

Examining the Effects of Cardio Exercises on Psychological Stress Reduction in Mothers of Children with Special Needs: A Promising Approach

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Received March 13, 2024; Revised April 25, 2024; Accepted May 26, 2024

Cite This Paper in the Following Citation Styles

(a): [1] Ahmed K. Hassan, Khaled M. Zahran, Mohammed S. Alibrahim, Majed M. Alhumaid, Sobhi Nouredin Ata, Hussam K. Aldawsari, Mohamed Frikha, Hatem Abd Elmonem Saleh Eldiasty, Naglaa Radwan, Badry E. Hammad, "Examining the Effects of Cardio Exercises on Psychological Stress Reduction in Mothers of Children with Special Needs: A Promising Approach," *Universal Journal of Public Health*, Vol. 12, No. 3, pp. 481 - 498, 2024. DOI: 10.13189/ujph.2024.120306.

(b): Ahmed K. Hassan, Khaled M. Zahran, Mohammed S. Alibrahim, Majed M. Alhumaid, Sobhi Nouredin Ata, Hussam K. Aldawsari, Mohamed Frikha, Hatem Abd Elmonem Saleh Eldiasty, Naglaa Radwan, Badry E. Hammad (2024). *Examining the Effects of Cardio Exercises on Psychological Stress Reduction in Mothers of Children with Special Needs: A Promising Approach*. *Universal Journal of Public Health*, 12(3), 481 - 498. DOI: 10.13189/ujph.2024.120306.

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Abstract Psychological problems are the main problem for mothers who have special kids. Caring for a child with a disability is stressful, disappointing, and frustrating, as a parent may be compelled to attend to the ill child for a long period and receive regular treatment. **Aims:** The study aimed to ascertain how cardio exercise affected the psychological stress experienced by mothers of special needs children. **Methodology:** The study adopted an experimental design, choosing a sample of 40 women, aged 25 to 46, to be regular visitors of the Association for People with Special Needs (APSN) in Al-Ahsa City, the Eastern Province of the Kingdom. Two groups of participants were randomly assigned: twenty mothers in the experimental group and twenty mothers in the control group. What distinguished the experimental group was the fact that it not only took part in the association's

psychological awareness sessions but also in its aerobic fitness program. A psychological stress scale was evaluated. **Findings:** Mothers of children with special needs who were in the experimental group had significantly lower psychological stress levels than those in the control group ($P < 0.05$), suggesting that the experimental group was superior to the latter. Mothers who participated in the cardio exercise program saw a reduction in psychological stress. Several suggestions for further study and application might be offered considering the study's findings. Initially, to confirm the findings, it is critical to repeat this study with a sizable sample. Furthermore, it would be helpful to understand the processes by which cardio exercise lowers psychological stress. According to scientific research, stress reduction can be achieved by including cardio exercise programs in

support services for moms of children with special needs. Studies indicate that engaging in physical activities, including cardiovascular exercise, might help enhance mental well-being and lower stress and anxiety levels. The research paper advises that institutions modeling support for mothers of special needs, children should include cardio exercises in their weekly routines. This inclusion attempts to achieve this by alleviating the severity of psychological pressures such as mothers' experience.

Keywords Cardio Training, Psychological Stress, Children with Special Needs, Physical Activity, Mental Health

1. Introduction

The birth of a child is typically a joyous occasion for mothers, as it deepens their bond and provides a sense of love and security. However, some children may encounter developmental challenges, such as mental, psychological, physical, or cognitive disabilities or disorders. These unique circumstances necessitate increased attention and support from both parents and society. Challenges may manifest as mental or physical development delays, communication or behavioral disorders, or learning difficulties [1-3]. In the last quarter of the twentieth century, the role of women in Arab society underwent significant transformations, impacting their social, economic, and cultural lives [4]. These changes had profound effects on the family structure. Women now bear multiple responsibilities outside the home, including employment and caring for children with special needs. Consequently, they often experience conflicts and psychological pressures, making adaptation challenging. Juggling work and family obligations, combined with feelings of neglect and guilt, can contribute to the development of psychological disorders such as anxiety, frustration, and low self-esteem. These stressors can manifest in physical and health-related symptoms [5].

The psychological stress experienced by mothers of children with special needs is a complex issue encompassing various dimensions of psychological and emotional strain. Research suggests that these mothers encounter higher levels of stress compared to mothers of typically developing children. Social stigma and isolation are significant contributors to their elevated stress levels. The lack of understanding and support from the broader community intensifies feelings of loneliness and distress [6]. Moreover, these mothers often grapple with the challenge of navigating intricate healthcare and education systems to access essential services for their children, which can be time-consuming and emotionally exhausting [7]. Factors such as the severity of the child's disability, the presence of behavioral issues, limited social support, and financial burdens lead to this stress [8,9]. Mothers of

children with special needs often endure psychological distress, which can include symptoms of depression and anxiety. The difficulties associated with raising children with special needs can result in emotional suffering, frustration, and disappointment [10]. Additionally, the severity and nature of the child's disability can impact the level of stress experienced by the mother. For instance, mothers of children with behavioral issues or severe intellectual disabilities may face greater challenges in daily caregiving, leading to heightened levels of stress [11]. Moreover, the financial burden associated with raising a child with special needs, including medical expenses, treatments, and educational support, can further contribute to stress for these mothers [9,12].

Exercise has been found to play a significant role in the prevention and treatment of mental illnesses, including depression and anxiety [13]. Mindfulness-based stress reduction (MBSR) programs, incorporating mindful yoga practices and meditation, have shown improvements in psychological, biological, and social well-being. These programs have been found to reduce perceived stress and enhance levels of mindfulness in athletes and individuals who are generally active [14]. Monitored exercise interventions, such as low-intensity qigong exercises, a combination of aerobic and anaerobic exercise, or nutrition and diet education, have demonstrated strong evidence in reducing psychological distress among older individuals [15]. Overall, engaging in physical activity, whether through exercise programs or specific sports, can have a positive impact on reducing psychological stress. Engaging in physical activities not only provides a physical outlet for the stress and challenges faced by mothers of children with special needs but also triggers the release of endorphins, which can elevate mood and reduce feelings of anxiety and depression [16]. Additionally, participating in sports and fitness activities allows mothers to take a break from their caregiving responsibilities, offering them a valuable opportunity to prioritize self-care and mental health [17]. Regular exercise can lead to improved self-esteem, enhanced stress management skills, and an overall sense of well-being, which can positively impact these mothers' ability to care for their children and overcome the unique challenges they face [18,19].

