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ORIGINAL PAPER

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Mastery Motivation in Children with Cerebral Palsy (CP) Based on Parental Report: Validity and Reliability of Dimensions of Mastery Questionnaire in Persian

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ABSTRACT

Introduction: The present study aimed to investigate validity and reliability of Persian Dimensions of Mastery Questionnaire (DMQ18) in children with cerebral palsy. **Material and Methods:** The original version was carried out through back translation into Persian, and then the construct validity was assessed by confirmatory factor analysis; and reliability was evaluated through Cronbach's alpha ($n=230$). Intra-class correlation coefficient (ICC) was used for test retest reliability ($n=32$). **Results:** 230 parents (155 (67.4%) mothers and 75 (32.6%) fathers) of children and adolescents with CP with an average age of 126.99 ± 24.59 months participated in the present research. Non-questions excluded from the confirmatory factor analysis, and thus all questions remained. Internal consistency reliability and total score were acceptable in all domains (higher than 0.70) except for negative reactions, sadness/shame (Cronbach's alpha of 0.414). Intra-class correlation coefficient of all domains and total score were significant ($p < 0.001$). **Conclusion:** DMQ18 (parental report) was valid and reliable for children with cerebral palsy. It also provided valuable information about different aspects of motivation in CP children according to their parents' opinion, and thus it can be used in clinical interventions.

Keywords: motivation, cerebral palsy, child.

efforts to master activities or skills (1, 2). Motivation leads to more confidence, creativeness and tendency while participating in special tasks and activities (3). Cerebral palsy (CP) is the motor disability in early childhood and has a significant effect on musculoskeletal features such as posture and movement (4). Children's motivation especially in children with disabilities such as cerebral palsy can affect rehabilitation programs and functional abilities (3, 5).

Furthermore, motivation is an essential key to learning new skills such as motor, social, or cognitive skills, adaption to a changing environment, and development of self care, social communication and relations, and psychological wellbeing (2, 3, 6). Children, who make efforts and challenge task or risks against successive failure, are more likely to have higher self-esteem and eventually may affect various aspects of life. Lack of motivation can inhibit realization of children's potential abilities (5, 7). Children's motivation is a personal factor which can affect the motor potential and results of interventions (8, 9). Clinicians can choose the best treatment plan after recognition of children motivation.

Parents' views and roles are very important as stated that social-environmental factors such as parenting styles and family ecology can influence motivation in children with and without disabilities (5, 9). According to Bartlett and Palisano's conceptual models, motivation is attributed to changes in children's motional abilities and personality characteristics in children with cerebral palsy (10). According to a research by Harris K,

1. INTRODUCTION

Mastery motivation is an inner psychological driving force which persuades individuals to take

Reid D., motivation plays an important role in changing children's motional performance and musculoskeletal factors (8).

Mastery motivation indicates information about children's behavior in challenging situations and predicts a successful challenging engagement. According to studies on children with disabilities, those with developmental disabilities had lower motivation and were passive in plays (11).

Motivation leads to learning of new skills as described by White's motivation theory. According to this theory, children have motivation to explore environment by walking, speaking, and manipulation of new objects. These functions and behavior help children in learning to interact with the environment. This learning process causes a feeling of competency (12). Therefore, mastery motivation can help to explain how children learn purposeful tasks, which are very important in rehabilitation. So there is a need for an instrument that can measure motivation in clinic or rehabilitation places specially for children. Dimensions of Mastery Questionnaire (DMQ) can be used to measure mastery motivation.

DMQ can be answered and completed by parents, teachers and children to determine their views on children's mastery motivation. The DMQ is thus a valuable questionnaire for future's family-centered approaches to rehabilitation (13).

Accordingly, the present study aimed to investigate validity and reliability of Persian Dimensions of Mastery Questionnaire in children with cerebral palsy.

