

Correlation Between Body Mass Index, Self-Esteem and Stress Among Female Handball Players

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Abstract

This study aimed to investigate the correlation between body mass index, self-esteem, and stress among female handball players. In addition, it explores the differences in the level of stress and Self-esteem according to body mass index (BMI) and years of training. A total of 122 elite handball players participated in this study, with age, height, body mass, and body mass index assessed and expressed as mean \pm standard deviation: 21.5 \pm 3.5 years, 1.69 \pm 0.09 m, 65.5 \pm 4.47 kg, and 22.94 \pm 3.52 kg/m², respectively. The applied the Self-esteem test (SEs) and perceived stress test (PS-s) to obtain the study data. The study's objectives were achieved by applying means, standard deviations, and one-way ANOVA analysis, with a confidence level of 95%. The study results revealed that a moderate level of the PS-s test (14.31) according to the scoring PS-s test, and there are statistically significant differences in PS-s according to the BMI variable and in favour of the normal category (12.95). Simultaneously, the level of perceived stress increased with the increase in the BMI category. However, the self-esteem level was high in general (32.50). Notably, all BMI categories achieved high levels of self-esteem with an advantage over the normal weight category (35.98). The current study showed a statistically significant association between BMI and stress level ($r=0.253$). Based on the results, further studies can focus on gender and play position variables.

Keywords: years of training, sport, categories, play position, self-concept, female athletes

Introduction

Sports and games are part of physical education and essential for the growth and development of individuals' physical, mental, and psychological aspects (Shiroli & Makawana, 2021). Handball is a dynamic team sport that imposes various high-level requirements on players (Sindik & Cuk, 2022). In addition, handball involves fast, force, and precise movements. Therefore, the psychological pressures on players are high, which confirms that the performance quality during sports competitions is affected by the player's psychological state (Jose & Sudheesh, 2020). In this regard, Wagner and Muller (2008) studied; the success in handball does not depend only on the player's physical fitness but also on their mental and psychological abilities, as is the case with any team

sport, as the final result depends mainly on the psychological and physical participation of the players, as well as the players' ability to cooperate.

Accordingly, all factors affecting the performance of athletes, especially in competitions, must be carefully considered by identifying the desired positive, strong, and weak personal qualities (Piepiora & Kazmierczak, 2020). In the same context, one of the psychological aspects affecting the performance of handball players is stress, which has strangely become a significant health problem according to the World Health Organization, which classified it as a health epidemic in the twenty-first century, because stress is a physiological mechanism for the body to adapt for the environment, which is necessary for recovery (Singh et al., 2019). Stress refers to the body's response to influential stressors, in other words, the response of

the nervous and immune systems to the external or internal load of athletes (Kaplanov & Gregor, 2019). Thus, psychological skills affect sports performance positively or negatively (Jose & Sudheesh, 2020).

Another psychological aspect is self-esteem, which refers to an individual's ability to think and deal with fundamental challenges in life, and it refers to what we think about ourselves (Satiners & Sandeep, 2018). Sharma et al. (2018) studied; also indicate that self-esteem is one of the specific sports personality dimensions, and female participation in sports contributes to developing leadership skills and self-esteem. Self-esteem is a positive feeling toward oneself and is often a critical factor in healthy growth and development (Chen et al., 2007). Self-esteem is also considered a protective factor to avoid emotions of anger and stress in sports (Munoz-Villeina et al., 2020). Studies have shown that individuals with low self-esteem recover from negative events much more slowly than those with high self-esteem (Sedikides et al., 2004). Esroy and Abdullah (2021) also indicate that self-esteem among handball players was below average.

On the other hand, Anthropometric parameters and fitness elements determine handball player performance (Michalsik & Aagaad, 2015). For example, backs, centers, and goalkeepers have higher anthropometric requirements than wingers, who are players with lower body mass and shorter (Feseler et al., 2017). When reviewing the theoretical literature on this study topic, the researchers found that overweight status was associated with poor self-esteem (Chen et al., 2007). Also, high body mass index (BMI) was associated with negative psychosocial responses that affect self-esteem (Stoerber et al., 2008). In addition, a negative association exists between high BMI and self-esteem (Anwar et al., 2020; Ortega Becerra et al., 2015). In the same context, Maciej et al. (2023) indicated that BMI was associated with a non-statistically significant

relationship between self-esteem and depression.

The current study's importance is highlighted by its discussion of the BMI associated with body image and the attempt to explore the effect of this variable on the psychological aspects (stress and self-esteem) among female handball players. The problem of this study crystallized from several aspects, the most important of which is that handball coaches focus on physical, skill, and tactical training, with a clear decline in psychological training. There has also been a decline in scientific studies focusing on female handball players. Researchers believe that the methodology of modern sports training includes multiple aspects to ensure that players adapt to the requirements of intense effort in competitions, training, and effective recovery after effort. Therefore, the novelty of this study lies in filling gaps in the scientific literature on psychological aspects and linking them to BMI among female handball players in the Arab environment. The study results can serve as a guide when selecting female handball players.