Resistance training and other exercise interventions help reduce anxiety symptoms and anxiety disorders in middle age [20]. Exercise training has been shown via research to be an excellent means of managing and preventing cardiovascular disease in addition to improving overall health, and it has been suggested that a lower incidence of anxiety disorders may be linked to higher levels of physical activity [21]. It has been shown that exercise reduces the symptoms of anxiety in several populations, including healthy adults, those with chronic illnesses, and those with panic disorder. Additionally, there are similarities between exercise and other evidence-based therapies for anxiety disorders [22]. Sports like cycling, aerobics, or jogging have been shown to enhance mood, lessen anxiety, and

enhance overall well-being in mothers of children with special needs [23]. In addition to being a useful stress reliever, physical exercise can also help mothers build the resilience they need to handle the unique challenges they face [24].

1.1. Research Problem

The psychological burden that mothers of children with special needs face is very high, which affects their levels of wellness. These mothers had the burden of ensuring proper care for their children, which called for so much attention and time. They feel a lot of depression, anxiety, helplessness, or emotional exhaustion. Furthermore, after all, those continuous demands of being a mother and caring for their kids may leave behind emotional deprivation and feelings of isolation. Apart from the physiological torture that they suffer, their physical health is also affected, as it leads to irregular sleep patterns, low nutrition, and a lack of exercise. This may present as physical exhaustion, muscle tension, and pain. In addition, chronic psychological stress amplifies their tendency to suffer from various types of health conditions, such as hypertension, heart disease, and diabetes. Hence, it is vital to recognize the psychological stress factors in mothers of children with special needs and offer them guidance from a psychologist as well as instances of health maintenance. The psychological stress of caregiver burnout can be addressed more effectively by practicing engaging in exercise and relaxation techniques, joining support community groups, or taking regular breaks from the role of a primary at-home caretaker. Researchers suggest that cardio training is highly effective in eliminating psychological stress for mothers of special-needs children.

1.2. Research Importance

Using cardio training to reduce psychological stress for mothers of children with special needs is of scientific and practical importance. Cardio training can improve overall mental health. It enhances the secretion of happy hormones such as endorphins and serotonin and reduces the secretion of harmful hormones such as cortisol. This contributes to improving mood and reducing anxiety and depression. Cardio training can also be an effective way to relieve tension and psychological stress. Improving the body's stress response system, thus reducing psychological stress and promoting relaxation. It can also provide opportunities for social communication and integration into sports communities or training groups. This can contribute to providing social support and sharing experiences and feelings with others facing similar challenges. From a practical standpoint, using cardio training to reduce the psychological stress of mothers of children with special needs could be an effective and low-cost way to improve their mental health. Exercise can be done at home or in fitness centers and can

be adapted to the needs and abilities of mothers. In addition, cardio training can be fun and motivating, which helps you stick with it over the long term. In general, using cardio training to reduce psychological stress for mothers of children with special needs is an effective and appropriate strategy for improving their psychological health and enhancing their general well-being.

1.3. Purpose of the Study

The purpose of this study is to assess how cardio exercise affects the psychological stress that moms of special needs children in the Kingdom of Saudi Arabia experience. The study aims to determine the extent to which engaging in physical activities can reduce psychological stress and improve the mental health of these mothers by analyzing the effect of cardio training on their stress levels.

1.4. Hypotheses

- There are statistically significant differences between the pre-and post-measurements of the experimental group and the control group in the psychological pressures of mothers of children with special needs in the post-measurement direction.
- There are statistically significant differences between the two post-measurements of the experimental and control groups in the psychological stress of mothers of children with special needs in the direction of the experimental group.

1.5. Literature Review

In a systematic review conducted by Chong T.W.H. et al. [20], the effectiveness of exercise interventions for anxiety and subthreshold anxiety disorders in mid-life and late-life individuals was assessed. The review included four trials with a total of 132 participants, and the interventions consisted of resistance training, aerobic exercise, and Tai Chi. Three of the trials demonstrated significant reductions in anxiety levels in the intervention group compared to the control group. The fourth trial showed reductions in anxiety for both groups, but the difference between the intervention and control groups was not statistically significant. These findings suggest that exercise interventions may be beneficial for reducing anxiety in mid-life and late-life individuals. In a study conducted by Özkan and Numanoglu-Akbaş [23], the physical activity levels, exercise barriers, and facilitators in mothers of children with motor disabilities were examined. The study included 69 participants, and none of the mothers achieved sufficient levels of physical activity. The most reported barrier to exercise was a lack of time, which was reported by over 90% of mothers in both groups. Mothers of children with mild motor disabilities had higher physical activity levels compared to those with moderate-to-severe

motor disabilities, and this difference was statistically significant. These findings shed light on the physical and emotional challenges faced by mothers of children with motor disabilities and emphasize the importance of interventions to promote physical activity in this population.

In a study conducted by Tsunoda et al. [24], the associations between physical activity (PA), psychological distress, and happiness in mothers of children with autism spectrum disorder (ASD) during the COVID-19 pandemic were investigated. The study included 334 mothers living in Yamaguchi and Okayama Prefectures, Japan. The mothers were reported significantly higher levels of psychological distress, while their happiness levels were similar to those of the general Japanese population. The analysis revealed that psychological distress was not associated with any specific PA items. However, moderate-intensity PA (MPA) and total moderate-to-vigorous-intensity PA (MVPA) were positively associated with happiness, regardless of psychological distress. Mothers who engaged in some or enough MPA, as well as those who engaged in sufficient total MVPA, had higher happiness scores compared to those who did not participate in PA. These findings suggest that engaging in PA, particularly MPA and MVPA, may have a positive impact on the happiness levels of mothers of children with ASD during the COVID-19 pandemic. This review, conducted by Churchill et al. [25], was to evaluate the effectiveness of various supervised exercise interventions in reducing psychological stress among older adults. The researchers conducted a comprehensive search of four electronic databases in February 2021 and identified a total of 854 studies. After applying specific inclusion criteria, twelve randomized controlled trials (RCTs) were included in the review. The findings of the review indicated that low-intensity qigong and interventions combining aerobic exercise with either

anaerobic exercise or nutrition/diet education demonstrated the strongest evidence for reducing psychological stress. The review also extracted additional information regarding the type, intensity, and duration of the interventions. The study by Azeem Mubarak, D.M.A. [26], a descriptive and cross-sectional study, aimed to examine the association between psychological stress and perceived self-efficacy in mothers and fathers of children with autism. A total of 110 parents, including 100 mothers and 10 fathers, participated in the study. The findings indicated that parental distress and dysfunctional parent-child interaction were reported at high levels. Additionally, the correlation analysis revealed a negative relationship between psychological stress and perceived self-efficacy.