2. METHODS

A sample of parents of children with cerebral palsy participated in the present study. Parents could fluently speak and read Persian. Parents were voluntarily recruited. Procedure and methodology of Forward-Backward translation of Dimensions of Mastery Questionnaire were performed by three individuals. Supervision of process was carried out by Professor Morgan as the questionnaire developer. Two translators who were fluent in Persian and English separately accomplished English to Persian translation, and then the consensus on the translations by both translators was combined and eventually the first Persian version of original questionnaire was produced in a session. Afterwards, cultural acceptability was performed by 15 parents of children with CP and 2 independent occupational therapists. Back translation was done by a translator whom maternal language was English and could also speak in Persian. Questionnaire was finally approved after sending Emails to professor Morgan. 32 parents of CP children filled the questionnaires after 2 weeks in order to achieve the reliability. Construct validity was obtained through factor analysis by AMOS software. Reliability was assessed by two-way internal consistency reliability (Cronbach's alpha) and test retest for intra-class correlation coefficient (ICC). Factor loadings were estimated using generalized least squares (14, 15). Validity of models was assessed by chi-square, the root mean square error of approximation (RMSEA) and adjusted goodness of fit index (AGFI) (16). The Chi-Square value is the traditional measure for evaluating overall model fit. A good model fit would provide an insignificant result at a 0.05 threshold. RMSEA values less than 0.05 indicated a good fit of model; and values from 0.05 to 0.08 were acceptable. Values for the GFI and AGFI also range between 0 and 1 and it is generally accepted that values of 0.90 or greater indicate well

fitting models. If any of these indexes indicated a poor fit to data, appropriate models were used following both theoretical and statistical criteria (residuals, modification indexes and expected change) to locate the source of misspecification and suggest how the model could be modified (17).

Research tool

Dimensions of Mastery Questionnaire (DMQ18), School-age Motivation Questionnaire (scored by adults):

DMQ18 has three current language versions: English, Chinese and Hungarian. There are four questionnaires (infant, preschool, school-age scored by adults, and scored by school-age children) in each language. Infant questionnaire is designed for infants at developmental ages of approximately 6-23 months scoring by adults. The preschool questionnaire is designed for young children at developmental age of approximately 2-6 years scoring by adults. The school-age questionnaire scored by adults is designed for student's school scores by adults (parents or teachers). The school-age self-scoring questionnaire is designed for student's school scoring by the children themselves. School-age Motivation Questionnaire (scored by adults) contains 41 items with five-point Likert scale (1-5) including score 1 for "never like this child" to 5 for "exactly like this child". Questionnaire was divided into eight sections containing the cognition-oriented persistence obtained from calculation of $(1+14+17+23+29+40)/6$, Gross Motor Persistence obtained from calculation of $(3+12+26+36+38)/5$, Social Persistence with Adults $(8+15+19+22+33+37)/6$, Social Persistence with children obtained from calculation of $(6+7+25+28+32+35)/6$, Mastery Pleasure obtained from calculation of $(2+11+18+21+30)/5$, Negative Reactions-frustration/anger obtained from calculation of $(9+13+16+41)/4$, Negative Reactions-sadness/shame obtained from calculation of $(5+24+34+39)/4$, and General Competence obtained from calculation of $(4+10+20+27+31)/5$ (13).

Cognitive levels

Cognitive levels were categorized into three groups according to a developed form by SPARCLE project: >70 , $50-70$, and <50 based on parents' responses. It was based on an algorithm depended on fulfilling the children's needs at schools and children abilities to understand concept and develop friendships compared to children at the same age or much younger children (18).

Gross Motor Function Classification System (GMFCS)

The GMFCS is categorized into five levels. Children at level 1 can walk without limitation. Children at level 2 can walk indoor, but they gave some problems outdoor; children at level 3 can walk by assistive devices; children at level 4 have self-mobility by the help of power mobility devices; and children at level 5 have severely limited self mobility (19).

