

## Association between spasticity and the level of motor function with quality of life in community dwelling Iranian young adults with spastic cerebral palsy

Nasrin Salehi Dehno<sup>1</sup>, Shohreh Noorizadeh Dehkordi<sup>2</sup>, Mehdi Dadgoo<sup>3</sup>,  
Masoud Salehi<sup>4</sup>

Department of Physical Therapy, Rehabilitation faculty, Tehran University of Medical Sciences, Tehran, Iran.

Received: 17 June 2012

Revised: 27 August 2012

Accepted: 29 September 2012

### Abstract

**Background:** Consequences of cerebral palsy in adulthood can affect physical, psychological capabilities and quality of life. The purpose of this study was to investigate the relationship between quality of life with spasticity and level of motor function in Iranian young adults with spastic cerebral palsy who were community dweller.

**Methods:** In an analytical cross sectional study, 77 participants with spastic cerebral palsy (44 women, 33 men) with age range of 20 to 40 years; (mean age 26.19±5 yr) took part in this study. They were enrolled from three Raad Rehabilitation Goodwill complexes in Tehran and Karaj cities. All subjects were recruited through convenient sampling. Severity of Spasticity for knee flexors was measured with Modified Tardieu Scale. In addition, the level of motor function, and quality of life were assessed respectively through Gross Motor Function Classification System and World Health Organization Quality of life questionnaire (WHOQOL- BREF). To analyze data, Pearson and Spearman correlation coefficient was used.

**Results:** No correlation found between quality of life with knee flexor muscles spasticity and level of motor function ( $p > 0.05$ ).

**Conclusion:** Quality of life as a multi dimensional concept has been impacted by many factors such as physical status, environmental issues and culture. Possibly, severity of spasticity and level of function have a less pronounced effect on quality of life in community dwelling adults with cerebral palsy.

**Keywords:** Adult, Cerebral palsy, Quality of life, Spasticity

### Introduction

Nowadays, the number of individuals with cerebral palsy (CP) that survive into adulthood has increased, since life expectancy of children with CP has increased dramatically and their mortality rate has significantly re-

duced (1).

Consequences of cerebral palsy in adulthood can affect physical, psychological capabilities and quality of life (QOL) (1). One of the most common motor impairments in individual with CP is spasticity (2). Spasticity was characterized by velocity-dependent

1. MSc of Physical Therapy, Department of Physical Therapy, Rehabilitation Faculty, Tehran University of Medical sciences, Tehran, Iran. nsalehi358@gmail.com

2. (Corresponding author) Assistant professor, Department of Physical Therapy, Rehabilitation faculty, Tehran University of Medical Sciences, Tehran, Iran. noorizadeh@razi.tums.ac.ir

3. Assistant professor, Department of Physical Therapy, Rehabilitation Faculty, Tehran University of Medical sciences, Tehran, Iran. mehdidadgoo@yahoo.com

4. Assistant professor, Department of biostatistics, Faculty of management and Medical informatics, Tehran University of Medical Sciences, Tehran, Iran. salehi74@yahoo.com.

increase in resistance to passive movement. It is caused due to hyper excitability of the stretch reflex (3). Uncontrolled spasticity affects on joint alignment, activity of daily living and social participation (4). Studies have shown that adults with CP suffering from degenerative joints diseases, musculo-skeletal pain, fatigue, joint deformities and functional mobility deterioration (5, 6). However, they refer to specialized health services less frequently (7). Moreover, other problems of adults with CP are job finding, marriage and aging (8).

The most commonly applied physiotherapy techniques for CP patients are based on the reduction of impairments and improvement of function however both functional status and quality of life of CP patients are affected (9). World Health Organization Quality of Life group defines QOL as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (10). QOL scores of adult with CP are significantly lower than healthy people (11). Studies showed that CP children with better gross motor functioning perceived a higher physical QOL (12, 13). Ophiem et al reported that physical component correlated negatively with musculoskeletal pain in adults with CP, and there was hardly any correlation between pain and psychological component (14).

Vanderslot et al showed a positive relationship between level of motor function and physical aspect of Health Related Quality of Life (HRQOL) (15). Furthermore, Young et al reported level of motor function was responsible for 45/2% of variance in QOL scores in adults with CP (16)). In contrast, Tarsuslu et al and Gaskin and Morris found no correlation between

HRQOL and the functioning level in adult population (17). Therefore results of studies were conducted in adult with CP in the field of association between QOL or HRQOL and level of motor function are inconsistent. Also seldom studies exist that have explored relationship between spasticity and QOL in

adult CP people.

