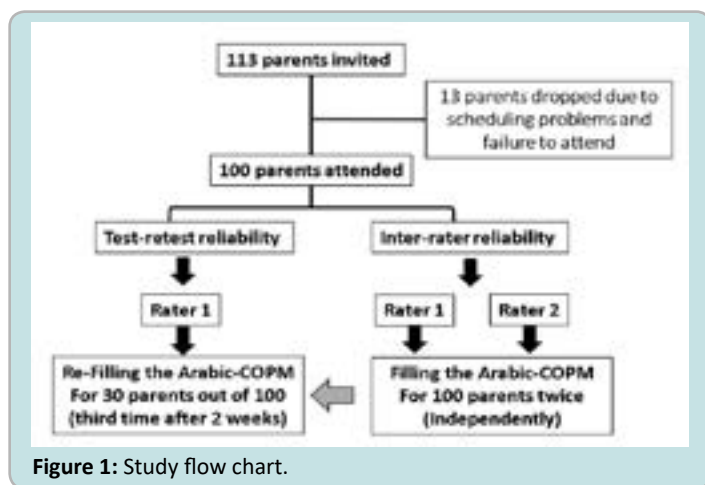
Data Analysis

The inter-rater reliability and test-retest reliability were evaluated based on the mean scores (sum scores divided by the number of identified problems) calculated for performance and satisfaction and calculated by Intra-class Correlation Coefficient (ICC) using a two-way mixed model consistency type (for the test-retest study) and a two-way mixed model absolute agreement type (for the inter-rater study) of the mean performance and

satisfaction scores. ICC values ranging from 0.4 to 0.59 were considered fair, 0.6 to 0.74 were considered good, and values > 0.75 considered excellent [23].

In addition, in the inter-rater agreement of the prioritized problems, the problems identified by the first-rater were compared with those identified by the second-rater, in which the agreement was expressed as the number of problems prioritized by the second-rater that had been prioritized by the first-rater too, divided by the total number of problems prioritized by the first-rater.

Besides, the agreement between the inter-raters and test-retest was also evaluated by two methods:

1) Bland and Altman method, and 2) Cohen's kappa coefficient. Bland and Altman's method was used to provide a graphical plot that quantifies the agreement between the two quantitative measurements obtained by the two independent raters by creating a scatter plot of XY, in which the Y-axis shows the difference between the two independent raters' scores (R scores –S scores) and the X-axis represents the mean scores of the two independent raters ((R scores + S scores)/2) [24]. Besides, it was recommended that the plotted data points would be distributed between two statistical limits of agreement (upper and lower agreement limits) that represented a 95% confidence interval to claim an acceptable and good inter-rater agreement level and to exclude any potential proportional bias [25]. The upper and lower agreement limits are calculated by (mean bias ± (1.96*SD)), respectively. Besides, to exclude proportional bias, the linear regression analysis was calculated to predict the score difference based on the mean scores.

Cohen's kappa coefficient was used to measure the inter-rater agreement for the qualitative items, which are the three main categories (daily activity, productivity, and leisure) of the five prioritized problems identified by the COPM coding system [26]. Cohen's kappa coefficient would range from no agreement (< 0), slight agreement (0.00 to 0.20), fair agreement (0.21 to 0.40), moderate agreement (0.41 to 0.60), substantial agreement (0.61 to 0.80), to almost perfect agreement (0.81 to 1.00) [27]. All the statistical analyses were carried out using the (SPSS) software (version 23.0).

Table 1: Demographic characteristics of the interviewed parents and their children with physical disabilities.

Children Characteristics (n=100)		Parents Characteristics (n=100)	
Age (years)	5.4 ± 2.7	Mother	83 (83%)
Weight (kg)	17.6 ± 6.8	Father	10 (10%)
Height (cm)	98.3 ± 19.5	Other	7 (7%)
Diagnosis		Educational Level	
Cerebral Palsy (CP)	60 (60%)	University degree	57 (57%)
Spina Bifida (SB)	20 (20%)	Non-university degree	43 (43%)
Other diagnosis	20 (20%)	Monthly Income	
Gender		High income (> 900 USD)	24 (24%)
Male	54 (54%)	Middle income (450 - 900 USD)	56 (56%)
Female	46 (46%)	Low income (< 450 USD)	20 (20%)

Results

The demographic characteristics of the study population are presented in Table 1. The mean age of children with physical disabilities was 5.4 ± 2.7 years, with 54 males and 46 females, and 83% of interviewed parents were the children's mothers.

