



Effect of Eight Weeks of Sports Exercises in Water on Sleep Disturbance and Alexithymia of Inactive Veterans

ARTICLE INFO

Article Type

Original Research

Authors

Rezaei S. ^{*1 PhD}

Kheiri A. ^{1 PhD}

Esmaili M. ^{2 PhD}

Mahmoudi A. ^{3 PhD}

How to cite this article

Rezaei S, Kheiri A, Esmaili M, Mahmoudi A. Effect of Eight Weeks of Sports Exercises in Water on Sleep Disturbance and Alexithymia of Inactive Veterans. Iranian Journal of War & Public Health. 2023;15(3):285-293.

¹ Department of Sport Sciences, Faculty of Humanities, Ilam University, Ilam, Iran

² Sport Sciences Research Institute, Tehran, Iran

³ Department of Sport Management, Faculty of Sport Sciences and Health, University of Tehran, Tehran, Iran

*Correspondence

Address: Post Address: Department of Sport Sciences, Faculty of Humanities, Ilam University, Research Boulevard, Ilam, Iran. Postal Code: 69315-51655
Phone: +98 (84) 34843257

Fax: -

sh.rezaei@ilam.ac.ir

Article History

Received: July 25, 2023

Accepted: August 16, 2023

ePublished: September 2, 2023

ABSTRACT

Aims This research has been conducted to investigate the effects of eight weeks of sports exercises in water on sleep disturbance and alexithymia in inactive veterans.

Materials & Methods This semi-experimental study with a pre-test/post-test control group design was conducted in the Spring of 2023. The research statistical population consisted of all non-athlete veterans, over 25% of anatomy being disabled (inactive) in Ilam city, Iran, among whom 28 individuals were selected by available and voluntary sampling and were divided randomly into two groups; experimental and control. Standard sleep quality questionnaires of Pittsburgh (1989) and Toronto Alexithymia (1994) were used to collect data. For analyzing the data, univariate and multivariate analysis of covariance was employed in SPSS 24 software.

Findings Before the exercise intervention, there were no significant differences in sleep disturbance and alexithymia between the experimental and control groups, and the two groups were homogeneous. However, after the exercise intervention, improvements in sleep disturbance and alexithymia were observed in the experimental group compared to the control group ($p \leq 0.05$).

Conclusion Sports exercises in water have a negative impact on sleep disturbance and alexithymia in the veteran population.

Keywords Alexithymia; Exercise; Veterans; Sleep

CITATION LINKS

[1] Effect of group exercise program on quality of life in post-traumatic ... [2] Type of injury and quality of life among veterans Kermanshah ... [3] Studying the effectiveness of treatment based on acceptance and commitment on ... [4] Sleep duration and sleep quality in caregivers of patients with dementia: A systematic ... [5] Comparison of the effectiveness of well-being therapy with and ... [6] Associations between metabolic disorders and sleep ... [7] An examination of the reciprocal associations between physical ... [8] The prevalence of posttraumatic stress disorder and sleep ... [9] Investigating sleep quality and factors affecting it in patients hospitalized ... [10] Poor sleep as a potential causal factor in ... [11] Role of anger rumination and cognitive emotion regulation strategies in ... [12] Predicting alexithymia based on early maladaptive schemas and ... [13] Investigating the effect of painting therapy on lexithymia ... [14] The effectiveness of compassion-focused therapy on resilience ... [15] Effectiveness of acceptance and commitment therapy on sexual ... [16] Comparison of the effectiveness of compassion focused ... [17] The role of alexithymia to predict high-risk behaviors based on mediating ... [18] Headache and alexithymia in children and adolescents: ... [19] The association between alexithymia and eating behavior ... [20] Alexithymic traits and somatic symptoms in children and adolescents: ... [21] The effectiveness of schema therapy on alexithymia and marital conflicts ... [22] A feeling difficult to identify: Alexithymia ... [23] Effectiveness of eight weeks of aquatic exercises on fatigue, balance ... [24] The effect of eight weeks aquatic therapy on quality of life ... [25] Influence of water-based exercise on energy intake, appetite, and appetite-related ... [26] Effect of eight weeks water exercise with blood flow restriction on growth ... [27] Sequential treadmill exercise and cognitive training synergistically ... [28] The pittsburgh sleep quality index: A new instrument ... [29] The twenty-item Toronto Alexithymia Scale-II. Convergent, ... [30] Investigating effect of a period of water exercise on sleep quality in ... [31] The relationship between sleep quality and lifestyle of ... [32] Effect of sports activities on some physiological parameters ... [33] The effect of physical activity on vitamin d levels ... [34] Associations between aerobic and ... [35] Physical activity and sleep are inconsistently ... [36] Comparison of aggression and sleep habits of athlete ... [37] The relationship of sleep quality with body mass index ... [38] The effectiveness of yoga therapy on early maladaptive schemas ... [39] ffect of aerobic exercise on the levels of pain, quality of life, ... [40] Comparison of the effectiveness of training cognitive ...

Introduction

War is an armed, intentional, and widespread struggle between political societies, which can be considered political violence. War is one of the important and influential factors in physical, psychological, and behavioral disorders because it exposes individuals to extremely risky conditions [1]. Iran's last war was with Iraq. This war started, due to the greed of the ruling regime in Iraq (at that time), in 1980 and ended in 1988. This war caused irrecoverable damages to both countries. According to the Martyrs Foundation of Ilam Province report, during this war, 2695 people were martyred, and 8848 became injured veterans in the province, of which more than 1200 are veterans, with over 25% of anatomy being disabled. Disabled veterans are divided into five groups based on the type of disability: Neurological and psychological, special, amputee, chemical, and combined. This classification is based on various injuries, such as limb amputation and psychological and psychiatric injuries caused by explosions and chemical weapons. Most veterans have physical and mobility disabilities, as well as psychological disorders such as loneliness, anxiety, depression, lack of emotional control, identity crisis, boredom, sleep disturbances, alexithymia, aggression, communication difficulties, and family problems [2].

