

The effects of Core Stability Exercises on Sleep Habits and Quality of Life in Children with Nocturnal Enuresis

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Abstract

Background: Nocturnal enuresis has negative effects on children's sleep habits and quality of life. Implementing physical activity and regular exercise can probably have an effect on improving sleep habits and the quality of life of these children. Core Stability exercises can be mentioned among these exercises. Therefore, this study was conducted with the aim of determining the effects of core stability exercises on sleep habits and quality of life in children with nocturnal enuresis.

Methods: In this clinical trial, 70 children with nocturnal enuresis referred to the educational-therapeutic Shahid Mofateh polyclinic, affiliated with Yasuj University of Medical Sciences in 2022, were selected using a convenient sampling method from the available population. Children's Sleep Habits Questionnaire and The Pediatric Quality of Life Inventory generic version 4 were completed before and 48 hours after the end of the intervention. The intervention was conducted in 8 weeks, 3 sessions a week and each session lasted 45 minutes. SPSS software version 21 and chi-square, independent T and paired T tests were used to analyze the data.

Results: The results showed that after the completion of the intervention, the changes in the mean score of sleep habits and quality of life in both groups were statistically significant ($P < 0.05$).

Conclusion: Core Stability Exercises are effective in the sleep habits and quality of life of children with nocturnal enuresis.

Key Words: Child, Core Stability, Nocturnal enuresis, Quality of Life, Sleep.

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1- INTRODUCTION

International Children's Continence Society Criteria described nocturnal enuresis as the involuntary nightly urination at night, in over 5-year old children (1). Studies have reported that about 10% of people experience nocturnal enuresis. Nevertheless, various studies report that in many cases, nocturnal enuresis depends on age, since it can change from 45% in 5-6 year olds to 4.8% in 12-13 year olds (2).

A serious problem affecting different aspects of a child's life is sleep disorder. One of the predisposing factors for this problem is bedwetting, which occurs during sleep more than 3 times a week (3). In this way, changes in sleep habits cause problems such as obesity (4). Quality of life is closely related to sleep habits, so it's no surprise that having trouble at sleep has effects on the quality of life (5).

The World Health Organization defines quality of life as "individuals' perceptions of their positions 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" (6). One of the exercises that strengthen the pelvic and spine muscles are core stability exercises (7).

Core stability exercises, which are related to movement learning approach, mainly focus on the joint activity of transversus abdominis and lumbar multifidus muscles (8). Also, core stability exercises along with trunk control, are able to increase physical strength, improving sitting and standing balance, mobility, and neuromuscular integration; thus affect daily life activities in a positive way (9).

Tanriverdi et al. employed an exercise intervention, based on virtual reality. The results revealed a positive effect on the sleep quality of children suffering from acute lymphoblastic leukemia (10). Also, Yilmaz and Büyük found that fully

explaining the disease to the child with nocturnal enuresis, could improve the child's quality of life (11).

Due to the mutual effects of sleep habits and children's quality of life, and considering the effectiveness of Psychological interventions in children suffering from nocturnal enuresis. Therefore, regarding the lack of interventions focusing on this aspect of nocturnal enuresis, the present study aimed to investigate the effects of core stability exercise training as a non-pharmacological method for improving the sleep habits and quality of life in children suffering from enuresis, along with drug treatments.

2- MATERIALS AND METHODS

2-1. Design and population

The current research is a clinical trial type. The research population consists of all children with nocturnal enuresis, referred to the specialized educational-therapeutic Shahid Mofateh polyclinic, affiliated with Yasuj University of Medical Sciences, in 2022. Using a purposeful sampling method, 70 children suffering from nocturnal enuresis were selected from the available population and were equally divided into the intervention (35 people) and control (35 people) groups, based on random block allocation (**Fig. 1**).

2-1-1. Inclusion and exclusion criteria

Inclusion criteria were as follows: being 6 to 12 years old, diagnosis of primary and secondary enuresis by a specialist in pediatric kidney diseases, having the physical ability to participate in sport exercises based on the physician's opinion, consensual participation in the study and signing the consent form by the parents and the child. Exclusion criteria included doing sports professionally, suffering from co-morbidities (cardiac, pulmonary and diabetes), and previous participation of the patient in studies similar to the present study in the last six months.