Determination of the association between spasticity and the level of motor function with QOL could be an evidence for the usefulness of therapeutic interventions.

The purpose of the present article was to investigate the relationship between quality of life with spasticity and level of motor function in community dwelling Iranian young adults with spastic cerebral palsy.

### Methods

Seventy-seven adults with CP were enrolled in this cross-sectional and analytical study. Participants were recruited from three Raad Rehabilitation goodwill complexes between April and August 2011. Inclusion criteria were diagnosis of spastic CP by a physician, age between 20 and 40 years and lack of any other neurological condition including neuropathies and myopathies. Subjects were excluded if they had a history of using inhibitory plasters, fractures, sprain or strain injury of their legs in the past 6 months and scored less than 18 on the Folstein Mini-Mental Status Test (MMSE) (18).

All assessments were completed by a physiotherapist during a single session and were performed in Raad Rehabilitation goodwill complexes. The ethic committee of the Tehran University of Medical Sciences and Health Services approved the study. Informed consent was obtained from all the participants.

Demographic data including age, gender, height, weight, marital status and type of spastic CP (unilateral and bilateral), according to the classification system by of Surveillance of Cerebral Palsy in Europe (SCPE)(19) ) and history of taking anti spasticity drug or injection of botulinum toxin type A or any other surgery within the 12 month period were obtained through patients' records.

To determine the level of motor function or severity of motor impairment, we used the Gross Motor Function Classification System (GMFCS). The GMFCS is a 5-level classification system which describes motor performance on the basis of functional sitting

Table 1. quality of muscle reaction (Gracies et al 2001).

Grade	Description
0	No resistance throughout the course of the passive movement slight
1	Slight resistance throughout the course of the passive movement
2	Clear catch at a precise angle, interrupting the passive movement, followed by release
3	Fatigable clonus (<10 second) occurring at a precise angle
4	Infatigable clonus (>10 second) occurring at a precise angle.

and walking ability and need for assistive technology and wheeled mobility. Individuals in level 1 walk independently while an individual in level 5 has no independent mobility except with significant assistive devices (20). In recent years, it has been reported that GMFCS is a reliable and valid tool for classifying gross motor functioning in adults with CP (20). Spasticity was assessed by the Modified Tardieu Scale (MTS). MTS grades the quality of muscle reaction into 5 levels (Table 1) (21). To measure spasticity, the knee joint was moved with a fast stretching velocity. When the grade of muscle reaction reached two or more, movement was repeated to measure an angle of catch or clonus with hand held goniometer (21).

To test spasticity of knee flexor muscles, participants were lied in supine position on a bed, and their hips flexed at 90° and the knees allowed to flex fully under gravity. While one hand of the therapist stabilized the thigh, and the other held under the ankle, so the knee could be moved into the position of maximal extension with a fast-stretching velocity (as fast as possible). When MTS score was detected two or more, movement was repeated to obtain an angle of spasticity. In order to apply goniometer, axis was put over the lateral epicondyle of the femur, with stationary arm parallel to long axis femur and movable arm parallel to long axis of tibia. An assistant held lower limb in this angles and the rater measured given angle by goniometer. Angle of muscle reaction showed severity of spasticity. The affected knee was tested in adults with unilateral involvement while the more affected knee was measured in those with bilateral involvement.

The quality of life was measured by the World Health Organization Quality of life questionnaire (WHOQOL- BREF); it con-

sists of 26 items and envelops four QOL dimensions: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items) along with two overall QOL and general health items. To score each item within every domain, a 5-point rating scale was used in which higher scores indicated better QOL. All scores were transformed in to a range of 0-100. There is no overall score for the WHOQOL-BREF (22). The WHOQOL-BREF has been shown to have a good-to-excellent reliability and an acceptable validity in various groups of participants in Iran (23). Participant filled out the WHOQOL-BREF questionnaire on their own. In this study, spasticity of knee flexor muscles was measured because knee flexor muscles spasticity can greatly interfere with mobility

Each participant was given a familiarization trial before the first test session and all assessments were performed randomly.

#### *Statistical analysis*

Analyses were performed with SPSS 19 for Windows. The Kolmogorov-smirnov test was used to test the normal distribution of variables. In addition, the relationship between quality of life with spasticity, contracture and level of motor function were assessed using Pearson's product moment correlation coefficient ( $r$ ) and spearman's rank correlation coefficient. The correlation coefficients were interpreted according to Domholt (24). Mann-Whitney U and independent sample T tests were used to compare mean scores of QOL between the two genders.