Inter-rater Reliability & Agreement

In terms of inter-rater reliability, the ICC for the mean scores of the performance and satisfaction were 0.84 (95% CI 0.77-0.89) (P < 0.001), and 0.80 (95% CI 0.70-0.86) (P < 0.001) respectively. In terms of inter-rater agreement, the first rater identified 460 problems and the second-rater identified 450. Out of the 460 prioritized problems identified by the first-rater, 338 (73.5%) were prioritized by the second-rater too (Table 2).

Table 2: Parents' prioritized problems identified by the first rater (460 problems) and the second rater (450 problems).

Main Category	First Rater	Second Rater
Sub-category	# Problem (%)	# Problem (%)
Daily Activity	380 (82%)	383 (85%)
Mobility	226 (49%)	225 (50%)
Self-Care	150 (33%)	154 (34%)
Communication	4 (1%)	4 (1%)
Productivity	30 (7%)	24 (5%)
School	30 (7%)	24 (5%)
House-hold	0 (0%)	0 (0%)
Community	0 (0%)	0 (0%)
Leisure	50 (11%)	43 (10%)
Socialization	14 (3%)	16 (4%)
Community entertainment	13 (3%)	10 (2%)
Quiet Recreation	1 (1%)	0 (0%)
Physical Recreation	22 (5%)	17 (4%)

The table presents the number (#) and percentage (%) of problems (out of the total number of problems) for the main categories and subcategories of the Arabic-COPM for each rater (R & S). Problems in the Arabic-COPM were categorized according to the coding system of the COPM in three main categories 'daily activity', 'productivity', and 'leisure', with further subcategories for each.

Besides, Bland and Altman's test showed a good level of quantitative inter-rater agreement in the mean scores of performance and satisfaction of the problems that were prioritized by the two independent raters. This is because the limits of agreement for performance scores were -1.69 to 1.60 (mean bias = -0.048, SD 0.84) and for satisfaction scores, -1.028 to 0.98 (mean bias = -0.024, SD 0.512). The Bland and Altman agreement plots are presented in Figures 2 and 3).
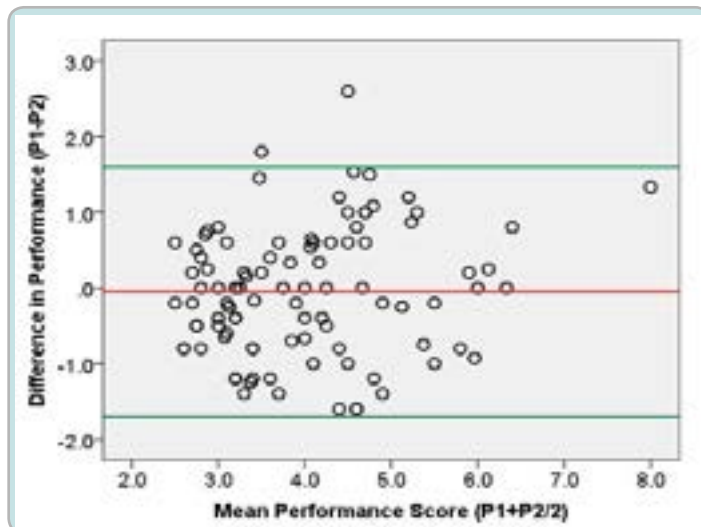

Figure 2: Bland & Altman inter-rater agreement plot of performance scores.