Manual Ability Classification System (MACS)

The MACS is classified into five levels. Children at level 1 easily handle their activities. Children at level 2 handle activities with low quality and speed. Children at level 3 handle activities with difficulty and need help. Children at level 4 handle a limited number of easy activities, and children at level 5 cannot handle activities (20).

3. RESULTS

Total amount of 230 parents participated in study. They were 155 (67.4%) mothers and 75 (32.6%) fathers of children

Variable	n (%)
Children age: 126.99±24.59	
Gender	
Male	141 (61.3)
Female	89 (38.7)
Gross Motor Function Classification System (GMFCS)	
Level 1, They walk and climb stairs without difficulty	37(16.1)
Level 2, They walk with difficulty	42(18.3)
Level 3, They walk with assistive devices	52(22.6)
Level 4, They are unable to walk; limited self-mobility	38(16.5)
Level 5, They are unable to walk; severely limited self-mobility	61(26.5)
Manual Ability Classification System (MACS)	
Level 1, They easily handle activities	23(10.0)
Level 2, They handle activities with lower quality and speed	88(38.3)
Level 3, They handle activities with difficulty and need help	59(25.7)
Level 4, They handle a limited selection of easily-managed activities in situations	37 (16.1)
Level 5, They do not handle activities	23(10.0)
Cognitive Impairment	
IQ>70	115 (50.0)
IQ: 50–70	48 (20.9)
IQ< 50	67 (29.1)
Parent	
Mother	155 (67.4)
Father	75 (32.6)

Table 1. Child and parents socio-demographics characteristics (n=230)

with cerebral palsy. According to parental reports, mean age was 126.99±24.59 months and there was a superiority of boys (141/230, 61.3%). Gross Motor Function Classification System level included the following levels: level 1, 37(16.1%); level 2, 42(18.3%); level 3, 52(22.6%); level 4, 38(16.5%); and level 5, 61(26.5%). Manual ability classification system levels were as follows: level 1, 23(10.0%); level 2, 88(38.3%); level 3, 59(25.7%); level 4, 37 (16.1%); and level 5, 23(10.0%). From children, who participated in cognitive impairment, 115 children (50.0%) had IQ of higher than 70; 48 (20.9%) had IQ of 50–70; and 67 (29.1%) had IQ of lower than 50 as shown in Table 1. Table 2 shows ICCs and Cronbach’s alpha at subscales and total score correlation for cognition-oriented Persistence, Gross Motor Persistence, Social Persistence with Adults, Social Persistence with children, Negative Reactions- frustration/anger, General Competence, Negative Reactions-sadness/shame along with the total score. ICC equal to or greater than 0.70 was considered as acceptance of test-retest reliability; and Cronbach’s alpha equal to or greater than 0.70 was considered as accepted internal consistency (Fayers et al., 1997). Negative Reactions-sadness/shame items were not accepted for internal consistency reliability (Cronbach’s alpha was 0.414), but test-retest reliability was accepted (ICC of 0.908) with high significance (P<0.001). Other items in test-retest reliability and Cronbach’s alpha were accepted (Table 2).

According to construct validity by confirmatory factor analysis with AMOS, P-values of all subscales did not have any significant model fit (P>0.05), but all items were signifi-

DMQ18 Sub scales	Cronbach’s alpha	ICC(95%CI)	p	DF
Cognitive-Oriented Persistence	0.759	0.912(0.819-0.957)		
Gross Motor Persistence	0.741	0.846(0.685-0.685)		
Social Persistence with Adults	0.613	0.957(0.911-0.979)		
Social Persistence with children	0.620	0.792(0.574-0.898)		
Mastery Pleasure	0.677	0.836(0.663-0.920)	P<0.001	31
Negative Reactions-frustration/anger	0.654	0.878(0.751-0.941)		
Negative Reactions-sadness/shame	0.414	0.908(0.811-0.955)		
General Competence	0.802	0.932 (0.862-0.967)		
Total	0.930	0.943(0.884-0.972)		

Table2.Cronbach’s alpha (N=230), Internal consistency (N =32) of the DMQ18 subscale

cant (P<0.05), and thus all items were accepted and the model had good fit. The root mean square error of approximation (RMSEA) and adjusted goodness of fit index (AGFI) were acceptable (Table 3).