One of the most significant problems affecting the quality of life of veterans is sleep disturbances. Sleep is a necessity of life, as humans spend about one-third of their lives sleeping [3]. Quality sleep refers to an individual's ability to achieve deep sleep, so quality sleep extends beyond having a few hours of sleep. Delayed and prolonged sleep onset without logical and reasonable cause is considered sleep disturbance, which usually manifests as dissatisfaction with sleep quality [4]. Inadequate and poor-quality sleep can affect body metabolism, homeostatic function, nervous system function, digestive system function, immune system, and individual mood [4, 5]. Disruption in the sleep-wake cycle also has a significant impact on disrupting physiological processes such as fatigue, decreased appetite, exacerbation of diseases, mental disorders, and physical weakness [6, 7]. Poor sleep quality disrupts individuals' emotions, thoughts, and motivations, and it increases stress and pain and delays recovery from illnesses and disorders [8]. Sleep disturbances and disorders appear in the form of insomnia and dyssomnia. Dyssomnia includes disturbances in sleep onset, sleep maintenance, excessive sleep, low-quality sleep, frequent awakenings, insufficient sleep, and respiratory problems during sleep. Insomnia also includes a kind of disturbance in sleep, disruption in sleep regulation, delayed sleep onset, difficulty staying asleep, low-quality sleep, disturbing dreams, waking up very early in the morning, or a combination of these

conditions. Individuals suffering from insomnia and dyssomnia, in addition to having low sleep quantity and quality, also experience social and personal life disruptions [3, 9]. There is a significant correlation between sleep quality and mental states, such as aggression, through the negative effects of sleep disturbances on the prefrontal cortex's function, which may lead to loss of control over inappropriate impulses in behavior. Other potential mechanisms related to sleep disturbances and disorders are the hypothalamus-pituitary-adrenal axis and central serotonin [10]. Individual differences in the neurobiological system are responsible for intensified psychological reactions (such as aggressive responses) caused by sleep disorders in specific individuals. Therefore, identifying these individuals is of particular importance [11]. Although sleep disturbances occur in all individuals and age groups, veterans are more likely to experience changes in sleep patterns and quality due to physical, psychological, and behavioral limitations caused by war and violence. Sleep disturbance is among the most common disorders experienced by veterans, and the findings of various studies indicate a high prevalence of poor quality of sleep among veterans, so inappropriate sleep quality is one of the most important reasons for referring veterans to medical centers and physicians [5]. Nazari *et al.* showed that Sleep disturbance in the elderly is affected by well-being therapy, acceptance, and commitment therapy [5]. Neyestani *et al.* pointed out that there is a significant and inverse relationship between the Sleep Quality of individuals and the Level of Stress and anxiety during the COVID-19 Pandemic [8]. The findings of the research conducted by Yan *et al.* revealed a significant and positive correlation between sleep disturbance and metabolic disorders in schizophrenic patients [6].

One of the important factors affecting the well-being of veterans, which negatively impacts their ability to regulate emotions, quality of social relationships, and reactions to stresses, is alexithymia. Alexithymia is characterized by clinical impairment in identifying and describing self or others' experienced emotions, and its main feature is impairment in emotional conscious functioning, interpersonal communication, and social attachments [12]. Alexithymia involves difficulties in emotional self-regulation and disturbances in psychological functioning, with the primary feature being the inability to verbalize emotions, which is also considered a major cause of mental illnesses and psychological disorders [13]. Individuals with alexithymia face significant difficulties identifying emotions and feelings and using appropriate words to describe them. In extreme cases, these individuals exhibit emotions in a one-dimensional or, at most, two-dimensional manner, and their emotional actions and reactions in interpersonal relationships are incomplete [12]. It can

be said that alexithymia, due to the impairment in describing, identifying, and distinguishing between one's own and other's emotions and feelings, can lead to communication problems, Psychosomatic disorders, and inability to process emotional information and regulate emotions in people. Therefore, the mental, psychological, and physical health of individuals is significantly influenced by alexithymia [14]. The most important message of the alexithymia theory is that organizing emotions and feelings at the right time is crucial for creating a sense of security, improving intimate relationships, enhancing coping with negative experiences, and achieving appropriate adaptation to the environment and others [15]. Veterans with alexithymia perceive the occurrence of normal physical and mental emotions and feelings as despicable and undesirable. Misinterpret is a sign of emotional arousal and sometimes manifests emotional disorders as physical complaints. They may even seek physical signs and injuries during the treatment process [16]. Alexithymia is not considered an explicit psychiatric diagnosis. Still, it can be described as a personality trait that exists in different degrees and is accompanied by many psychiatric, psychological, and medical symptoms [17]. The results of various studies indicate a significant correlation between alexithymia and headache [18], alcohol and narcotics consumption and dependency [17], eating disorders [19], the tendency toward risky behaviors [17], and depression [20]. Findings of Roustaei Alishah and Mostafaei's research showed that in couples with family differences, alexithymia is affected by schema therapy. So, schema-based intervention methods can improve alexithymia [21]. Gharadaghi demonstrated that Art Therapy (drawing) has a significant impact on reducing alexithymia and emotional suppression of Students [13]. Longhurst & Swammi showed a significant and inverse correlation between alexithymia and positive body image among older adults in Britain [22].