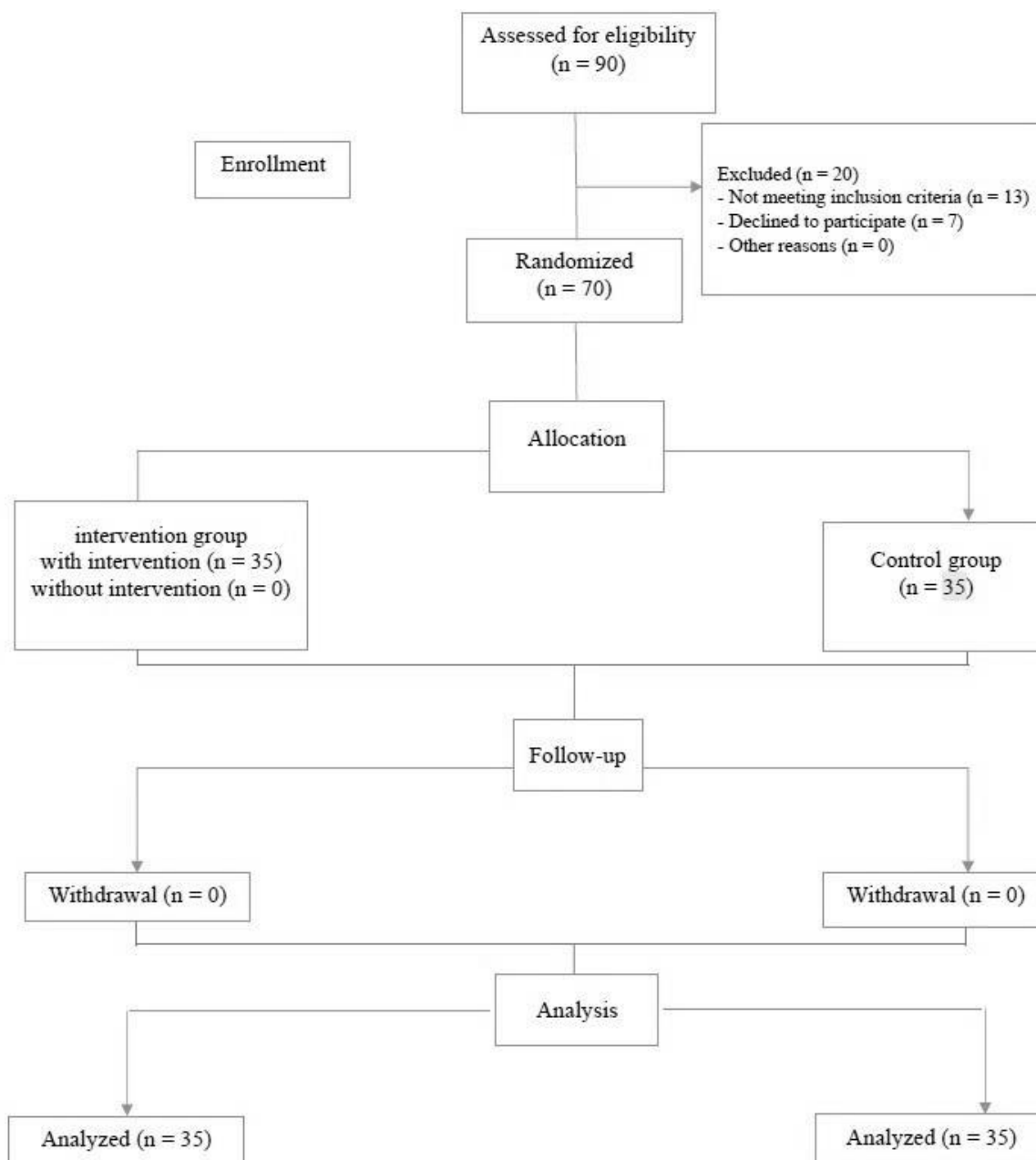


Fig. 1: Equal division into two intervention and control groups based on random block allocation

2-1-2. Sample size and sampling

In this research, in order to estimate the required sample size, we considered $s_1=5.88$, $s_2=6.47$, $\mu_1=47.8$, $\mu_2=54.07$ (12), $\alpha=0.05$, $1-\alpha=0.95$, $z_{1-\frac{\alpha}{2}}=1.96$, $\beta=0.2$, $1-\beta=0.8$, $z_{1-\beta}=0.85$.