2. Materials and Methods

2.1. Research Sample

The study comprised 40 mothers aged between 25 and 46 who had children with special needs, specifically Down syndrome, ASD, and hearing impairment. Participants were chosen by associating with the special needs association in Al-Ahsa City, Eastern Province in Saudi Arabia. The sample was balanced and split Randomization into two groups with 20 moms in the experimental group and 20 moms in the control group to promote such comparison with a similar study population. The experimental group attended a cardio training program at the association's gym; this factor was also investigated for its role in impacting mothers. Members of the control group will not participate in either the abovementioned sessions or those taken in class to act as a baseline to compare the results. A detailed description of the study sample is provided in Table 1.

Table 1. Description of the sample research

Variables		Total Sample n=40		Experimental Group n=20		Control group n=20	
		N	%	N	%	N	%
Age	25 - 30 years	8	20%	4	20%	4	20%
	31 - 35 years	19	47.5%	10	50%	9	45%
	36 - 40 years	8	20%	4	20%	4	20%
	41 - 46 years	5	12.5%	2	10%	3	15%
Level of disability	Moderate level of disability	18	50%	7	35%	11	55%
	Severe level of disability	22	50%	13	65%	9	45%
Educational level	Pre-Intermediate	7	17.5%	4	20.00%	3	7.5%
	Secondary	16	40.00%	8	40.00%	8	40.00%
	academic	17	42.5%	8	40.00%	9	45.00%
Total		40	100%	20	100%	20	100%

2.2. Measurements of Variables

2.2.1. Psychological Stress Scale

The researchers utilized a modified psychological stress scale, previously employed by other researchers in certain studies [27-30]. This scale was developed to assess the psychological pressure experienced by mothers with children who have special needs. The initial version of the scale consisted of 65 statements, which underwent a thorough review by a committee of experts in counseling, psychological guidance, and educational and psychological measurement and evaluation. Our analysis aimed to assess the appropriateness of the scale and its statements for the intended purpose, the suitability of the scale's language for the sample, the accuracy of the statements, and the linguistic formulation of the scale. Based on the feedback from the experts, some modifications were made to the scale, resulting in the exclusion of five statements. Consequently, the final version of the scale comprised 60 statements, categorized into four dimensions of stress: health stresses, family and social pressures, personal pressures, and stress of caring for a disabled child. A five-point Likert scale was employed to evaluate responses, ranging from "Applies perfectly" (1 point), "Apply" (2 point), "Somewhat applicable" (3 points), "Do not apply" (4 points), "Not quite applicable" (5 points) (see Appendix A). To establish the validity of the scale, correlations between the score of each statement and the corresponding dimension were calculated. The correlation coefficients ranged from 0.752 to 0.883 for all dimensions, with an overall correlation coefficient of 0.904 for the entire scale. Cronbach's alpha was used to assess the reliability of the scale, yielding a coefficient of 0.746 for each dimension. These results indicate the validity and acceptability of the scale.

2.3. Cardio Training Program

The cardio training program spanned eight weeks, with three training sessions per week, resulting in a total of 24 training sessions. The experimental group engaged in cardio exercises for a duration of 20 to 35 minutes during the sessions held at the Association for People with Disabilities. This time was deducted from the overall session duration, as the experimental and control groups also participated in 60-minute psychological counseling sessions. Within these counseling sessions, the experimental group received cardio exercises, while the control group solely engaged in the psychological counseling sessions without incorporating any exercises. The exercises utilized in the study were carefully structured and standardized. Each exercise had a duration of 40 seconds, with 8 repetitions, followed by a rest period of 30 seconds. The number of sets ranged from 2 to 4, with a rest period of 45 to 70 seconds between sets (see Table 2). When implementing these exercises for mothers of children with special needs, the researchers considered important principles. The training sessions were conducted on Sundays, Tuesdays, and Thursdays of each week. The exercises gradually progressed, starting with easier movements, and gradually increasing in difficulty and complexity. Safety and security factors were considered throughout the exercise sessions. Light exercises were initially used to prepare the body, and then the difficulty of the exercises gradually increased. To enhance the exercise experience, accompanying and motivating music was played during the performance of the prescribed exercises (See Appendix B). Additionally, a timer application was downloaded from Google Play onto participants' mobile phones. This timer served as an organizer for the exercise and rest intervals within each set and between sets, ensuring that participants were aware of the work and rest periods during the exercise sessions.

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Table 2. Cardio- exercises program

Weeks	1			2			3			4		
session	1	2	3	4	5	6	7	8	9	10	11	12
Exercises	1,2	1,3	2,4	3,4	1,4	5,7	6,7	1,3	4,6	5,7,8	8,9	4,8
Sec × Repeats	40×3	40×3	40×3	40×3	40×3	40×3	40×2	40×3	40×3	40×4	40×3	40×4
Intensity of exercises	m	H	m	H	H	m	H	H	m	H	H	m
Rest(Sec)	45 s	70 s	70 s	65 s	70 s	65 s	70 s	65 s	60 s	55 s	60 s	65 s

Weeks	5			6			7			8		
session	13	14	15	16	17	18	19	20	21	22	23	24
Exercises	9,11	8,10	5,8,9	12,13	6,14,15	7,14,16	11,13,15	12,16	1,9,18	19	19,20	18,20
Sec × Repeats	40×3	40×4	40×3	40×3	40×3	40×4	40×3	40×4	40×3	40×3	40×3	40×2
Intensity of exercises	H	M	m	M	M	m	H	M	m	H	H	m
Rest(Sec)	70 s	45 s	60 s	45 s	55 s	70 s	65 s	70 s	60 s	70 s	55 s	70 s

M = Maximum; H = High; m = Middle.