A scatter plot shows the score difference between the performance scores obtained by the two independent raters (P1-P2) vs. the mean performance scores obtained by the two independent raters (P1+P2/2) of the studied sample (n=100). The red line represents the mean bias (-0.048), and the green lines represent the upper limit of agreement (1.60) and the lower limits of agreement (-1.69), where 95% of plotted data located within (mean ± 1.96*SD), and this indicates a good quantitative agreement level between the two independent raters.
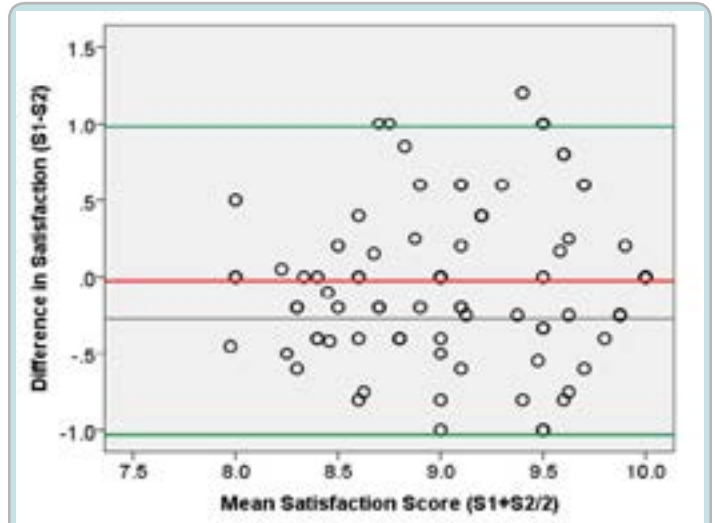

Figure 3: Bland & Altman inter-rater agreement plot of satisfaction scores.

A scatter plot shows the score difference between the satisfaction scores obtained by the two independent raters (S1-S2) vs. the mean satisfaction scores obtained by the two independent raters (S1+S2/2) of the studied sample (n=100). The red line represents the mean bias (-0.024), and the green lines represent the upper limit of agreement (0.98) and the lower limits of agreement (-1.03), where 95% of plotted data located within (mean ± 1.96*SD), and this indicates a good quantitative agreement level between the two independent raters.

The linear regression analysis showed no proportional bias or strong systematic difference in the mean scores of performance and satisfaction of the problems that were prioritized by the two independent raters. This is because the score difference based on the mean scores of the scatter plotted data showed non-significant regression (F (1,98) = 2.80, P=0.098) with an R^2 of 0.028 for the performance scores, and (F (1,98) = 0.83, P=0.364) with an R^2 of 0.008 for the satisfaction scores. On the other hand, Cohen's kappa coefficients calculated for the three main categories (daily activity, productivity, and leisure) of the five prioritized problems identified by the COPM coding system showed a slight-to-fair inter-rater agreement level (0.22 ± 0.10).

Test-Retest Reliability & Agreement

In terms of test-retest reliability, the ICC for the mean scores of performance and satisfaction were respectively 0.83 (95% CI 0.64-0.92) (P < 0.001) and 0.91 (95% CI 0.81-0.95) (P < 0.001). In terms of the test-retest agreement, Bland and Altman's test showed an acceptable and good level of quantitative agreement in the mean scores for performance and satisfaction of the problems prioritized by the same rater in the first and third assessment visits (2 weeks after). This is because the limits of agreement for performance scores were -1.431 to 1.505 (mean bias = 0.036, SD 0.749) and for satisfaction scores, -0.562 to 0.782 (mean bias = 0.11, SD 0.343). The Bland and Altman agreement plots are presented in Figures 4 and 5).
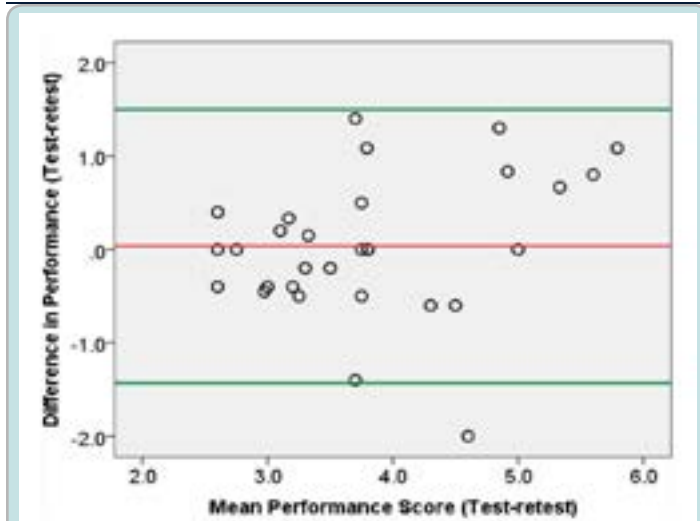
Figure 4: Bland & Altman test-retest agreement plot of performance scores.