The number of samples in each group was calculated to be 30.71 people, taking into

account the 15% probability of dropping and rounding the number, the assigned number of participants for each group calculated to be 35 and in total, 70 people were selected for this study.

2-2. Instruments

In addition to the demographic profile form, Children's Sleep Habits Questionnaire and The Pediatric Quality of

Life Inventory generic version 4 were used.

2-2-1. Children's Sleep Habits Questionnaire

Children's Sleep Habits Questionnaire, designed by Judith A. Owens in 2000, is a 33-item retrospective questionnaire for parents. This questionnaire includes 8 subscales including; Bedtime Resistance, Sleep Onset Delay, Sleep Duration, Sleep Anxiety, Night Wakings, Parasomnias, Sleep-Disordered Breathing, and Daytime Sleepiness. The score of this tool is calculated as follows: for the option 'usually' (5 to 7 times) a score of 3 is considered, 2 for 'sometimes' (2 to 4 times) and 1 for 'rarely' (never or once). The total summation of scores in the aforementioned subscales, will determine the overall score of children's sleep, which is in the range of 33-99. Higher scores indicate more sleep problems (13, 14).

In Fallahzadeh et al.'s study, the convergence validity range of the scale was from 0.4 to 0.86, the divergence validity range was from 0.006 to 0.66, and the reliability of its Cronbach's alpha coefficient was reported to be higher than 0.8 (14). The reliability of the tool was re-checked in the present study and Cronbach's alpha coefficient was calculated to be 0.741.

2-2-2. The Pediatric Quality of Life Inventory generic version 4

The Pediatric Quality of Life Inventory generic version 4, is a 23-item tool which calculates children's quality of life in 2 aspects; Physical Health and Psychosocial Health, in the format of 4 Scales; It measures Physical Functioning (8 items), Emotional Functioning (5 items), Social Functioning (5 items) and School Functioning (5 items). Parents of children suffering from nocturnal enuresis choose one of the options of never, rarely, sometimes, often or always for any item in

this questionnaire on a five-point Likert scale, with a score of 100 for never, 75 for Rarely, 50 for sometimes, 25 for most of the time option, and 0 for always. The overall score of children's quality of life is measured from the sum of the scores of all 23 questions in the questionnaire divided by 23 in the range of 0-100. Higher scores indicate better quality of life (15, 16).

In Amiri et al.'s study, the convergent validity of this questionnaire was found to be 0.4 to 0.80 and the Cronbach's alpha reliability was reported to be higher than 0.7 (16). In Mohamadian et al.'s research, the content validity of the entire instrument was reported as 0.84 and Cronbach's alpha coefficient as 0.82 (17). The reliability of the tool was checked again by the researchers and the Cronbach's alpha coefficient was calculated to be 0.827.

2-3. Implementation method

In the intervention group, 45-minute sessions were held for 8 weeks, 3 days a week (one day in between). It is worth mentioning that in order to improve the quality, core stability exercises as an independent variable and the research intervention were performed by the same trainer and in the same conditions, in two groups of 17 and 18 people (35 people in total). The place of training was the sports hall of Shahid Dr. Mohammad Zarei, Yasuj University of Medical Sciences. First, before the beginning of the intervention, we talked to the participants about the purpose of the research, the rules and regulations of the group, the place and time of the sessions, the duration of the therapy, the number of sessions, the duration of each meeting, and the duties and responsibilities of individuals. In the intervention group, core stability exercises were focused on 2 movements in the first 4 weeks and on 2 other movements in the second 4 weeks (**Table 1**) (18). No training was given to the control group.

