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

Mahyar Salavati1, Roshanak Vameghi2, Seyed Ali Hosseini2, Ahmad Saeedi3, Masoud Gharib2

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.

1. INTRODUCTION
Mastery motivation is an inner psychological driving force which persuades individuals to take 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, adaptation 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,
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. 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.

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 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 test retest for intra-class correlation coefficient (ICC). Factor loadings were estimated using generalized least squares (14, 15).

Validity of models was assessed using 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 level. 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 is designed for school’s student’s 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 concepts 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 5 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.
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, 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); and level 5, they do not handle activities 23(10.0). Manual ability classification system levels were as follows: 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); and level 5, they are unable to walk; severely limited self-mobility 61(26.5). Cognitive Impairment IQ>70 115 (50.0) IQ: 50–70 48 (20.9) IQ<50 67 (29.1). Table 1. Child and parents socio-demographics characteristics (n=230)

Mastery Motivation in Children with Cerebral Palsy (CP) Based on Parental Report was 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 significant (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 questionnaires that were answered by teachers (21). In addition, Huang and Lay (2011) found good parental reporting questionnaires that were answered by teachers (21).

Table 2. Cronbach’s alpha (N=230), Internal consistency (N =32) of the DMQ18 subscale

| 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(0.574-0.888) | | |
| Mastery Pleasure | 0.677 | 0.836(0.663-0.920) | | |
| 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) | | |
Table 3: Summary of classification into DMQ18 subscales according to 230 families. *p<0.001

| Dimension                                      | Load factor | Items included in domain | Model Fit | x² | p       | RMSEA | AGFI |
|------------------------------------------------|-------------|--------------------------|-----------|----|--------|-------|------|
| Cognitive-Oriented Persistence                |             |                          |           |    |        |       |      |
| 1. Works on a new problem until he or she can do it | 0.76*       | 1,14,17,23,29,40         | 7.219     | 0.614 | 0.000  | 0.976 |
| 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*       |                          |           |    |        |       |      |
| 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     | 0.672 | 0.000  | 0.983 |
| 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     | 0.442 | 0.000  | 0.968 |
| 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*      | 6,7,25,28,32,35          | 7.272     | 0.609 | 0.000  | 0.975 |
| 25. Tries hard to understand other children | 0.688*      |                          |           |    |        |       |      |
| 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     | 0.672 | 0.000  | 0.983 |
| 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     | 0.282 | 0.034  | 0.973 |
| 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     | 0.442 | 0.000  | 0.982 |
| 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*      | 4,10,20,27,31            | 6.136     | 0.293 | 0.031  | 0.969 |
| 20. Does things that are difficult for kids his or her age | 0.845*      |                          |           |    |        |       |      |
| 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<0.001
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 disabled 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.