Nowadays, due to the positive effects of physical activities and sports on many diseases, engaging in sports activities is recommended for patients. On the other hand, due to the side effects of medications, their high costs, and the lack of definitive treatment for certain diseases, non-pharmacological treatment methods such as physical activities and sports have gained attention from patients and therapists. Sports activities, as a complementary treatment, are an economical, accessible, non-invasive method used in clinical approaches that serve as a strategy for pain management and treating physical and mental disorders [23]. There are various sports exercises, each of which follows specific goals. Many veterans are unable to perform sports exercises on land due to limitations, movement, and skeleton disabilities, as well as joint pains. Therefore, to maintain and increase mobility and strengthen muscles, it's better to train in water. Sports exercises in water have

features such as buoyancy, less inflammatory responses, reduced pressure on joints, creation of isokinetic contractions, hydrostatic pressure, and adhesion, as well as increased sensory feedback and proprioception, reduced risk of falling and breaking bones, mental relaxation, and pain relief, increased and maintained range of motion, and reduction of depression and anxiety in individuals can be achieved. Therefore, it can be an effective exercise method for veterans [24, 25]. On the other hand, aging and prolonged sedentary lifestyle resulting from inactivity in veterans lead to rapid and severe skeletal muscle system weakening (sarcopenia), the occurrence of mental and psychological problems, a decrease in the quality and hope of life, accumulation of fat and obesity, and weakened immune system, making them susceptible to various diseases and even death [1]. Jani *et al.* have stated that sports exercises and physical training in water can reduce fatigue and improve individual performance in men with multiple sclerosis [23]. Zaravar *et al.* showed that physical exercises in water increase the secretion of growth hormone, insulin-like growth factor 1, and bone metabolism in elderly women [26]. Gamiz *et al.* showed that sports and mental exercises have a positive and significant effect on the neurogenesis of hippocampal neurons in the brain [27].

The review and summary of the literature on the subject showed that the social life of veterans is affected by various mental, physical, and skeletal disorders, and sports activities can be one of the most beneficial interventions in this area. Furthermore, it seems that sports exercises in water improve body control and help veterans perform a wide range of daily physical activities without injury. Therefore, considering the importance of quality of life and veterans' health, this research was conducted to investigate the effects of eight weeks of sports exercises in water on sleep disturbances and alexithymia of veterans.

Materials and Methods

This semi-experimental study with a pre-test/post-test control group design was conducted in the Spring of 2023. The research statistical population consisted of all non-athlete veterans, over 25% of anatomy being disabled (inactive) in Ilam city, Iran, among whom 28 individuals were selected by available and voluntary sampling and were divided randomly into two groups; experimental (14 individuals) and control (14 individuals). The individuals with a history of cardiovascular and respiratory diseases (acute myocardial infarction, asthma), neurological disorders (stroke, paralysis, Parkinson's), deformity of the spine, severe lower limb disabilities, skin diseases, smoking, unmarried status, and regular sports activities were not selected. Failure to complete the questionnaires and absence for more than two sessions caused exclusion.

Table 1. Summary of exercises in water

Row	Exercises	Set and Repetition
Introductory Session	Pre-test	In this session, the objectives and method of the research were explained to the participants - from the beginning to the end, and they also completed a written informed consent form with full awareness. Then a pre-test was carried out using demographic questionnaires, Pittsburgh sleep disturbance, and Toronto alexithymia.
1	Week 1 (endurance exercises)	1 - Walking 200-300 meters, skipping, jumping, and leaping in different directions. - Walking and running sideways with hand movements variation (butterfly-like movements). - Cycling movement. - Team water games (tug of war, volleyball, water splashing, etc.).
2	Week 2 (resistance exercises without weight)	- Front thigh muscle exercises with a straight and stable spine (thigh joint flexion and knee joint extension). - Back thigh muscle exercises with a straight and stable spine (thigh joint extension and knee joint flexion). - Upper body muscle exercises (elbow flexion and extension, lower back flexion and extension, shoulder abduction and adduction, head flexion and extension, wrist flexion and extension). - Squats in water with a knee joint angle of 60 degrees.
3	Week 3 (resistance exercises without weight)	- External thigh muscle exercise (abduction of the hip joint with a straight and stable spine). - Internal thigh muscle exercise (adduction of the hip joint (returning from abduction), with a straight and stable spine). - Upper body muscle exercises: (elbow flexion and extension, lumbar flexion and extension, shoulder flexion and extension, lumbar rotation, supination and pronation of the forearm). - Scott exercise in water with a 90-degree angle at the knee joint.
4	Week 4 (resistance exercises without weight)	- Triple flexion exercise of the lower body (hip, knee, and ankle joints). - Plantar flexor exercise: plantar flexion. - Dorsiflexor exercise. - Upper body muscle exercises: abduction, adduction, flexion, extension, and lateral rotation of the shoulder, lumbar rotation, lateral flexion of the neck. - Scott exercise in water with a 90-degree angle at the knee joint.
5	Week 5 (resistance exercises with weights)	- Anterior thigh muscle exercise with sponge pads and water weights (hip joint flexion and - knee joint extension). - Posterior thigh muscle exercise with sponge pads and water weights (knee joint flexion and hip joint extension). - Upper body muscle exercises with barbell and water dumbbells (elbow flexion and extension, lumbar flexion and extension, shoulder abduction and adduction, head flexion and extension, wrist flexion and extension). - Squat in water with a water barbell and a 60-degree angle at the knee joint.
6	Week 6 (resistance exercises with weights)	- Outer thigh muscle exercise with sponge pads and water weights (hip abduction with a straight spine) - Inner thigh muscle exercise with sponge pads and water weights (hip adduction with a straight and stable spine) - Upper body muscle exercises with dumbbells and water wrist bands (abduction, adduction, flexion, extension and shoulder rotation, waist rotation, lateral flexion, and extension of the head - Squat in the water with dumbbells and a 90-degree knee joint angle.
7	Week 7 (resistance exercises with weights)	- Lower body triple flexion exercises (hip, knee, and ankle joints) with water resistance bands. - Plantar flexor exercises: Plantar flexion with water resistance bands - Upper body exercises with barbell and water dumbbells (elbow flexion and extension, lumbar flexion and extension, shoulder adduction and abduction, head flexion and extension, wrist flexion and extension) - Water squat with a water barbell and a 90-degree knee joint angle.
8	Week 8 (resistance exercises with weights)	- Dorsiflexors exercise with water Wristbands. - Upper body muscles exercise with barbells and water dumbbells.
Farewell session	Post-test	In this session, the participants were appreciated for their cooperation, regular attendance in - the training sessions, and participation in this research. At the end of the post-test, population-based questionnaires were used to assess the Pittsburgh Sleep Quality Index (PSQI) and Toronto Alexithymia Scale.