Table-1: Intervention protocol of the Core Stability Exercises

Time	Exercises	How to perform
1 st week	Superman Supine bridge	Two sets of 10 Two sets of 10
2 nd week	Superman Supine bridge	Two sets of 15 Two sets of 15
3 rd week	Superman Supine bridge	Two sets of 20 Two sets of 20
4 th week	Superman Supine bridge	Two sets of 25 Two sets of 25
5 th week	Twisting Sit-Up Half Sit-Up	Two sets of 10 Two sets of 10
6 th week	Twisting Sit-Up Half Sit-Up	Two sets of 15 Two sets of 15
7 th week	Half Sit-Up Twisting Sit-Up	Two sets of 20 Two sets of 20
8 th week	Half Sit-Up Twisting Sit-Up	Two sets of 25 Two sets of 25

48 hours after completing the intervention as described above, Children's Sleep Habits Questionnaire and The Pediatric Quality of Life Inventory generic version 4 were completed again, with the help of the researcher and by children and their parents in two groups.

2-4. Data analysis

The data were entered into SPSS ver. 21. The collected data were analyzed through chi-square, independent t and paired t tests. The significance level of 0.05 was considered for all tests.

3- RESULTS

In the present study, 70 children with enuresis were selected. The intervention group had a mean age of 8.31 ± 1.98 years and the control group had a mean age of 7.91 ± 1.99 years (**Table 2**).

In the case of mean score of sleep habits and its subscales before the intervention, according to the results of independent t-test, no statistically significant difference was observed ($P > 0.05$). However, in the intergroup comparison, a statistically significant difference was observed in the

mean score of sleep habits and its subscales, 48 hours after the intervention had ended ($P < 0.05$). The intra-group comparison of the mean score of sleep habits and its subscales was also done in each group separately. The results of paired t-test showed that there was a statistically significant difference in the test group, before and 48 hours after the end of the intervention ($P < 0.05$), but this statistically significant difference was not observed in the control group ($P > 0.05$) (**Table 3**).

In the case of mean scores of Scales and Summary Scores of life quality before the intervention, according to the results of the independent t-test, no statistically significant difference was observed ($P > 0.05$). However, in the inter-group comparison, a statistically significant difference was observed in the mean scores of the Scales and Summary Scores of the life quality, 48 hours after the intervention ($P < 0.05$). Intra-group comparison of average scores of Scales and Summary Scores of quality of life were also performed in each group separately.

The results of paired t-test showed that there was a statistically significant difference in the test group, before and 48 hours after the intervention ($P < 0.05$), but

this statistically significant difference was not observed in the control group ($P > 0.05$) (**Table 4**).

Table-2: Comparison of demographic characteristics in the studied groups

Variable		Intervention group mean \pm SD		Control group mean \pm SD				Statistical analysis
Age		8.31 \pm 1.98		7.91 \pm 1.99				0.40**
Variable	Level	Intervention group		Control group		Total		Statistical analysis
		number	percentage	number	percentage	number	percentage	
Gender	Male	20	57.1	23	65.7	43	61.4	0.46*
	Female	15	42.9	12	34.3	27	38.6	
Father' education	Dropout	6	17.1	6	17.1	12	17.1	0.57*
	Diploma	11	31.5	15	42.9	26	37.2	
	Higher education	18	51.4	14	40.0	32	45.7	
Mother's education	Dropout	7	20.0	6	17.1	13	18.4	0.47*
	Diploma	12	34.3	17	48.6	29	41.4	
	Higher education	16	45.7	12	34.3	28	40.0	
Occupation	worker	8	22.9	11	31.4	19	27.1	0.35*
	Employee	18	51.4	12	34.3	30	42.9	
	Self-employed	9	25.7	12	34.3	21	30.0	

*Chi-square statistical test

** Independent t-test

Table-3: Comparison of mean and standard deviation sleep habits scores and its subscales in the studied groups