REFERENCES

1. Watkinson EI, Dwyer SA, Nielsen AB. Children theorize about reasons for recess engagement: Does expectancy-value theory apply? Adapted Physical Activity Quarterly. 2005; 22(2): 179-197.
2. Morgan GA, Busch-Rossnagel NA, Barrett KC, Wang J. The Dimensions of Mastery Questionnaire (DMQ): a manual about its development, psychometrics, and use. Fort Collins: Colorado State University. 2009.
3. Poulsen AA, Rodger S, Ziviani JM. Understanding children’s motivation from a self-determination theoretical perspective: Implications for practice. Australian Occupational Therapy Journal. 2006; 53(2): 78-86.
4. Abbasskhanian A, Rashidi V, Delpak A, Vameghi R, Gharib M. Rehabilitation Interventions for Children with Cerebral Palsy: A Systematic Review. Journal of Pediatrics Research. 2015; 3(1).
5. Majner A, Shevell M, Law M, Poulin C, Rosenbaum F. Level of motivation in mastering challenging tasks in children with cerebral palsy. Developmental Medicine & Child Neurology. 2010; 52(2): 1120-1126.
6. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American psychologist. 2000; 55(1): 68.
7. Jennings RD, Connors RE, Stegman CE. Does a physical handicap alter the development of mastery motivation during the preschool years? Journal of the American Academy of Child & Adolescent Psychiatry. 1988; 27(3): 312-317.
8. Harris K, Reid D. The influence of virtual reality play on children’s motivation. Canadian Journal of Occupational Therapy. 2005; 72(1): 21-29.
9. Gilmore R, Ziviani J, Sakzewski L, Shields N, Boyd R. A balancing act: children’s experience of modified constraint-induced movement therapy. Developmental neurorehabilitation. 2010; 13(2): 88-94.
10. Bartlett DJ, Palisano RJ. Physical therapists’ perceptions of factors influencing the acquisition of motor abilities of children with cerebral palsy: Implications for clinical reasoning. Physical therapy. 2002; 82(3): 237-248.
11. Majner A, Shiokako-Thomas K, Lach L, Shevell M, Law M, Schmitz N. Mastery motivation in adolescents with cerebral palsy. Research in developmental disabilities. 2013; 34(10): 3384-3392.
12. White RW. Motivation reconsidered: The concept of competence. Psychological review. 1999; 66(3): 245-272.
13. Morgan G, Wang J, Barrett K, Liao H, Wang P, Huang S, et al. The Revised Dimensions of Mastery Questionnaire (DMQ 18). Retrieved from. 2015.
14. Brown TA. Confirmatory factor analysis for applied research. Guilford Publications; 2014.
15. Floyd FJ, Widaman KF. Factor analysis in the development and refinement of clinical assessment instruments. Psychological assessment. 1995; 7(3): 286.
16. Goff B, Straub D, Boudreau M-C. Structural equation modeling and regression: Guidelines for research practice. Communications of the association for information systems. 2000; 4(1): 7.
17. Dickinson HO, Colver A, Group S. Quantifying the physical, social and attitudinal environment of children with cerebral palsy. Disability and Rehabilitation. 2011; 33(1): 36-50.
18. Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B. Development and reliability of a system to classify gross motor function in children with cerebral palsy. Developmental Medicine & Child Neurology. 1997; 39(4): 214-223.
19. Elyasson AC, Krumlinde-Sundholm L, Röshland B, Beckung E, Arner M, Öhrvall AM, et al. The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity, reliability, Developmental medicine and child neurology. 2006; 48(7): 549-554.
20. Morgan GA, Wang J, Liao HF, Xu Q. Using the Dimensions of Mastery Questionnaire (DMQ) to Assess Mastery Motivation of English-and Chinese-Speaking Children. 2012.
21. Hauser-Cram P, Krauss WS, Warfield ME, Steele A. Congruence and predictive power of mothers’ and teachers’ ratings of mastery motivation in children with mental retardation. Mental retardation. 1997; 35(3): 355-361.
22. Miller L, Marnane K, Ziviani J, Boyd RN. The Dimensions of Mastery Questionnaire in school-aged children with congenital hemiplegia: test–retest reproducibility and parent–child concordance. Physical & occupational therapy in pediatrics. 2014; 34(2): 168-184.
23. Jozsa E, Mohári ÉD. The Relationship Between Mastery Motivation, Self-Regulated Learning, and School Success. Handbook of self-regulatory processes in development: New directions and international perspectives. 2013: 265.
24. Igoe D, Peralta C, Jean L, Vo S, Yep LN, Zabjek K, et al. A pilot evaluation of the test-retest score reliability of the Dimensions of Mastery Questionnaire in preschool-aged children. Infants & Young Children. 2014; 25(2): 280-291.
25. Jozsa K, Morgan GA. Developmental changes in cognitive persistence and academic achievement between grade 4 and grade 8. European journal of psychology of education. 2014; 29(3): 521-535.
26. Jozsa K, Wang J, Barrett KC, Morgan GA. Age and cultural differences in self-perceptions of mastery motivation and competence in American, Chinese, and Hungarian school age children. Child Development Research. 2014.