2.4. Timeline

Between October 22 and October 24, 2023, baseline assessments were made of the subjects in the experimental and control groups. After that, on October 29, 2023, and ending on December 21, 2023, an eight-week training program was introduced for moms of children with special needs. Ultimately, the last measures were made on December 24 and 25, 2023, to assess how the training program affected these moms.

2.5. Statistical Analysis

A preset significance level of $P < 0.05$ was applied while conducting statistical analyses with IBM SPSS version 26 (IBM Corp., ARMONK, NY, USA). The data had a normal distribution, as indicated by the P value of 0.001 obtained from the Kolmogorov-Smirnov test, which was used to determine the data's normality. To compare data between groups or conditions, the T-test was used for data analysis. The internal consistency of scales or questionnaires was

also evaluated using Cronbach's alpha and the Pearson correlation coefficient, which provide estimates of the direction and strength of correlations between variables.

3. Results

The mean, standard deviation, and improvement % for the psychological stress pre- and post-measurements in the experimental and control groups are shown in Figures 1 and 2. The disparities between the two groups are also shown in the figures. The variations in psychological stress levels in the experimental and control groups before and after the intervention are shown graphically in these figures. The standard deviation shows the variation within each group, whilst the mean values show the average stress levels. The percentage of improvement shows how much the participants' stress levels dropped between the pre-and post-measurements (see Table 3, 4). This can assist in determining whether the intervention was successful in lowering psychological stress.

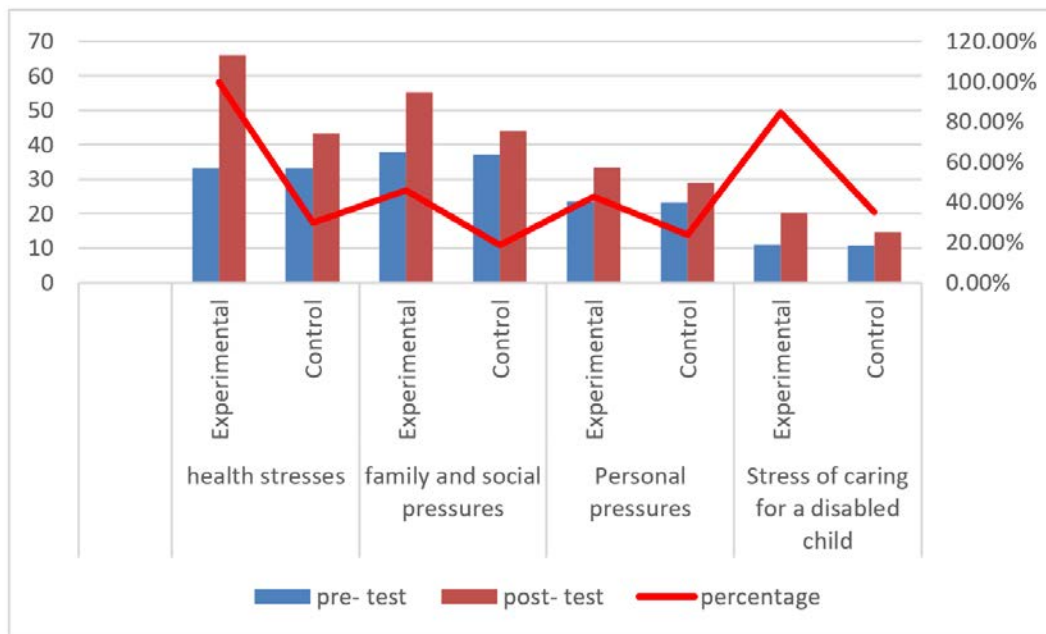


Figure 1. Diagram of the pre-and post-measurements for the experimental and control groups

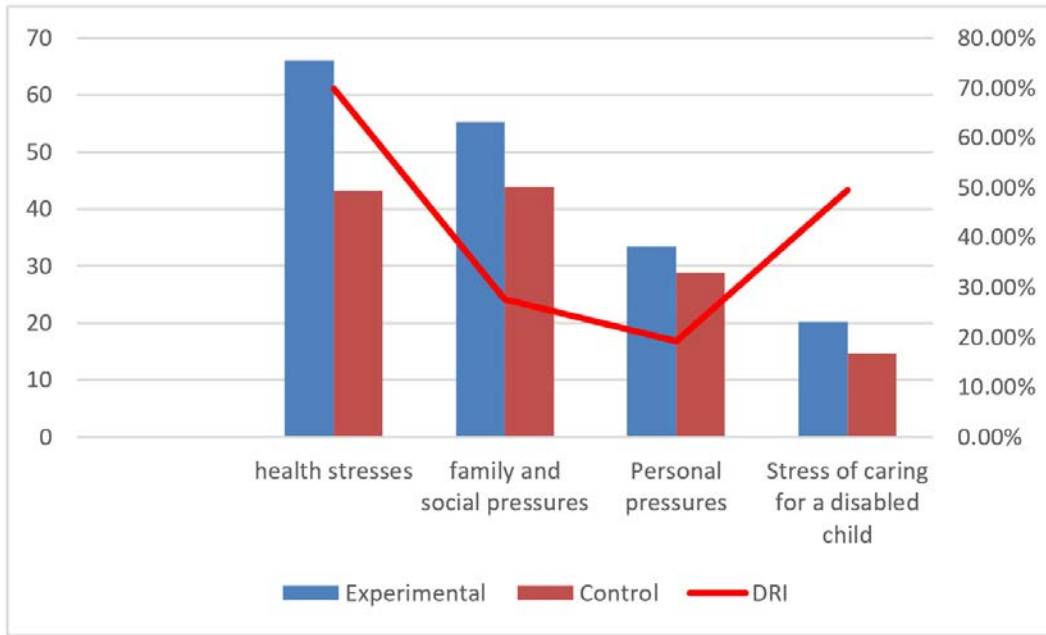


Figure 2. Diagram of the post-measurements for the experimental and control groups

Table 3. Mean, standard deviation, and t-value for the Experimental and control groups