The library method was used to collect the background and theoretical basis of the research, and three standard questionnaires were used to collect data:

Demographic questionnaire: This general questionnaire includes four questions about age, education, daily sports activities level, and marital

status, aiming to collect general population data from the sample.

Pittsburgh Sleep Quality Index (PSQI): This questionnaire was designed and validated by Buysse *et al.* to assess sleep quality during four weeks of individuals with and without health conditions. The Pittsburgh Sleep Quality Index originally consisted of

9 questions. Still, since question 5 itself includes ten sub-questions, the total questionnaire consists of 18 questions, which are scored from 0 to 3 on a 4-point Likert scale. This questionnaire has seven subscales, including sleep quality, sleep onset latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The minimum score for each question is Zero, and the maximum is 3. Calculating the total scores of this questionnaire is a bit complicated and ranges from 0 to 21, with a higher score indicating a lower quality of sleep. A score higher than 6 indicates poor sleep quality. Buisse *et al.* obtained the reliability of this questionnaire by using Cronbach's alpha of 83% [28]. Also, the face and content validity of this tool was verified by six expert professors, and its reliability coefficient was obtained as 0.94 using Cronbach's alpha.

Toronto Alexithymia Scale-20 (TAS20): This questionnaire was developed by Bagby *et al.* and consists of 20 items and three subscales for Difficulty Identifying Feelings (7 items), Difficulty Describing Feelings (5 items), and Externally Oriented Thinking (8 items). The responses are rated on a 4-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). The highest possible score on this questionnaire is 100, and the lowest is 20. Questions 4, 5, 10, 18, and 19 are scored conversely. Bagby *et al.* reported a reliability coefficient of 81% for this questionnaire using Cronbach's alpha [29]. In this study, the face and content validity of the tool were confirmed by six expert professors, and the reliability coefficient was also obtained as %82 using Cronbach's alpha.

Exercise sessions in water were conducted for eight weeks, with three sessions per week (Saturdays, Mondays, and Wednesdays). Each session lasted 70 minutes and was conducted with the experimental group by a specialized coach at the covered pool of Issar (Veterans) in the City of Ilam. During this period, the control group continued their normal activities and did not participate in any specific exercise program. The water temperature in the pool ranged from 26 to 28°C, and the water depth ranged from 130 to 150cm. To adhere to ethical considerations, in the introductory session (pre-test), the research objectives and methods were explained to the participants from beginning to end, and they also completed a written informed consent form with full awareness. Participants were also assured that their personal and health information would remain confidential, and each participant could withdraw from the study at any time they desired. The water exercise protocol consisted of three stages:

Stage 1: Adaptation to the water environment and warm-up, which included walking in water and stretching exercises (10 minutes);

Stage 2: Endurance and resistance exercises gradually increasing in intensity (45-65% of

maximum heart rate) and repetitions (50 minutes; Table 1); and

Stage 3: Cool-down, which included deep breathing, walking in water, muscle relaxation in a floating position, and stretching exercises (10 minutes).

After data collection, the data were analyzed using descriptive statistical indices (frequency distribution tables, mean, standard deviation) and inferential statistics (univariate and multivariate analysis of covariance tests) using SPSS 24 software. Also, the results of the normality test indicate that the skewness and kurtosis coefficients of all research variables fall within an acceptable range (-2 to +2); therefore, it can be inferred that the data distribution is normal.

Findings

The mean age of veterans was 56.40±5.11 years. Among them, 17 individuals had a bachelor's degree or lower, nine individuals had a master's degree, and two individuals had a PhD degree. Additionally, none of them had regular sports activities.

There was a significant difference between the mean scores of sleep disturbance and alexithymia in the pre-test and post-test of the experimental group ($p < 0.05$; Table 2).