Variable		Intervention	Control	Level of significance (inter-group) *	
		mean \pm SD	mean \pm SD		
Total score of sleep habits	Before intervention	68.7 \pm 37.78	68.83 \pm 7.63	0.89	
	After intervention	50.6 \pm 03.21	70.03 \pm 7.06	0.001	
	Level of significance (intra-group) **	0.001	0.19	-	
Sleep habits subscales	Bedtime Resistance	Before intervention	14.2 \pm 60.39	14.37 \pm 2.38	0.69
		After intervention	8.1 \pm 14.9	14.51 \pm 2.39	0.001
		Level of significance (intra-group) **	0.001	0.43	-

Variable			Intervention	Control	Level of significance (inter-group) *
			mean \pm SD	mean \pm SD	
Sleep Onset Delay	Before intervention		2.0 \pm 09.74	1.97 \pm 0.75	0.52
	After intervention		1.46 \pm 0.66	2.14 \pm 0.69	0.001
	Level of significance (intra-group) **		0.001	0.32	-
Sleep Duration	Before intervention		5.1 \pm 94.63	6.40 \pm 1.19	0.18
	After intervention		4.1 \pm 69.35	6.17 \pm 1.38	0.001
	Level of significance (intra-group) **		0.001	0.31	-
Sleep Anxiety	Before intervention		3.1 \pm 91.07	3.94 \pm 1.37	0.92
	After intervention		3.1 \pm 29.02	3.91 \pm 1.36	0.032
	Level of significance (intra-group) **		0.006	0.89	-
Night Wakings	Before intervention		6.1 \pm 43.31	6.86 \pm 1.29	0.17
	After intervention		4.1 \pm 57.07	6.60 \pm 1.33	0.001
	Level of significance (intra-group) **		0.001	0.34	-
Parasomnias	Before intervention		15.3 \pm 46.32	16.17 \pm 3.46	0.38
	After intervention		12.4 \pm 69.42	16.54 \pm 3.18	0.001
	Level of significance (intra-group) **		0.001	0.22	-
Sleep-Disordered Breathing	Before intervention		5.1 \pm 14.40	5.37 \pm 1.56	0.52
	After intervention		4.1 \pm 29.02	5.71 \pm 1.67	0.001
	Level of significance (intra-group) **		0.001	0.09	-
Daytime Sleepiness	Before intervention		14.4 \pm 80.01	13.54 \pm 3.58	0.17
	After intervention		10.2 \pm 91.24	14.43 \pm 4.22	0.001
	Level of significance (intra-group) **		0.001	0.21	-

* Independent t-test

** Paired t-test

Table-4: Comparing the mean and standard deviation of quality of life and its sub-scales and in the studied groups

Variable			Intervention	Control	Level of significance (inter-group) *
			mean ± SD	mean ± SD	
Summary scores of quality of life	Physical Health Summary	Before intervention	46.14 ± 34.94	45.54 ± 10.32	0.79
		After intervention	77.8 ± 05.97	47.77 ± 8.76	0.001
		Level of significance (intra-group) **	0.001	0.16	-
	Psychosocial Health Summary	Before intervention	41.12 ± 33.86	37.95 ± 9.51	0.22
		After intervention	59.6 ± 29.73	35.76 ± 7.36	0.001
		Level of significance (intra-group) **	0.001	0.06	-
Scales of quality of life	Physical Functioning	Before intervention	46.14 ± 34.94	45.54 ± 10.32	0.79
		After intervention	77.8 ± 05.97	47.77 ± 8.76	0.001
		Level of significance (intra-group) **	0.001	0.16	-
	Emotional Functioning	Before intervention	24.15 ± 00.66	19.86 ± 12.92	0.23
		After intervention	47.9 ± 00.49	15.57 ± 7.35	0.001
		Level of significance (intra-group) **	0.001	0.09	-
	Social Functioning	Before intervention	49.13 ± 57.08	46.43 ± 12.92	0.32
		After intervention	58.13 ± 14.73	45.29 ± 12.66	0.001
		Level of significance (intra-group) **	0.008	0.43	-
	School Functioning	Before intervention	50.19 ± 43.98	47.57 ± 12.57	0.48
		After intervention	72.16 ± 71.29	46.43 ± 12.04	0.001
		Level of significance (intra-group) **	0.001	0.13	-

* Independent t-test

** Paired t-test

4- DISCUSSION

The aim of this research was determining the effect of core stability exercises on sleep habits and quality of life of children with nocturnal enuresis. As shown in the results, the mean score of sleep habits and its subscales in the intervention group and the control group were significantly different, which is in line with the findings of Elshafey et al., who showed that the core stability program can improve the balance and coordination in children with cerebellar ataxic cerebral palsy, using a standard physiotherapy program (19). The similarities are in the investigated variable and the results of the study.