#### **Results**

Table 2 presents demographic and clinical characteristics of 77 young adults with spastic CP. In a pilot study on 30 participants,

Table 2. Demographic and clinical characteristics of 77 young adults with spastic CP

Characteristics	
Age in year, mean(SD)	26/14(5)
Height(cm), me (SD)	162.79(12.11)
Weight(kg), mean (SD)	56.52(13.63)
Gender, n (%)	
Male	33(43)
Female	44(57)
Marital status, n (%)	
Married	0(0)
Single	77(100)
CP type, n (%)	
Spastic unilateral	29(38)
Spastic bilateral	48(62)
anti spasticity drug or injection of botolinum toxin type A within recent 12 month:	
yes	0(0)
no	77(100)
Presence of knee flexor muscle spasticity, n (%):	
With spasticity	43(56)
Without spasticity	34(34)
GMFCS, n (%):	
Level I	22(28.6)
Level II	27(35.1)
Level III	15(19.5)
Level IV	11(14.3)
Level V	2(2.6)

SD: standard deviation; n (%): number (percent)

GMFCS: Gross motor function classification system

the inter-rater reliability of spasticity angle was very high (Intraclass coefficient (ICC) value was 0.93 ( $p=0.000$ )). Also, the intra-rater reliability of spasticity angle in 10 participants was investigated in two sessions over one week. The ICC value was 0.89 ( $p=0.000$ ).

Among the 77 spastic CP participants, 43 (56%) had spasticity in knee flexor muscles. No correlation was found between the severity of knee flexor muscles spasticity with the four domains of QOL and the two general items in these 43 individuals ( $p>0.05$ ) (table 3).

In addition, no correlation existed between QOL and the level of motor function ( $p>0.05$ ). Table 4 shows value of  $r$  and signification of the relationship between QOL and spasticity and level of motor function in 77 participants with cerebral palsy.

Table 5 presents the results of Mann-Whitney U and independent sample T tests for comparing mean scores of QOL's domains in two genders. No significant difference was found between males and females

in QOL domain score.

### Discussion

Our results showed that spasticity and level of gross motor function were not correlated with QOL. Adaptation of our study population to their condition and acceptance of their disability may have resulted due to lack of association between spasticity and QOL domains. These observations were consistent with previously work performed in stroke (25). In contrast, Welmer et al reported a low correlation between the physical aspect of HRQOL and spasticity in stroke population ( $r<0.4$ ,  $p<0.05$ ). They applied the SF-36 and MAS to assess HRQOL and spasticity of upper and lower extremities in the people 18 months after first stroke (26). Therefore, this discrepancy could be related to differences in the measurement tools, type of population and culture.

Additionally, Wiegerink et al reported that young adults with CP had problems in their sexual relationship (27). While, our subjects did not report any difficulty in the social as-

Table 3. Correlations between the QOL and spasticity in 43 individual with spasticity in knee flexor muscles

WHOQOL-BREF		Physical health	Psychological health	Social health	Environmental health	Overall QOL	General health
Spasticity (knee flexor muscle)	R	/.12	/.23	/.02	/.15	/.1	/.02
	P	/.42	/.13	/.89	/.32	/.49	/.89

Table 4. Correlations between the QOL and level of motor function in 77 individual with cerebral palsy

WHOQOL-BREF		Physical health	Psychological health	Social health	Environmental health	Overall QOL	General health
Level of motor function	R	/.19	/.05	/.22	/.19	/.86	/.02
	P	/.08	/.66	/.05	/.09	/.19	/.84

Table 5. Comparison of mean scores (SD) of the QOL domains between two genders (n=77)

QOL domains	male	female	p- value
Physical health	69.52(13.89)	66(17.3)	0.33
Psychological health	56.18(18.72)	58.91(14.75)	0.47
Social health	61.15(22.28)	67.59(21.3)	0.23
Environmental health	59.18(16.44)	59.23(14.38)	0.99
General health	3.61(1.2)	3.55(1.08)	0.63
Overall QOL	3.67(0.85)	3.75(0.96)	0.67

pect, because our participants were single and most of them did not answer the sex item in the QOL questionnaire. Hence, if all participants answered the sex item of the social domain and we did not have to employ the mean of two other items in this aspect of QOL as the score of the sex item, the result of the social domain would have been different.