Table 2. The mean of pre-test and post-test scores in both experimental (n=14) and control (n=14) groups

Parameter	Group	Min.	Max.	Mean	SD
Sleep Disturbance					
Experimental	Pre-test	8	18	13.15	2.76
	Post-test	4	14	9.22	1.15
Control	Pre-test	7	18	13.12	3.32
	Post-test	8	19	12.84	2.65
Alexithymia					
Experimental	Pre-test	40	84	6.20	4.08
	Post-test	38	68	57.88	2.56
Control	Pre-test	39	84	65.55	4.22
	Post-test	41	79	66.95	3.83

The homogeneity of variances between the groups was established by Levene's test ($p > 0.05$). The results of the linear relationship test (assuming linearity in the analysis of covariance) between the co-variances (pre-test) and the dependent variables were significant. Furthermore, the results of the slope homogeneity of regression linear in the dependent variables were consistent at a 5% error level. The results of the homogeneity Chi-square test indicated no difference in the distribution of (testable) subjects in terms of demographic variables in both the pre-test and post-test groups ($p > 0.05$). Additionally, the results of the Box's M test for examining the equality of the covariance matrix of the dependent variable between the experimental and control groups showed that the covariance matrix of the dependent variables in the two groups was equal ($p = 0.445$; $F = 2.233$; Boxes $M = 28.68$). To examine the effect of sports exercises in water on sleep disturbance and alexithymia, both multivariate (MANCOVA) and

univariate (ANCOVA) tests were used ($F=15.845$; $df=18$; $Sig.=0.001$).

The results of the univariate analysis of covariance indicated that by removing the effect of sleep disturbance scores as a covariate, the main effect of sports exercises in water on sleep disturbance

remained statistically significant (Table 3).

The results of the covariance analysis indicated that by removing the effect of alexithymia scores as a covariate, the main effect of sports exercises in water on alexithymia post-test remained statistically significant (Table 4).

Table 3. ANCOVA results for sleep disturbance

Source of changes	Sum of squares	df	Mean square	F	Sig.	Partial Eta Squared
Pre-test	5.118	1	5.118	0.443	0.321	0.154
Group	58.885	1	58.885	3.422	0.005	0.44
Error	521.106	26	12.106			
Total	32133	28				

Table 4. ANCOVA results for alexithymia

Source of changes	Sum of squares	df	Mean square	F	Sig.	Partial Eta Squared
Pre-test	39.892	1	39.892	0.882	0.130	0.032
Group	1710.36	1	1710.36	60.564	0.001	0.650
Error	2014.656	26	37.112			
Total	38413	28				

Discussion

This research aims to examine the impact of eight weeks of sports exercises in water on sleep disturbance and alexithymia among veterans in the city of Ilam. Nowadays, the positive effects of sports activities on health as a non-pharmacological approach are well-known to everyone. However, the biological mechanisms of the effects of sports exercises in water on psychological variables are still unknown and not easily analyzable or interpretable. When it comes to the impact of sports exercises in water, it should be noted that the buoyancy property in water and the higher density of water compared to air reduce pressure on joints, create greater resistance to movement, and consequently engage muscles more and require more energy expenditure compared to exercise on dry land. This can provide a suitable and safe environment for everyone, especially veterans [24]. Furthermore, Sports exercises in water allow veterans to engage in a wide range of sports activities without the risk of falling or serious injury, which can contribute to improving the quality of exercise and increasing motivation and effort [23].

The inferential results of the research demonstrate that sports exercises in water have a significant impact on sleep disturbances in veterans of the city of Ilam. These findings are consistent with the results of research conducted by Dadashpour, Mohamadi, and Dadashpour [30], Taheri and Irandoust [31], Abdi *et al.* [32], Daraei *et al.* [33], Duncan *et al.* [34], and Morbee *et al.* [7], and are inconsistent with the results of the research by Antczak *et al.* [35]. Antczak *et al.*, in a review article, examined the relationship between sports activities and sleep in children aged 3 to 13 years. The results of this research indicate a negligible correlation between sports activities and sleep in children. The probable reason for that might be the wide age range selection in this study [35]. In explaining the effect of sports exercises in water on

sleep disturbances in veterans of the city of Ilam, it can be said that various theoretical and biological mechanisms suggest that regular and intense sports activities can increase the desired sleep duration and improve sleep quality. Firstly, moderate to vigorous sports activities prevent weight gain and its associated risks, which leads to fewer experiences of obstructive sleep apnoea. According to the results of various studies, nearly 60% of moderate to severe sleep apnoea cases are closely related to individuals' obesity [36]. Another relationship that exists between sports activities and sleep quality is related to increased slow-wave sleep or deep sleep duration. This is due to participation in aerobic sports. In this state, the brain and body have an opportunity to rejuvenate, which helps reduce psychological stress and improve individuals' mood. Researchers have found that aerobic exercises, at moderate levels, are the most effective in improving insomnia. However, other forms of exercise are also beneficial and effective. Therefore, individuals, who participate in sports activities their brains secrete more adenosine (a sleep-inducing hormone), resulting in a greater sense of sleepiness compared to inactive individuals [34]. Thirdly, sports activities, especially aerobic exercises, enhance mood-promoting chemicals such as serotonin, which can help regulate the body's biological clock or circadian rhythm. Serotonin levels, by sending signals to various parts of the brain, assist individuals to wake up or fall asleep. Fourthly, during sports exercises, body temperature increases and then decreases after the exercise session. This temperature decrease is similar to the temperature change that occurs before falling asleep, and this similarity between these changes may signal to the brain that it's time to sleep [34]. Finally, insomnia is often accompanied by stress, anxiety, and depression. Regular sports activities can reduce these symptoms through the release of endorphins and positively improve sleep quality [33]. According to the findings of

the research conducted by Zekaei & Adib Saber, participating in regular sports activities through various sports can improve sleep patterns in children and reduce aggressive behaviors [36]. Daraei *et al.* stated that sports activities increase the level of 25-hydroxy vitamin D and improve sleep quality in women. Thus, the status of vitamin D, especially its deficiency, may be a determining factor for sleep quality in active and inactive women [37]. Gilanian Amiri & Habibi pointed out that sports activities lead to improvement of sleep quality by developing and increasing the Non-REM sleep stage (in this stage, heart rate decreases and brain metabolism significantly reduces), reducing REM sleep stage (in this stage, heart rate is faster and brain metabolism is similar to the wakefulness period), and decreasing sleep latency (the time between sleep onset and the first sleep stage).