Psychological stress	Groups	pre- test		post- test		t- value	Cohen's d.	Sig.	percentage
		Mean	Std.	Mean	Std.				
health stresses	Experimental	33.10	3.24	66.10	3.24	43.17	9.65	0.001	99.70%
	Control	33.25	2.989	43.15	3.133	18.76	4.19	0.001	29.77%
family and social pressures	Experimental	37.80	2.57	55.20	3.61	18.76	4.19	0.001	46.03%
	Control	37.05	2.523	43.90	6.480	4.59	1.03	0.001	18.49%
Personal pressures	Experimental	23.40	3.07	33.40	2.70	10.93	2.44	0.001	42.74%
	Control	23.30	2.658	28.80	1.795	10.56	2.36	0.001	23.61%
The stress of caring for a disabled child	Experimental	10.95	1.61	20.20	2.59	15.36	3.43	0.001	84.47%
	Control	10.85	2.007	14.65	1.040	10.35	2.31	0.001	35.02%

Table 4. Mean, standard deviation, and t-value for the experimental and control groups

Psychological stress	Groups	post- test		t- value	Cohen's d.	Sig.	DRI	95% Confidence Interval of the Difference	
		Mean	Std.					Lower	Upper
health stresses	Experimental	66.10	3.24	22.76	3.60	0.001	69.93%	20.91	24.99
	Control	43.15	3.13						
family and social pressures	Experimental	55.20	3.61	6.80	1.08	0.001	27.54%	7.94	14.66
	Control	43.90	6.48						
Personal pressures	Experimental	33.40	2.70	6.34	1.00	0.001	19.13%	3.13	6.07
	Control	28.80	1.79						
The stress of caring for a disabled child	Experimental	20.20	2.59	8.90	1.41	0.001	49.45%	4.29	6.81
	Control	14.65	1.04						

DRI: Differences in the rate of improvement

The mean, standard deviation, t-value, and significance level for psychological stress are shown in table 3 for both the experimental and control groups. Health stressors, family and societal stressors, personal stressors, and stressors associated with caring for a disabled kid are the four areas into which the data is divided. The experimental group showed a statistically significant rise in average scores from the pretest to the posttest across all dimensions. The control group's mean score gain was, however, less pronounced. Comparing the experimental and control groups, these results imply that the intervention or treatment significantly lowers psychological stress. It is extremely improbable that the observed differences between the two groups are the result of chance, according to the significance level of 0.001. Consequently, it can be concluded that the intervention effectively reduced psychological stress in all dimensions for the experimental group compared to the control group.

4. Discussion

Tables 3 and 4 show that psychological stress was considerably and favorably reduced by the intervention in all dimensions when comparing the experimental group to the control group. It appears that the intervention was effective in reducing psychological distress because of the statistical significance of the differences between the two groups. The average score of the experimental group in the health stress component of the post-test was significantly higher than that of the control group. This shows that reducing stress linked to health was a good outcome of the intervention. With a DRI of 69.93%, the experimental group outperformed the control group in terms of rate of improvement. Furthermore, the experimental group significantly outperformed the control group in terms of mean post-test scores for social and familial pressures. This shows that psychological stress resulting from social and familial issues was successfully decreased by the intervention. Given the control group's lower rate of improvement, the experimental group's DRI of 27.54% suggests a clear superiority. The experimental group outperformed the control group in the post-test concerning the personal stress dimension, as evidenced by their much higher average score. This suggests that the level of subjective psychological discomfort was successfully decreased by the intervention. Comparing the experimental group to the control group, the DRI of 19.13% shows that the experimental group improved at a much higher pace. Finally, the experimental group did better on the stress component of raising a disabled child in terms of mean post-test scores than the control group. This implies that the psychological burden associated with parenting a disabled child was successfully reduced by the intervention. The experimental group's DRI of 49.45% suggests that they have improved at a significantly faster rate than the control group. Taking everything into account, these

results provide strong evidence of the intervention's efficacious reduction of psychological distress. Significant statistical differences were identified between the two groups, with the experimental group improving at a significantly higher pace than the control group. The intervention's positive effects on reducing psychological stress on all fronts are shown by these outcomes.

Exercise has been shown to contribute to the reduction of psychological stress. Various studies [31-33] have demonstrated the preventative benefits of exercise on mental health, including its impact on depression and anxiety. In older adults, supervised exercise interventions such as low-intensity qigong and combinations of cardio exercise with aerobic exercise or nutrition/diet education have shown the strongest evidence for stress reduction [25]. Additionally, physical activity, including transport and leisure activities, has been associated with lower psychological distress, particularly in women [34]. Furthermore, moderate exercise has been found to stabilize autonomic and neuroendocrine responses to psychological stress, leading to a decrease in stress-related indicators such as heart rate variability and serum cortisol levels [35,36]. Finally, physical activity interventions have been recommended as a therapy for reducing stress in older adults, especially during the COVID-19 pandemic [37]. According to the findings of studies conducted by Naoko, T. et al. [38] and Tomitani, N. et al. [39], engaging in physical activity helps to lower stress and psychological strain. According to a study, Hachenberger, J. et al. [40] compared engaging in physical activity and experiencing stress, engaging in physical activity lessened stress-related sensations as seen by feelings of tension being lower in the evening and a lesser increase in stress from morning to evening.

Regular participation in sports can help lower psychological stress, according to studies [41, 42]. University students' low levels of stress are correlated with participation in sports [43]. In comparison to entertainment athletes, elite athletes also have reduced psychological distress [44]. The same findings have been concluded from different studies that show how exercise reduces the intensity of depression, anxiety, and stress in adults [45-47]. These benefits have been demonstrated in different populations, such as healthy people and those suffering from mental health and physical illness among others [39]. For psychological coping high-intensity sport, exercise is the most proper option. This is effective in diminishing the symptoms of depression [48]. According to Yildirim et al. [49], the experimental group had lower stress and depression scores than the control group, proving that the intervention was successful in lowering stress and depression symptoms. In patients with alcohol and drug use disorders, Kayaoglu K., Altun Ö.Ş. [50] discovered that psychoeducation and music intervention successfully decreased stress and raised self-efficacy. Sports dance activities have been shown by Zheng C, Ji H. [51] to reduce psychological stress and increase self-satisfaction in

college students. Lastly, Yang P. et al. [52] discovered that in people with mild depressive symptoms, a multimodal intervention combining aerobic exercise and rhythmic music significantly facilitated attentional bias to positive emotional signals.