In our study changes in the level of motor function could not alter QOL. Although the severity of disability is considered as one of the main factors affecting functional status in both children and adults with CP (28). It seems that adults' perception of QOL is discordant with the severity of their disability. Furthermore, according to Albrecht's balance theory, the experience of high QOL is contingent on the person's achievement of balance between body, mind and spirit (29). We believe that lack of a relationship between QOL and the level of motor function could indicate this balance in spastic CP adults. Our results are consistent with previous studies which examined the relationship between the level of motor function and QOL in CP populations (17, 30). On the contrary, Vandersolt et al, reported that bilateral spastic CP adults who had a better

GMFCS showed a higher physical HRQOL (15). This discordance could be due to different measurements in QOL tools. They assessed health related quality of life (SF36). The HRQOL is a subdomain of QOL that focuses on physical health and psychological health. In addition, Vargus- Adams and KO found that lower GMFCS levels were associated with lower physical health scores (12, 13). This difference could have resulted from different study samples, QOL assessment tools and people who completed QOL questionnaire.

Moreover In our study no difference was found between mean scores of QOL in females and males. According to the social and cultural condition of Iran, disabled people are supported by family and others who are responsible for performing their roles. Thus difference between males and females were disappeared. Our results were consistent with the findings of van der Slot et al and Ko et al (13, 15).

This study supports lack of relationship between spasticity and level of motor function with QOL of community dweller adults with CP. In other word, a physiotherapist should pay special attention to the other needs of CP. adults who are community dweller, the

need for a family and financial support, employment and improve function in order to enhance their QOL.

Future studies should focus on the impacts of other impairments (such as muscle weakness and impaired balance) on the QOL, to identify which impairment can be affect on QOL of adult cp who are community dweller. Furthermore, larger studies should be conducted on other age groups and other kinds of CP to determine the relationship between these variables and QOL. Also, the relationship between spasticity of other muscle groups in upper and lower limbs and QOL should be investigated.

The cross sectional design, convenience sampling and relatively small sample size may be factors affecting the interpretation of the results. Also we cannot generalize our results to married adults with spastic CP, people who are imprisoned in the house and other types of cerebral palsy

### Conclusion

This study indicated that although spasticity is a common impairment in adult CP patients, it could not change the QOL of adults with spastic CP. In addition, it seems that limitations in gross motor function did not affect the QOL in adults with spastic CP.

### Acknowledgements

The authors thank three Raad Rehabilitation goodwill complexes. This manuscript was prepared based on an MSc thesis and was financially supported by a grant from Tehran University of Medical Sciences (grant number: p/26/54/317 dated July 11, 2011).

### References

1. Roeberoeck ME, Jahnsen R, Carona C, Kent RM, Chamberlian MA. Adult outcomes and lifespan issues for people with childhood onset physical disability. *Devel Med Child Neurol* 2009; 51(8):670-8.
2. Stanley F, Blair E, Alberman E. How common are the cerebral palsies? In: Stanley F, Blair E, Alerman E. *Cerebral Palsies: Epidemiology and Causal Pathways* (eds). London: MacKeith Press;

2000. pp. 22–39.

3. Lance JW. Pathophysiology of spasticity and clinical experience with baclofen. In: Lance JW, Feldman RG, Koella WP. *Spasticity: disordered motor control*. (eds). Chicago: Year Book 1980; pp. 185-203.

4. Young RR. spasticity: a review. *Neurol*; 1994; 44 Suppl 9: 512-20.

5. Opheim A, Jahnsen R, Olsson E, Stanghelle JK. Walking function, pain, and fatigue in adults with cerebral palsy: a 7 year follow - up study. *Deve Med Child Neurol*. 2009; 51(5):381-8.

6. Jahnsen R, Villien L, Aamodt G, Stanghelle J, Holm I. Musculoskeletal pain in adults with cerebral palsy compared with the general population. *J Rehabil Med* 2004; 36(2):78-84.

7. Young NL, Gilbert TK, McCormick A, Ayling-Campos A, Boydell K, Law M, et al. Youth and young adults with cerebral palsy: their use of physician and hospital services. *Arch Phys Med Rehabil* 2007; 88(6): 696-702.

8. Michelsen SI, Uldall P, Kejs AMT, Madsen M. Education and employment prospects in cerebral palsy. *Deve Med Child Neurol* 2005; 47(8):511-17.

9. Sandstrom K, Ahnder J, Oberg B. Description of functioning and health and relation to a gross motor classification in adults with cerebral palsy. *Disabil Rehabil* 2004; 26:1023-31.

10. The WHOQOL group. The World Health Organization quality of life assessment: (WHOQOL): Development and general psychometric properties. *Soc Sci Med* 1998; 46: 1569-85.