Among the other findings of this research was the significant and negative impact of sports exercises in water on alexithymia in veterans of Ilam city, which aligned with the results of Saeidi Asl and Robati [38], as well as Torlak *et al.* [39]. Reviewing domestic and international sources showed limited research on the impact of sports activities on alexithymia. Based on the results of Saeidi Asl and Robati's research, yoga therapy has a significant effect on the alexithymia of depressed women, with an effect size of 47.2%. Yoga exercises are effective in two direct ways on an individual's mood, such as alexithymia. One is the release of endorphins (Creators pleasant feelings), and the other is the reduction of cortisol levels (a hormone released in response to stress). Endorphins are natural pain reducers, and sports exercises that have an enhancing effect on endorphin levels lead to the experience of pleasant emotions in individuals [38]. Sports exercises stimulate the production of proteins in the body that fight diseases and are referred to as antibodies. Therefore, individuals who are physically and mentally active are better equipped to combat physical illnesses and mental disorders, leading to increased happiness and improved interactions for them. According to researchers, one of the most effective sports for mental disorders is sports exercises in water. Sports exercises in water can act as a strong stimulus for the hypothalamic, pituitary, adrenal, and noradrenergic systems and reduce stress and depression by decreasing cortisol levels and increasing BDNF (Brain-Derived Neurotrophic Factor) [38]. Therefore, it can be said that sports exercises in water, due to the changes they create in physiological functioning, brain cells, chemical processes, and the immune system, can have a greater and faster impact on cognitive, mental, and emotional processes such as improving communication, positive mood, and reducing alexithymia.

Another aspect of the effects of sports exercises in water on alexithymia that should be mentioned is the social connections formed through sports activities.

Engaging in sports activities, particularly in an active sports environment involving interaction with different individuals as teammates or competitors, can enhance creativity, self-confidence, independence, stress release, and foster intimate relationships among people. These factors can serve as active and continuous stimuli leading to a reduction in alexithymia, especially among veterans. Alexithymia and negative emotions can lead to non-acceptance of emotional responses, emotional unawareness, limited access to emotion regulation strategies, stress, anxiety, anger, shame, hopelessness, and fatigue. Participation in sports activities can be effective in reducing emotional behaviors such as alexithymia and promoting relaxation among individuals [40]. In another description of the significant impact of sports exercises in water on alexithymia among veterans in the city of Ilam, it is worth mentioning that the intervention of sports exercises in water, due to the presence of diverse physical and sports activities, energy discharge, reminiscing, the enjoyable environment of the pool, improvement of psychological factors, social interaction, and leisure time spent with past comrades, helps in moderating and regulating negative emotions such as alexithymia. Various research results indicate that sports exercises in water, which combine features such as water buoyancy, increased resistance, and warmth, regulate blood circulation and reduce body temperature, leading to a preference for deep sleep, increased mental tranquillity, and a reduction in nervous fluctuations and negative emotions [30]. Additionally, sports exercises in water have significant positive effects on psychological and physiological mechanisms, such as enhancing self-efficacy, reducing emotional pressure, promoting self-perception and desirable physiological responses, reducing psychological and physical stress, and improving neurotransmitter function [24]. Individuals who regularly participate in sports activities are emotionally and motivationally stronger, more distant from negative preoccupations, have closer relationships, and have higher spirits, leading to overall psychological relaxation and better quality of life. Overall, regarding the psychological benefits of sports exercises, multiple hypotheses have been proposed. The biochemical hypothesis suggests that exercise increases blood levels of norepinephrine and serotonin, leading to a reduction in individuals' depression levels and an increase in positive mood. The thermogenic theory states that the increase in body temperature during sports activities has a relaxing effect on individuals. Several psychosocial hypotheses have been proposed regarding participation in sports activities and mental well-being. Physical activity and sports revive the sense of responsibility, enhance self-awareness, and bring individuals back to the joy of childhood play. Engaging in sports activities creates a sense of

self-confidence and provides a form of biofeedback, teaching participants how to regulate their emotions and establish order.

Since this study was limited to veterans in Ilam City, caution should be exercised when generalizing the results to other groups and veterans in different cities. Furthermore, other limitations of this research include the lack of precise control over medication consumption, limited access to the veteran community, various psychological and emotional states, and environmental factors. In the end, participation program in sports activities for 30 minutes per day and a minimum of 5 days per week, which leads to improved sleep quality, reduced emotional disorders such as alexithymia and maintained mental and physical health in individuals, is recommended for veterans. It is also suggested to investigate the duration of the effects of sports exercises in water on psychological variables. Additionally, the enjoyable nature of the aquatic environment compared to other environments increases the inclination of individuals, especially veterans, to engage in sports in this setting.