A scatter plot shows the score difference between the performance scores obtained by the same rater in two different assessment sessions of 2-weeks interval (P1-P2) vs. the mean performance scores obtained by the same rater in two different assessment sessions of 2-weeks interval (P1+P2/2) of the random studied sample (30 out of 100 parents). The red line represents the mean bias (0.037), and the green lines represent the upper limit of agreement (1.50) and the lower limits of agreement (-1.43), where 95% of plotted data located within (mean ± 1.96*SD), and this indicates a good quantitative agreement level between the two independent raters.

Figure 5: Bland & Altman test-retest agreement plot of satisfaction scores.

A scatter plot shows the score difference between the satisfaction scores obtained by the same rater in two different assessment sessions of 2-weeks interval (P1-P2) vs. the mean satisfaction scores obtained by the same rater in two different assessment sessions of 2-weeks interval (P1+P2/2) of the random studied sample (30 out of 100 parents). The red line represents the mean bias (0.11), and the green lines represent the upper limit of agreement (0.78) and the lower limits of agreement (-0.56), where 95% of plotted data located within (mean ± 1.96*SD), and this indicates a good quantitative agreement level between the two independent raters.

On the other hand, Cohen's kappa calculated for the three main categories (daily activity, productivity, and leisure) of the five prioritized problems identified by the COPM coding system showed a slight to moderate test-retest agreement level (0.19 ± 0.16).

Families' Priorities of COPM

The first rater identified 460 problems and the second rater identified 450. The data showed that parent-prioritized problems were more related to the daily activity main category (82-85% of the total problems) with a major concern on the mobility subcategory (≈50 % of the total problem), followed by the leisure main category (10-11% of the total problem) with much concern on physical recreation subcategory (≈5% of the total problems), and ended with productivity main category (5-7%) that solely stressed the school subcategory (Table 2). In terms of the self-care subcategory of the daily activity main category, parents expressed their concerns relating to the dressing function, followed by the eating function (Table 3).

Discussion

The findings of this study provided evidence on the reliability of the Arabic -COPM to be used with parents of children with physical disabilities. They also identified the most common problems related to the daily activities of children with physical disabilities. As for reliability, the results showed that the Arabic-COPM is a reliable instrument for measuring the parents' perception of the functional performance of their children with physical disabilities and the parents' satisfaction. This is because the Arabic-COPM had excellent and high ICCs values ranging from 0.80 to 0.91% either for inter-rater reliability or for test-retest reliability. This is in congruence with previous studies that examined the reliability of COPM in other disease conditions. For example, the ICC values of the test-retest scores for the administration of COPM in patients with chronic obstructive pulmonary disease were
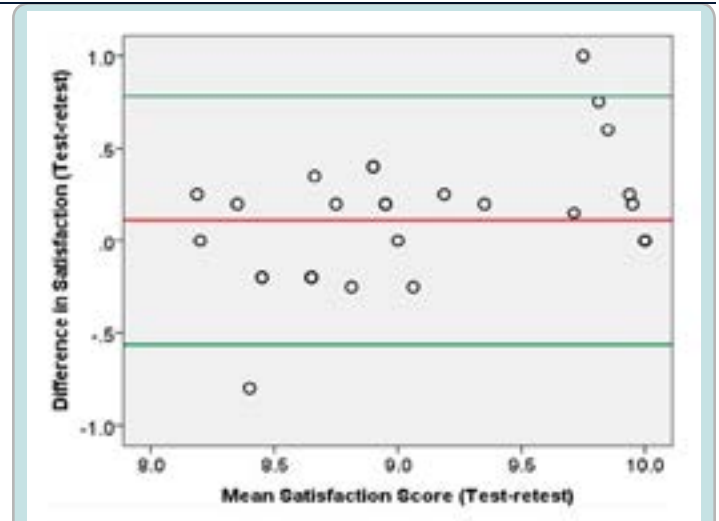
Table 3: Parents' prioritized problems identified - Test-retest.