5. Conclusions

This study aimed to evaluate the effect of a cardio training program on the psychological stress of mothers of children with special needs. The program took eight weeks in the eastern region of the Kingdom of Saudi Arabia. The sample consisted of 40 mothers, who were divided equally into two groups: the experimental group (20 mothers) and the control group (20 mothers). The results of the study showed that there were statistically significant differences between the pre- and post-measurements of psychological stress levels in the experimental and control groups. When compared to the control group, the experimental group - which completed the cardio training program - showed higher improvements. Results indicate that mothers who participated in the cardio training program experienced a significant reduction in stress levels ($P < 0.05$). Therefore, the applied program showed significant improvement for the experimental group in health stresses, family and social pressures, personal pressures, and stress of caring for a disabled child. Respectively, the percentages of (69.93%, 27.54%, 19.13%, 49.45%) were over the control group.

5.1. Study Limitations and Strengths and Future Directions

The Eastern Province of the Kingdom of Saudi Arabia hosted this study to find out how cardio exercise affected moms of special needs children's psychological stress levels. However, there were several restrictions and difficulties with the study. Firstly, the results may not be entirely representative as some moms chose not to engage in the program, resulting in a rather small sample size. Furthermore, outside variables like social settings and the surrounding environment may have an impact on the study's findings, necessitating care in how the data are interpreted. Examining how cardio exercise affects psychological stress in a particular demographic is one of the study's strong aspects, which supports raising awareness of the value of exercise in promoting mental

wellness. Future research should broaden the study's focus to include more diverse and sizable sample sizes as well as further evaluations of other variables including social support, sleep, and diet that may have an impact on results. It is worth mentioning that the study did not assess the impact of genetic or biological factors on the outcomes. This is an area that needs more research to gain a more accurate knowledge of the potential consequences.

The study suggests that special needs care organizations should consider incorporating exercises like cardio into the weekly schedules of mothers with special needs children. This inclusion aims to help reduce the severity of psychological pressures experienced by these mothers. These organizations need to recognize the significant burden these mothers carry in caring for their children with special needs. Furthermore, the study emphasizes the importance of these organizations and institutions paying attention to the study's findings. By doing so, they can benefit from the results and insights provided, potentially improving the support and services offered to mothers of children with special needs. This proactive approach can lead to better outcomes for both the mothers and their children, enhancing their overall well-being and quality of life.

Funding

The Deanship of Scientific Research at King Faisal University, Saudi Arabia, funded this study; grant number (GRANT A280).

Informed Consent Statement

Before participating in the study, all participants provided their informed consent.

Acknowledgements

The author expresses their gratitude to all the participants who took part in the study.

Conflicts of Interest

There is no conflict of interest for the author.

Supplementary Materials

Appendix A: The Appendix Includes the Psychological Stress Scale

Table S1. Psychological stress scale

No.	Phrases	Applies perfectly	Apply	Somewhat applicable	Do not apply	Not quite applicable
(A) Health stresses						
1.	I am currently experiencing insomnia, finding it difficult to fall asleep or stay asleep.					
2.	I am feeling a lack of energy, motivation, and a sense of laziness, affecting my ability to be active.					
3.	I often find myself feeling sad and crying over minor reasons.					
4.	I consistently feel tired, even after engaging in simple activities.					
5.	I am experiencing shortness of breath without any apparent cause.					
6.	Frequent headaches occur without any identifiable reason.					
7.	I am dealing with joint pain without any apparent cause.					
8.	I am struggling with memory issues, even with simple tasks.					
9.	Digestive disorders are impacting my overall well-being.					
10.	I frequently experience anxiety without any valid reason.					
11.	Constant stomach pain is preventing me from enjoying food.					
12.	I am unable to find joy or happiness in my life.					
13.	Unexplained breathing difficulties are causing discomfort.					
14.	I have difficulty controlling my temper and tend to get angry easily.					
15.	I tend to excessively blame myself for even minor things.					
16.	Making decisions, even simple ones, is challenging for me.					
17.	I have a loss of appetite and no desire to eat.					
18.	I feel uncomfortable and suffocated in the presence of others.					
19.	I am feeling frustrated and lacking the desire to live.					
20.	I am currently experiencing insomnia, finding it difficult to fall asleep or stay asleep.					
(B) Family and social pressures						
21.	I feel that my family is at risk of falling apart due to the challenges posed by my disabled child.					
22.	The arrival of my disabled son has shattered my life and caused significant disruption.					
23.	I perceive that others view me as inferior because of my disabled son.					
24.	I sense that my relatives are avoiding interactions with my family due to my disabled son.					
25.	I feel abandoned by my friends because of my disabled son.					
26.	I believe that having a disabled member in my family is a tremendous disaster.					
27.	Taking my son abroad during vacations hampers my ability to enjoy myself.					
28.	I feel anxious when I take my son to public places.					
29.	I feel that everything we do with our son is futile and does not yield any results.					
30.	The numerous instructions and directions that need to be given to my son bother me.					

Table S1 continued

31.	It saddens me that my son cannot naturally integrate into our family.				
32.	I blame myself for my son's disability.				
33.	I fear that the presence of a disabled family member will greatly impact our social standing.				
34.	I face limitations in visiting my friends due to the demands of caring for my disabled child.				
35.	Family members must make sacrifices and forego certain necessities because of the presence of a disabled child.				
36.	I tend to avoid discussing my disabled son with others.				
37.	There are moments when I feel embarrassed and uncertain because of my disabled son.				
38.	I worry that my son will consistently pose challenges for the family.				
39.	I see no point in attempting to teach my son even a simple profession.				
40.	I feel that people do not consider the feelings of the family of a disabled child.				
41.	I feel that my family is at risk of falling apart due to the challenges posed by my disabled child.				
(C) Personal pressures					
42.	I experience deep sadness when I think about my son's condition.				
43.	I feel anxious and upset when I contemplate my son's future as he grows up.				
44.	I feel frustrated knowing that my son will never have a typical life.				
45.	I prioritize providing extra protection for my son.				
46.	It pains me to accept that my son will live his entire life with a disability.				
47.	I feel frustrated and disappointed with the limitations my disabled son faces in his lifestyle.				
48.	I believe that my son's potential is restricted, preventing him from performing everyday tasks.				
49.	I perceive that the responsibilities of a family with a disabled child surpass those of a typical family.				
50.	I experience anxiety when I am unable to adequately care for my son.				
51.	I feel that my disabled son's achievements fall significantly below what is expected of him.				
52.	I sometimes wish that my disabled son was merely a bad dream from which I could wake up.				
53.	I am distressed by the distorted portrayal of people with disabilities in the media.				
54.	My son becomes upset when he feels that I am not attentive to his needs.				
(D) Stress of caring for a disabled child					
55.	I am worried that the financial burden of caring for my disabled son is overwhelming and beyond my means.				
56.	I feel that I have had to sacrifice many personal desires and aspirations due to the needs of my disabled son.				
57.	The demands of caring for my son are numerous and draining for both me and my family.				
58.	Planning for my child's future is challenging and uncertain.				
59.	I am saddened by the lack of adequate support available for families with disabled children.				
60.	It deeply troubles me that my son displays intense aggression that is difficult to handle.				