Conclusion

Sports exercises in water have a negative impact on sleep disturbance and alexithymia in the veteran population. Therefore, sports exercises in water can improve sleep quality, reduce negative emotions, and enhance the mental well-being of veterans.

Acknowledgments: This article is extracted from the research project of the Sports Sciences Department of Ilam University. Thanks and appreciation are extended to all the dear veterans of Ilam City who assisted us in this research.

Ethical Permissions: The authors declare that in this study, all relevant ethical principles, including obtaining ethical approval from the Ethics in Research Committee of Ilam University (IR.ILAM.REC.1402.009), the confidentiality of questionnaires, written and informed consent of participants, and the right to withdraw from the research, have been observed.

Conflicts of Interests: The authors declare no conflict of interest in this study.

Authors' Contributions: Rezaei Sh (First Author), Methodologist/Main Researcher/Statistical Analyst/Discussion Writer (40%); Kheiri A (Second Author), Introduction Writer/Assistant Researcher/Discussion Writer (23%); Smaeili M (Third Author), Introduction Writer/Main Researcher/Statistical Analyst/Discussion Writer (19%); Mahmoudi A (Fourth Author), Methodologist/Statistical Analyst (18%)

Funding/Support: The present study was not financially supported.

References

1- Mandani B, Hosseini SA, Saadat Abadi M, Farahbod M. Effect of group exercise program on quality of life in post-traumatic stress disorder war veterans. *Iran J War Public Health*. 2015;7(2):91-9. [Persian]

2- Gholiour S, Parhizgarkalat SZ, Gholipour M. Type of injury and quality of life among veterans Kermanshah province. *J Soc Work Res*. 2016;1(4):65-99. [Persian]

3- Daghigh Z, Arabhashemi M. Studying the effectiveness of treatment based on acceptance and commitment on improving problems related to sleep and social isolation in patients with ostomy in Ghaem clinic, Mashhad. *J Clin Psychol Personality*. 2023;20(2):17-32. [Persian]

4- Gao C, Chapagain NY, Scullin MK. Sleep duration and sleep quality in caregivers of patients with dementia: A systematic review and meta-analysis. *JAMA Netw Open*. 2019;2(8):e199891.

5- Hossin Nazari N, Nejat H, Saffarian Tosi. Comparison of the effectiveness of well-being therapy with acceptance and commitment therapy on the quality of sleep in elderly. *J Modern Psychol Res*. 2023;18(69):103-112. [Persian].

6- Yan H, Huang Z, Lu Y, Qiu Y, Li M, Li J. Associations between metabolic disorders and sleep disturbance in patients with schizophrenia. *Compr Psychiatry*. 2023;122:152369.

7- Morbee S, Beeckman M, Loeys T, Waterschoot J, Gardon G, Haerens L, et al. An examination of the reciprocal associations between physical activity and anxiety, depressive symptoms, and sleep quality during the first 9 weeks of the COVID-19 pandemic in Belgium. *Ment Health Phys Act*. (2023);24:100500.

8- Neyestani F, Kashi Z, Elyasi F, Ali Mohammadpour R, Rezaeian Z, Gohardehi F, et al. The prevalence of posttraumatic stress disorder and sleep quality disorder related to the outbreak of COVID-19 in patients referred to the welfare organization in Mazandaran province. *Curr Psychosomatic Res*. 2023;1(2):182-95. [Persian].

9- Yousefi F, Arasteh M, Sharifi Z. Investigating sleep quality and factors affecting it in patients hospitalized in gynecology and general surgery departments. *Mashhad Univ Med Sci*. 2013;6:762-9. [Persian]

10- Kamphuis J, Meerlo P, Koolhaas JM, Lancel M. Poor sleep as a potential causal factor in aggression and violence. *Sleep Med*. 2012;13(4):327-34.

11- Mahmoodi T, Bassak Nejat S, Mehrabizadeh M. Role of anger rumination and cognitive emotion regulation strategies in prediction of sleep quality in female students. *Knowl Res Appl Psychol*. 2020;21(1):1-7. [Persian]

12- Vakilian L, Tarkhan M, Khalatbari J. Predicting alexithymia based on early maladaptive schemas and emotional expressions with the mediating role of cognitive flexibility in patients with chronic pain. *Knowl Res Appl Psychol*. 2021;22(3):32-46. [Persian]

13- Gharadaghi A. Investigating the effect of painting therapy on alexithymia and emotional suppression in students. *J Mod Psychol Res*. 2023;18(69):205-10. [Persian].

14- Valizadeh H, Ahmadi V, Mirshaker S. The effectiveness of compassion-focused therapy on resilience, emotional ataxia and feelings of loneliness in female heads of households. *J Mod Psychol Res*. 2023;18(69):256-63. [Persian].

15- Pirani Z, Abbasi M, Kalvani M, Nourbakhsh P. Effectiveness of acceptance and commitment therapy on sexual self-esteem, emotional skillfulness and marital adjustment in veterans' wives. *Iran J War Public Health*. 2017;9(1):25-32. [Persian].