11. Jahnsen R VL, Aamodt G, stanghelle jK, Holm I. Health related quality of life in adults with cerebral palsy compared to the general populattion. *Dev Med Child Neurol* 2005;47 suppl 103: 359-69.

12. Vargus-Adams J. Health-related quality of life in childhood cerebral palsy. *Arch Phys Med Rehabil* 2003; 84(9):E26-E7.

13. Ko J, Lee BH, Kim M. Relationship between Function and Health-Related Quality of Life of School-Aged Children with Cerebral Palsy. *J Phys Ther Sci* 2011; 23(2):189-95.

14. Opheim A, Jahnsen R, Olsson E, Stanghelle JK. Physical and Mental Components of Health-Related Quality of Life and Musculoskeletal Pain Sites Over Seven Years in Adults with Spastic Cerebral Palsy. *J Rehabil Med* 2011; 43(5):382-7.

15. van der Slot W, Nieuwenhuijsen C, van den Berg-Emons R, Wensink-Boonstra A, Stam H, Roebroek M. Participation and Health-Related Quality of Life in Adults with Spastic Bilateral Cerebral Palsy and the Role of Self-Efficacy. *J Rehabil Med* 2010; 42(6):528-35.

16. Young N, Rochon T, McCormick A, Law M, Wedge J, Fehlings D. The Health and Quality of Life Outcomes among Youth and Young Adults with Cerebral Palsy. *Arch Phys Med Rehabil* 2010; 91(1):143-8.

17. Tarsuslu T, Livanelioglu A. Relationship be-

tween quality of life and functional status of young adults and adults with cerebral palsy. *Disabil Rehabil* 2010; 32(20):1658-65.

18. Foroughan M, Jafari Z, Shrin BP, Ghaem Magham Farahani Z, Rahgozar M, Foroughan M, Validation of mini-mental state examination (MMSE) in the elderly population of Tehran. *Adv Cog Sci* 2008; 10(2)(38):29-37.

19. Can C. Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. *Surveillance of Cerebral Palsy in Europe (SCPE)*. *Devel Med Child Neurol* 2000; 42(12):816-24.

20. Jahnsen R, Aamodt G, Rosenbaum P. Gross Motor Function Classification System used in adults with cerebral palsy: agreement of self-reported versus professional rating. *Dev Med Child Neurol* 2006 Sep; 48(9):734-8.

21. Gracies J. Évaluation de la spasticité: Apport de l'échelle de Tardieu= Evaluation of spasticity: contribution of Tardieu's scale. *Motricité cérébrale* 2001; 22(1):1-15.

22. Group TW. WHOQOL-Bref: introduction, administration, scoring and generic version of the assessment. WHO Geneva; 1996.

23. Nedjat S, Montazeri A, Holakouie K, Mohammad K, Majdzadeh R. Psychometric properties of the Iranian interview-administered version of the World Health Organization's Quality of Life Questionnaire (WHOQOL-BREF): A population-based study. *BMC Health Servers* 2008; 8(1):61.

24. Domholt E. *Rehabilitation research*. 3<sup>rd</sup> ed. St Louis, MO: Elsevier Saunders 2005; 358.

25. Dajpratham P, Kuptniratsaikul V, Kovindha A, Kuptniratsaikul PS, Dejnuntarat K. Prevalence and management of poststroke spasticity in Thai stroke patients: a multicenter study. *J Med Assoc Thai* 2009; 92(10):1354-60.

26. Welmer AK, von Arbin M, Holmqvist LW, Sommerfeld DK. Spasticity and its association with functioning and health-related quality of life 18 months after stroke. *Cerebrovasc Dis* 2006; 21(4):247-53.

27. Wiegerink DJ RM, Donkervoort M, Cohenkettenis PT, Stam HJ. Social, intimate and sexual relationships of adolescents with cerebral palsy compared with able-bodied age-mates. *J Rehabil Med* 2008; 40(2):112-118.

28. Gunel MK, Mutlu A, Tarsuslu T, Livanelioglu A. Relationship among the Manual Ability Classification System (MACS), the Gross Motor Function Classification System (GMFCS), and the functional status (WeeFIM) in children with spastic cerebral palsy. *Eur j Pediatr* 2009; 168(4):477-85.

29. Albrecht GL, Devlieger PJ. The disability paradox: high quality of life against all odds. *Soc Sci Med* 1999; 48(8):977-88.

30. Dickinson H, Parkinson K, Ravens-Sieberer U, Schirripa G, Thyen U, Arnaud C, et al. Self-reported quality of life of 8-12-year-old children with cerebral palsy: a cross-sectional European study. *Lancet* 2007; 369 (9580):2171-8.