4. DISCUSSION

The present study indicated that the DMQ18 (parental report) was valid and reliable in children with cerebral palsy. We could not find any data and information about validity and reliability of DMQ18 because it was a new and developmental version of other versions. However, there was available extensive data about these issues in the DMQ17 in which the questions and scores were so similar to DMQ 18 (13), and thus we took the advantage of DMQ17 for validity and reliability. In the field of reliability, Morgan et al. (2012) found acceptable good internal consistency (alphas>0.74) for both English and Chinese and English versions of four DMQ 17 questionnaires that were answered by teachers (21). In addition, Huang and Lay (2011) found good parental reporting alphas for four questionnaire scales in typical children from 10 to 53 months of age in Taiwan (21). Hauser-Cram, Kraus, Warfield & Steele (1997) found good Cronbach’s alphas for teacher and parent DMQs on young American children with disabilities(22); and Miller, Marnane, Ziviani, and Boyd (2014a) investigated psychometrical properties in 5-14 year-old children with cerebral palsy and their parents. Cronbach alphas were acceptable for four persistence scales and mastery pleasure for parent rating (0.69- 0.86, mean of 0.76) (23).

According to reliability of test retest, Jozsa and Molnar (2013) established a range from 0.61 to 0.94, and the test-retest reliability of Hungarian parents and teachers with mean correlation of these scales was respectively 0.80 and 0.83 (24, 25).

Their outcome indicates that the test-retest correlation was maximum for cognitive/objective and gross motor persistence, and lower for social mastery scales and mastery pleasure, and minimum for negative reactions to failure. These results were consistent with our results at subscale of negative reaction- sadness/shame, but if we mix and compute negative reaction- sadness/shame with negative reaction- frustration/anger in internal consistency (Cronbach alphas was 0.414), we would have better results. Igoe et al. (2011) reported test-

Dimension	Load factor	Items included in domain	Model Fit			
			χ ²	p	RMSEA	AGFI
Cognitive-Oriented Persistence						
1. Works on a new problem until he or she can do it	0.76*					
14. Completes school work, even if it takes a long time	1.277*					
17. Tries to figure out all the steps needed to solve a problem	1.104*					
23. Works for a long time trying to do something challenging	1.09*	1,14,17,23,29,40	7.219	0.614	0.000	0.976
29. Will work for a long time trying to solve a problem for school	1.208*					
40. Prefers to try challenging problems instead of easy ones	1.000*					
Gross Motor Persistence						
3. Tries to do well at athletic games	0.747*					
12. Tries to do well in physical activities even when they are challenging	0.765*	3,12,26,36,38	3.184	.672	.000	.983
26. Repeats sports skills until he or she can do them better	0.6*					
36. Tries hard to get better at sports	0.693*					
38. Tries hard to improve his or her ball-game skills	0.416*					
Social Persistence with Adults						
8. Often discusses things with adults	0.238*					
15. Tries hard to interest adults in his or her activities	0.766*					
19. Tries to get adults to see his or her point of view	0.451*	8,15,19,22,33,37	8.954	.442	.000	.968
22. Tries hard to get adults to understand him or her	0.693*					
33. Tries to find out what adults like and don't like	0.692*					
37. Tries hard to understand the feelings of adults	0.763*					
Social Persistence with children						
6. Tries hard to make other children feel better if they seem sad	0.444*					
7. Tries to say and do things that keep other children interested	0.805*					
25. Tries hard to understand other children	0.688*	6,7,25,28,32,35	7.272	.609	.000	.975
28. Tries hard to make friends with other kids	0.183*					
32. Tries to get included when other kids are doing something	0.735*					
35. Tries to keep things going for a long time when playing with other kids	0.73*					
Mastery Pleasure						
2. Is pleased with self when finishes something challenging	0.284*					
11. Gets excited when he or she is successful	0.791*					
18. Gets excited when he or she figures something out	0.842*	2,11,18,21,30	3.184	.672	.000	.983
21. Is pleased when solves a problem after working hard at it	0.727*					
30. Smiles when succeeds at something he or she tried hard to do	0.738*					
Negative Reactions- frustration/anger						
9. Gets upset when not able to complete a challenging task	0.742*					
13. Gets frustrated when does not do well at something	0.754*	9,13,16,41	2.529	.282	.034	.973
16. Protests after failing at something tried hard to do	0.789*					
41. Gets angry if cannot do something after trying hard	0.301*					
Negative Reactions- sadness/shame						
5. Seems sad when he or she doesn't accomplish a goal	0.563*					
24. Won't look people in the eye when tries but cannot do something	0.478*	5,24,34,39	1.632	.442	.000	.982
34. Looks away when tries but cannot do something	0.301*					
39. Withdraws after trying but not succeeding	0.6*					
General Competence						
4. Solves problems quickly	0.526*					
10. Is very good at doing most things	0.616*					
20. Does things that are difficult for kids his or her age	0.845*	4,10,20,27,31	6.136	.293	.031	.969
27. Does most things better than other kids his or her age	0.748*					
31. Understands things well	0.608*					