16- Bahadori M, Mehrabizadeh M, Asgari P, Ahadi H, Moradi L. Comparison of the effectiveness of compassion focused therapy and positive psychology with well-being approach on alexithymia, adaptive behavior and adherence to

- treatment of patients with diabetes type 2. *Psychol Achiev*. 2022;29(1):161-8. [Persian]
- 17- Farzadnia M. The role of alexithymia to predict high-risk behaviors based on mediating role of perceived social support. *J Psychol*. 2022;25(4):550-9. [Persian]
- 18- Natalucci G, Faedda N, Calderoni D, Cerutti R, Verdecchia P, Guidetti V. Headache and alexithymia in children and adolescents: What is the connection?. *Front Psychol*. 2018;9:48.
- 19- Shank LM, Tanofsky-Kraff M, Kelly NR, Jaramillo M, Rubin SG, Altman DR, et al. The association between alexithymia and eating behavior in children and adolescents. *Appetite*. 2019;142:104381.
- 20- Cerutti R, Spensieri V, Presaghi F, Renzi A, Palumbo N, Simone A, et al. Alexithymic traits and somatic symptoms in children and adolescents: A screening approach to explore the mediation role of depression. *Psychiatr Q*. 2020;91(2):521-32.
- 21- Roustaei Alishah S, Mostafaei N. The effectiveness of schema therapy on alexithymia and marital conflicts in couples with family differences. *J New Ideas Psychol*. 2023;16(20):1-13. [Persian]
- 22- Longhurst P, Swami V. A feeling difficult to identify: Alexithymia is inversely associated with positive body image in adults from the United Kingdom. *J Affect Disord*. 2023;334:121-8.
- 23- Jani AH, Tabatabaei H, Alavizadeh NA. Effectiveness of eight weeks of aquatic exercises on fatigue, balance and functional movement in male patients with multiple sclerosis: A clinical trial study. *J Gorgan Univ Med Sci*. 2021;23(3):1-7. [Persian]
- 24- Sajedi Sabegh M, Nasermelli MH, Ganji Namin B. The effect of eight weeks aquatic therapy on quality of life, movement performance and pain in men with fibromyalgia. *Scientific J Rehabil Med*. 2021;10(3):496-507. [Persian]
- 25- Grigg MJ, Thake GD, Allgrove JE, King JA, Thackray AE, Stencil DJ. Influence of water-based exercise on energy intake, appetite, and appetite-related hormones in adults: A systematic review and meta-analysis. *Appetite*. (2023);180:106375.
- 26- Zaravar L, Nemati J, Rezaei R, Koushki M, Daryanoosh F. Effect of eight weeks water exercise with blood flow restriction on growth hormone, insulin-like growth factor-1 and bone metabolism in elderly women. *Sport Physiol*. 2021;13(15):69-92. [Persian]
- 27- Gamiz FA, Cano P, Berlanga P, Vigo M, Infantes Z, Santin L. Sequential treadmill exercise and cognitive training synergistically increase adult hippocampal neurogenesis in mice. *Physiol Behav*. (2023);266:114184.
- 28- Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatr Res*. 1989;28(2):193-213.
- 29- Bagby RM, Taylor GJ, Parker JDA. The twenty-item Toronto Alexithymia Scale-II. Convergent, discriminant and concurrent validity. *J Psychosom Res*. 1994;38:33-40.
- 30- Dadashpuor A, Mohamadi R, Dadashpuor A. Investigating effect of a period of water exercise on sleep quality in male elders. *J Shahid Sadoughi Univ Med Sci*. 2013;21(3):300-10. [Persian]
- 31- Taheri M, Irandoust Kh. The relationship between sleep quality and lifestyle of the elderly. *Iran J Ageing*. 2020;15(2):188-99. [Persian]
- 32- Abdi H, Khodaparast S, Karimi Pashaki H, Bakhshalipour V. Effect of sports activities on some physiological parameters and mental quality of sleep in the elderly. *Caspian J Health Aging*. 2021;5(2):46-54. [Persian]
- 33- Daraei H, Hazrati Alashti F, Habibian M. The effect of physical activity on vitamin d levels and improving sleep quality in women. *Ardabil Univ Med Sci*. 2021;21(1):29-40. [Persian]
- 34- Duncan J, Oftedal S, Kline E, Plotnikoff C, Holliday G. Associations between aerobic and muscle-strengthening physical activity, sleep duration, and risk of all-cause mortality: A prospective cohort study of 282,473 U.S. adults. *J Sport Health Sci*. 2023;12:65-72.
- 35- Antczak D, Lonsdale C, Lee J, Hilland T, Duncan MJ, del Pozo Cruz B, et al. Physical activity and sleep are inconsistently related in healthy children: A systematic review and meta-analysis. *Sleep Med Rev*. 2020;51:101278.
- 36- Zokaei H, Adib Saber F. Comparison of aggression and sleep habits of athlete and non-athlete children. *Q J Child Ment Health*. 2020;7(3):155-66. [Persian]
- 37- Gilanian Amiri O, Habibian M. The relationship of sleep quality with body mass index in male college students with and without regular exercise. *J Inflamm Dis*. 2020;24(1):14-23. [Persian]
- 38- Saeidi Asl S, Robati FS. The effectiveness of yoga therapy on early maladaptive schemas and emotional distress of depressed women: A semi experimental study. *Avicenna J Nurs Midwifery Care*. 2021;29 (2):137-45. [Persian]
- 39- Torlak S, Bayram Unuvar S, Gercek H. Effect of aerobic exercise on the levels of pain, quality of life, and alexithymia in alexithymic individuals with chronic pain: A single-blinded randomized controlled trial. *J Manipulative Physiol Ther*. 2023;45(9):652-9.
- 40- Abbasiaval K, Beyrami M, Panahali A, Hashemi Nosratabad T. Comparison of the effectiveness of training cognitive regulation of emotions and social competence on emotional regulation and positive emotions of learning for male students. *J Modern Psychol Res*. 2022;10(19):25-59.