Appendix B: Cardio Training

Exercises

1. Perform standing jumps with feet opening before the hands and closing them with each jump. This exercise involves jumping vertically while simultaneously spreading the feet apart and extending the arms out in front of the body. Upon landing, bring the feet back together and return the arms to the starting position. Repeat this movement with each jump.
2. Perform jumping jacks by standing with feet together and arms by your sides. Jump up, spreading your feet apart and raising your arms out to the sides until they are overhead. At the same time, keep your legs straight and engage your core muscles. Jump again, bringing your feet back together and lowering your arms to the starting position. Repeat this movement, opening and closing the feet and hands with each jump. This exercise helps to improve cardiovascular endurance and works the muscles in the legs, arms, and core.
3. Lie on your back with your legs extended and your arms by your sides. Lift your head slightly off the ground, engaging your abdominal muscles. From this position, raise one leg off the ground while keeping the other leg extended and close to the floor. Lower the raised leg back down and repeat the movement with the opposite leg. Continue alternating between legs, lifting, and lowering them in a controlled manner. This exercise targets the abdominal muscles, particularly the lower abs, and helps to improve core strength and stability.
4. Perform jumps with your arms close to your body, bringing your feet closer together, and raising your toes during the jump. Start in a standing position with your feet hip-width apart and your arms by your sides. Jump up explosively, keeping your arms close to your body and bringing your feet together in mid-air. As you jump, raise your toes towards the top of your feet, engaging your calf muscles. Land softly with your feet back in the starting position, ready to repeat the movement. This exercise helps to improve lower body strength, explosiveness, and calf muscle activation.
5. Perform squats by starting in a standing position with your feet shoulder-width apart. Engage your core muscles and keep your chest lifted. Lower your body down by bending your knees and pushing your hips back, as if you are sitting back into a chair. Keep your weight on your heels and your knees in line with your toes. Go down until your thighs are parallel to the ground, or as low as you can comfortably go. Push through your heels to return to the starting position, standing back up. Repeat this movement, going down and up, while maintaining proper form and control. Squats target the muscles in your lower body, including the quadriceps, hamstrings, and glutes, and help to improve lower body strength and stability.
6. Perform forward lunges with arms extended and alternating legs and arms. Start by standing tall with your feet hip-width apart and your arms extended straight out in front of you. Take a step forward with your right leg, lowering your body down into a lunge position. As you lunge, simultaneously extend your left arm forward. Keep your front knee aligned with your ankle and your back knee hovering just above the ground. Push through your front heel to return to the starting position, while simultaneously bringing your right leg back and your left arm back to the extended position. Repeat the movement on the opposite side, stepping forward with your left leg and extending your right arm. Continue alternating legs and arms with each lunge. This exercise targets the muscles in your lower body, including the quadriceps, hamstrings, and glutes, while also engaging the core and upper-body muscles for stability and coordination.
7. Hold a large rubber ball behind your head and lean on the ground with both hands. From this position, roll the ball along your body, moving it from behind your head towards your feet. Keep your core engaged and your body in a straight line as you roll the ball. Once the ball reaches your feet, reverse the movement, and roll it back up towards your head. Continue rolling the ball along your body, back and forth, while maintaining control and stability. This exercise targets the muscles in your core, including the abdominals and obliques, while also engaging the muscles in your arms and shoulders for stability and control.
8. Lie on your back with your legs slightly raised off the ground and hold weights in your hands. Extend your arms out to the sides, parallel to the floor. From this position, open your arms out to the sides, bringing the weights away from each other. Keep your arms straight and engage your chest and shoulder muscles as you open your arms. Then, bring your arms back together, crossing the weights over your chest. Repeat this movement, opening and closing your arms to the sides while maintaining control and stability. This exercise targets the muscles in your chest, shoulders, and arms, helping to improve upper-body strength and toning.
9. Lie on your back with your legs slightly raised off the ground and hold weights in your hands. Extend your arms straight up above your chest, with your palms facing each other. From this position, open your arms out to the sides, bringing the weights away from each other while keeping your arms extended. Engage your chest and shoulder muscles as you open your arms. Then, bring your arms back together, crossing the weights over your chest and extending them back up