Self-Care Sub-category	First Rater 150 Problem (%)	Second Rater 154 Problem (%)
Eating	38 (25%)	34 (22%)
Dressing	53 (35%)	53 (34%)
Toileting	22 (15%)	33 (21%)
Bathing	29 (19%)	22 (14%)
Hygiene	9 (6%)	12 (8%)

The table presents the number (#) and percentage (%) of problems (out of the total number of self-care problems) for the further subcategories of self-care subcategory the Arabic-COPM for test-retest.

approximately 0.90 [14], and approximately 0.85 in patients with psychotic disorders [15]. In addition, the reliability of the COPM in physical disabilities was reported to be around 0.92 in a study that examined the test-retest reliability of the COPM in patients with ankylosing spondylitis through a personal interview [28]. Therefore, our data provide much support for the applicability and clinical utility of the COPM to evaluate and to assess the functional performance of children with physical disabilities.

In terms of agreement level, our data showed that the Arabic-COPM inter-rater agreement level was good and acceptable; based on the Bland and Altman agreement methods. Besides, 73.5% of the prioritized problems identified by the first rater were prioritized by the second rater too. Compared to previous COPM-related studies, this study's percentage of good agreement is close to that reported in the previous study, where the English-COPM inter-rater agreement was 80% in parents with children with physical disabilities [17], and above the inter-rater agreement percentage of 56% reported in stroke patients [16], or the 66% reported in patients with various neurological and orthopaedic disorders [18]. A possible explanation for such percentages of the

agreement would be that, in the COPM, the clients' responses are influenced by many factors such as the ability of the parents to either over-or under-estimate their children's functional capacities while generating self- reports, the perspective and awareness of parents relating to their children's performances, and the degree to which therapists communicate with children's parents in guiding or encouraging them to answer [29,30]. This negotiation between parents and the therapist would probably rule out the problems that, on second thought or session, do not need rehabilitation intervention. Besides, parents' perceptions of problems may also lead to differences in the outcome of the identified problems. Therefore, it is assumed that the semi-structured design of the COPM may introduce some sort of or a certain extent of variability during the assessment [31]. Besides, its negotiation nature would generate a moderate inherent difference in the outcome of the identified problems between the first and second raters in this study, which would also explain the slight to moderate qualitative inter-rater agreement findings of Cohen's Kappa between the two raters. Altogether, we could still assume that the Arabic-COPM is a reliable instrument with a good inter-rater agreement level to identify the prioritized problems in children with a physical disability.

On the other hand, in terms of the identified prioritized problem, parents prioritized problems more focused on the daily activity (82-85% of the total problems) with much concern for mobility subcategory and self-care subcategory (eating and dressing), followed by the leisure (10-11% of the total problem) with much concern on the physical recreation subcategory (≈5% of the total problems), and ended with productivity (5-7%) that solely stressed the school subcategory. These findings are consistent with the psychological hypotheses of Maslow that suggest that individuals focus on fulfilling their basic daily needs before seeking professional achievement and leisure [32]. Later on, Duncan and Blugis [33] re-framed specifically the basic physiological needs for families with pediatric patients as nourishments, personal care, hygiene, and rest, followed by love and belonging that promote companionship, friendship, and interaction with family members and community. Health professionals who work with children with physical disabilities are encouraged to discuss these areas more with the families when setting goals for therapy.

From this perspective, it would be accepted that parents in this study viewed mobility and self-care of their children in light of their expectations related to their child's development, and reflected the willingness of the child to be able to fulfill self-care needs, which would not only reduce the amount of caregiver assistance, but also encourage peer socialization, involvement in group activities, and transition to independent living. The parents' priorities, perspectives, and views presented in this study are also consistent with the findings of previous studies, where the parents of children with cerebral palsy, who had physical disabilities, identified more priorities for daily activities, with self-care as the most frequent priority subcategory [34]. However, we have to deal with caution with the parent-prioritized problems reported here, because the scope and aim of this study did not cover the changes in the Arabic-COPM priorities according to the severity of the children's disabilities, which would influence the parent-prioritized problems. Hence, further studies are required in this regard.

Conclusion

In conclusion, the Arabic-COPM showed excellent inter-rater and test-retest reliability when administered to parents of children with physical disabilities. The problems identified by the Arabic-COPM were consistent enough and would help the identification of goals for pediatric rehabilitation, based on a client-centered approach.

Acknowledgment

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