The results also showed that in the intervention group, the mean score of sleep habits and its subscales is significantly different compared to the beginning of the study. Elnaggar et al. showed that core stability exercises are an effective treatment for improving bone health and functional capacity in children with polyarthritis idiopathic arthritis (20). Also, Amara et al. found that high-intensity exercise rehabilitation can effectively improve the sleep outcomes and immobility symptoms in patients diagnosed with Parkinson (21). The results of these studies are consistent with the findings of the present study. They are also consistent in the independent variable. This consistency may be due to the similarity in the duration of the intervention sessions and the positive effectiveness of core stability exercises in the intervention group.

The findings of this study showed that the mean scores of the Scales and Summary Scores of the quality of life in the intervention group and the control group are significantly different. Lengkana et al. showed that core stability training is effective in improving balance in elementary school students (22). This research finding is consistent with the

present study, the reason for this consistency may be the similarity in the investigated variable.

Core stability exercises can reduce pain and disability, improve proprioception, and successfully treat postural disorders (8). In this regard, Mahmood et al. showed that core stability exercises were better than the conventional physical therapy treatment to treat trunk disorders, functional movement and quality of life, as well as improving trunk mobility of the sagittal plane in stroke patients (23). This research finding is consistent with those of the present study; this can be attributed to the positive effectiveness of core stability exercises in the intervention group.

The findings of this study showed that in the intervention group, the average scores of Scales and Summary Scores of quality of life are significantly different compared to the beginning of the study. Kanwal et al. showed that core stability exercises have the ability to reduce pain, disability and improve strength and quality of life in postmenopausal women (24). These studies are consistent with the present study. Albeit, it should be considered that the duration of the intervention sessions is almost the same.

When evaluating medical interventions in the healthcare service system, the life quality of children is considered an important criterion and outcome, which in turn is related to the evaluation of children's mental perception of their health status and treatment, and can be used to evaluate the success in treating these patients (25). The results obtained from this study, which led to the improvement of the quality of life of children suffering from nocturnal enuresis, can prove this claim. Therefore, in this regard, Liu et al. also found that chain exercise therapy is a safe and effective method for improving balance, mobility, daily life activities, quality of life, and decreasing shoulder pain in stroke patients. This can be an

important therapeutic strategy to promote comprehensive functional recovery after stroke (26). These studies are consistent with the present study in the investigated variable.

4-1. Limitations of the study

The questionnaires were self-report with subjective responses; and it should be considered that usually each person's understanding of the severity of his mood and mental disorders is different from the other person, and there is a possibility for mistakes in the person's self-reporting due to the lack of focus. It is suggested to conduct further studies on the effects of core stability exercises on self-care of children suffering from nocturnal enuresis.

5- CONCLUSION

Implementation of core stability exercises caused statistically significant changes in the scores of sleep habits and life quality of children with nocturnal enuresis. Therefore, it is suggested that the members of the health team consider the implementation of this method in the care program of children with nocturnal enuresis.

6- ETHICAL CONSIDERATIONS

Before starting the intervention and after fully explaining the purpose of the study, written consent forms were obtained from the patients. In the explanations, there was also an emphasis on the confidentiality of the collected information, completely voluntary participation in the study, and free withdrawal at each stage of the study. This study has been registered in the research ethics committee of Yasuj University of Medical Sciences with the code IR.YUMS.REC.1401.031, and in the Iranian clinical trial registration site with the code IRCT20220803055611N1.

7- CONFLICT OF INTEREST

None.

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