- above your chest. Repeat this movement, opening and closing your arms to the sides while maintaining control and stability. This exercise targets the muscles in your chest, shoulders, and arms, helping to improve upper-body strength and toning.
10. Lie on your back with your legs extended and slightly raise your torso off the ground. Extend your arms straight out in front of you. From this position, engage your core muscles and lift your right arm and left leg off the ground, reaching toward your left foot. Return to the starting position and then lift your left arm and right leg off the ground, reaching towards your right foot. Continue alternating sides, touching your arms to the opposite feet, while maintaining control and stability. This exercise targets the muscles in your core, including the abdominals and obliques, while also engaging the muscles in your arms and legs for stability and coordination.
 11. Stand with your legs slightly apart and extend your arms straight back behind you. From this position, bring your arms forward and clap your hands together in front of your body. Then, extend your arms back again and repeat the movement. Continue alternating between extending your arms back and clapping in front of your body, maintaining a steady rhythm. This exercise helps to engage the muscles in your arms, shoulders, and chest, while also improving coordination and flexibility in your upper body.
 12. Stand with your feet apart and your arms relaxed at your sides. Hold a half-kilo weight in one hand. Begin by taking a step to the left, shifting your weight onto your left foot, and simultaneously raising your right arm out to the side, holding the weight. Return to the starting position and then repeat the movement, this time stepping to the right and raising your left arm with the weight. Continue alternating between stepping to the left and right while raising the corresponding arm with the weight. This exercise helps to engage the muscles in your legs, core, and arms, while also improving balance and coordination.
 13. Sit on a rubber ball, ensuring that your feet are firmly planted on the ground for stability. Hold weights in your hands, with your arms extended straight up above your shoulders. From this position, simultaneously open your arms out to the sides, bringing the weights away from each other while maintaining a slight bend in your elbows. Engage your shoulder and chest muscles as you open your arms. Then, bring your arms back together, crossing the weights over your chest and lowering them back down to the starting position. Repeat this movement, opening and closing your arms to the sides while maintaining control and stability. This exercise targets the muscles in your shoulders, chest, and arms, helping to improve upper body strength and toning. The added challenge of sitting on a rubber ball also engages your core muscles for stability and balance.
 14. Stand in front of a platform, ensuring it is sturdy and secure. Begin by stepping up onto the platform with your right foot, pushing through your heel to lift your body. As you bring your right foot back down, step up onto the platform with your left foot. Continue alternating legs, stepping up and down quickly in a controlled manner. Make sure to engage your leg muscles and maintain proper form throughout the exercise. This exercise targets your lower body, specifically your quadriceps, hamstrings, glutes, and calves, while also improving cardiovascular endurance and leg strength.
 15. Stand in front of a platform or step, ensuring it is sturdy and secure. Hold hand weights in each hand, with your arms relaxed at your sides. Begin by stepping up onto the platform with your right foot, pushing through your heel to lift your body. As you bring your right foot back down, step up onto the platform with your left foot. Continue alternating legs, stepping up and down quickly while maintaining a brisk pace. Make sure to engage your leg muscles and maintain proper form throughout the exercise. The added challenge of holding hand weights will increase the intensity and engage your arm muscles as well. This exercise targets your lower body, specifically your quadriceps, hamstrings, glutes, and calves, while also improving cardiovascular endurance, leg strength, and upper body strength.
 16. Engage in jump rope exercises until you reach a point of fatigue. Here's a breakdown of how to perform jump rope exercises:
 - Start by holding the jump rope handles in each hand, with your hands positioned at your sides.
 - Begin swinging the rope over your head and jump over it as it comes towards your feet. Try to maintain a steady rhythm.
 - Land softly on the balls of your feet, keeping your knees slightly bent to absorb the impact.
 - Continue jumping rope, aiming to maintain a consistent pace and rhythm.
 - As you become more comfortable, you can try different variations, such as alternating feet, high knees, or double unders (where the rope passes under your feet twice in one jump).
 - Keep jumping until you start to feel fatigued or until you reach your desired workout duration.
 17. Perform jump rope exercises while wearing ankle weights to increase the intensity and challenge of the workout. Here's a breakdown of how to incorporate ankle weights into your jump rope routine:
 - Secure ankle weights around your ankles, ensuring they are snug but not too tight.
 - Hold the jump rope handles in each hand, with your hands positioned at your sides.
 - Begin swinging the rope over your head and jump over it as it comes towards your feet. Maintain a steady rhythm.

- Land softly on the balls of your feet, keeping your knees slightly bent to absorb the impact.
 - Continue jumping rope, aiming to maintain a consistent pace and rhythm while feeling the added resistance from the ankle weights.
 - As you become more comfortable, you can try different variations, such as alternating feet, high knees, or double unders, while still wearing the ankle weights.
 - Keep jumping until you start to feel fatigued or until you reach your desired workout duration.
18. Continue performing step-ups on a platform but focus on using your right leg and calves. Here's a breakdown of how to perform this exercise:
- Stand in front of a sturdy platform or step, ensuring it is secure and at a comfortable height.
 - Place your right foot firmly on the platform, ensuring your entire foot is supported.
 - Push through your right heel and engage your right leg muscles to lift your body onto the platform.
 - As you bring your right foot back down, focus on landing softly on your left leg, maintaining balance and stability.
 - Repeat the movement, stepping up with your right leg and landing on your left leg, until you start to feel fatigued or reach your desired workout duration.
 - Maintain proper form throughout the exercise, keeping your core engaged and your movements controlled.
 - If needed, you can use your arms for balance by extending them out in front of you or placing your hands on your hips.
 - Performing step-ups with a focus on using one leg at a time helps to isolate and strengthen the muscles of that leg, while also improving balance and stability.
19. Perform step-ups on a platform with your right leg and land on the left leg while holding a one-kilogram medicine ball with both hands until you reach a point of fatigue. Step-ups with added weight can help increase the challenge and intensity of the exercise, targeting the lower body muscles and improving overall strength and stability. Here's a breakdown of how to perform this exercise:
- Stand in front of a sturdy platform or step, ensuring it is secure and at a comfortable height.
 - Hold a one-kilogram medicine ball with both hands, keeping it close to your chest.
 - Place your right foot firmly on the platform, ensuring your entire foot is supported.
 - Push through your right heel and engage your right leg muscles to lift your body onto the platform.
 - As you bring your right foot back down, focus on landing softly on your left leg while maintaining balance and stability.
 - Throughout the exercise, keep the medicine ball close to your chest, maintaining a strong grip.
 - Repeat the movement, stepping up with your right leg and landing on your left leg, while holding the medicine ball, until you start to feel fatigued or reach your desired workout duration.
 - Maintain proper form throughout the exercise, keeping your core engaged and your movements controlled.
 - If needed, you can use your arms for balance by extending them out in front of you or placing your hands on your hips.
20. Engage in ladder drills, performing rapid ascents and descents until you reach a point of fatigue. Ladder drills are a great way to improve agility, speed, and coordination. Here's a breakdown of how to perform ladder drills:
- Set up an agility ladder on the ground, ensuring it is flat and secure.
 - Stand at one end of the ladder, facing forward with your feet shoulder-width apart.
 - Begin by stepping into the first square of the ladder with your right foot, followed by your left foot.
 - Quickly move your right foot out to the side and step into the next square, followed by your left foot.
 - Continue this pattern, moving quickly and efficiently through the ladder, ascending towards the other end.
 - Once you reach the end of the ladder, turn around and begin descending by stepping backward through the squares.
 - Maintain a quick pace and focus on proper footwork, keeping your movements light and precise.
 - Continue ascending and descending the ladder, pushing yourself until you start to feel fatigued or reach your desired workout duration.

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