Table 3- Summary of classification into DMQ18 subscales according to 230 families. *p<.001

retest reliability for parents of children and presented acceptable ICC coefficients (0.65 - 0.85, mean of 0.77) for the DMQ 17 scales except for mastery pleasure in Canada (25). Miller et al. (2014a) also found good test-retest reliability in Australian samples for parent rating of children with cerebral palsy; ICCs were 0.70-0.91 for DMQ 17 scales (23).

To assess validity, Jozsa et al. (2014) performed the principal axis factor analysis with orthogonal rotation on Hungarian, Chinese, and American school-age children's data of DMQ 17 from a large combined sample and each of three countries. For combined sample, there was a strong factorial evidence for validity (exploratory factor analysis) of five mastery motivation scales, but the cognitive persistence did not load on any scale. Therefore, all four persistence scales and mastery pleasure had good factorial validity for school-aged children from three cultures (26). We used confirmatory factor analysis for validity that our results were similar to studies in other countries. In addition, Jozsa et al. (2014) conducted studies on factor analysis in smaller sample of American, Chinese and very large sample of Hungarian school-age children in all cases; and most factors were accepted (27). Unlike to the other studies, we used confirmatory factor analysis for validity for instrument development. There is always a debate about parents' perception of children behavior in agreement with actual children's behavior; for example, Gilmore L. et al. reported that when children with developmental disabilities use structured tasks, they would have levels of motivation similar to their age-matched peers, whereas parental reports of motivation showed lower scores. There was also validity concern about translated a questionnaire into a language and culture and its application in another culture. We tried to overcome this problem by following principles of validity and reliability of tools. We suggested conducting studies on comparison of motivation between typical children with CP or disable children and find ways to increase children's motivation for accepting the rehabilitation.

5. CONCLUSION

The present study indicated that the DMQ18 (parental report) was valid and reliable for children with cerebral palsy. It also provided valuable information about different aspects of motivation in CP children according to parents' perspectives; hence, we could use it in clinical interventions and find the best interventional programs and even cognition of mastery motivation problems.

- **Authors' contributions:** Mahyar Salavati, Roshanak Vameghi, Seyed Ali Hosseini, Ahmad Saeedi and Masoud Gharib (authors) considered and aimed, the study and drafted the final manuscript and conceived of the study, participated in disseminating and, collecting the survey. All authors read, and approved of the final manuscript.
- **Conflict of interest:** The authors have no conflict of interest to declare.

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