In addition, a primary aim of the study was to investigate the correlation between body mass index, self-esteem, and stress among female handball players. In addition, the secondary aim of the study was to explore the differences in the level of stress and Self-esteem according to body mass index (BMI) and years of training

Materials and methods

Participants

This analytical research used the descriptive approach during the 2024/2025 sports season. This study was conducted on (122) female handball players affiliated with clubs participating in the local league. Participants in the current study were also selected using the random sampling method. The study sample's demographic characteristics are shown in Table 1.

Table 1. The demographic characteristics of the study sample

Variables	Mean	Std. Deviation	Skewness
High/m	1.69	0.09	0.93
Mass/kg	65.50	4.70	0.53
Age/year	21.50	3.60	0.04
BMI(kg/m ²)	22.94	3.52	0.88
Years of training	7.50	2.50	0.92

Additionally, the researchers checked the data's skewness values (0.042-0.93). As a result of the statistical process, it was determined that the data were in the range of -1,.,, +1 (George & Mallery, 2019), which are considered suitable for normal distribution. The study sample participated only by completing the electronic questionnaire, and the researchers clarified the purpose of the current study and that the data obtained would be treated confidentially. The first paragraph included approval to participate in the current study. In addition, written consent was obtained from each female handball player, as well as from her guardian.

Self-esteem scale (SE-s)

The Self-Esteem Scale (SE-s) is used most to measure self-esteem. It has been used in several fields and has demonstrated comparable stability in many cultures (Park & Park, 2019). In addition, the (SE-s) is a 10-item scale that measures global self-worth by measuring both positive (items: 1, 3, 4, 7, 10) and negative (items: 2, 5, 6, 8, 10) feelings about the self. All items are answered using a 4-point Likert scale ranging from strongly agree to disagree strongly. Scoring: Items 2, 5, 6, 8, and 9 are reverse scored by giving 1 - Strongly Disagree, 2 - Disagree, 3 - Agree, and 4 - Strongly Agree. Sum scores for

all ten items. The scale ranges from 0-40. Scores between 20 and 30 are within the normal range; scores below 20 suggest low self-esteem (Ciarrochi et al., 2007).

Perceived Stress Scale (PS-s)

The Perceived Stress Scale (PS-s) is a 10-item scale; the questions in this scale ask about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. All items are answered using a 4-point Likert scale ranging from never to very often. Scoring is as follows: the scores of Items 1, 2, 3, 6, 9, and 10 like this: 0 - never, 1 - almost never, 2 - sometimes, 3 - fairly often, and 4 - very often. However, the scores of Items 4, 5, 7, and 8 are like this: 4 - never, 3 - almost never, 2 - sometimes, 1 - fairly often, and 0 - very often. Additionally, the Individual scores on the PSs can range from 0 to 40, with higher scores indicating higher perceived stress. Scores ranging from 0-13 would be considered low stress; scores ranging from 14-26 would be considered moderate stress, and scores ranging from 27-40 would be considered high perceived stress (Cohen & Janicki-Deverts, 2012).

To adapt the (SE-s and PS-s) scales, the researchers translated the original version from English into Arabic. Then, they sent the original and translated versions to three university professors in sociology and psychology to evaluate and review the translation. The researchers then revised the translated version based on the reviewer’s comments and then submitted it again to a translation expert to review the linguistic accuracy of the translated scale.

Applying the (SE-s and PS-s) scales test for the study sample

After adopting the (SE-s and PSs) scales, to facilitate the response process of the study sample, the researchers put the (SE-s and PSs) items in an electronic questionnaire using (Google Forms). They sent the link to the participants via the WhatsApp application and the official website of the Jordanian Handball Federation. It is worth noting that the first

paragraph of the electronic questionnaire requests consent to participate in this study. Accordingly, the researchers sent the study tool on 30/8/2024 and continued to receive responses for four weeks.

Body mass index (BMI)

The body mass index (BMI), an anthropometric indicator commonly used in studies with athlete populations, was calculated using the following formula: $BMI = BW/h^2$. Where: $BMI (kg/m^2) = Body Mass (BW) (kg) / Height (h) (m)$. Furthermore, it is categorized using the World Health Organization (WHO) cut-off points. BMI categories can be classified (normal: 18.5 - less than 25 kg/m^2 , overweight: 25 - less than 30 kg/m^2 and first-degree Obesity: 30 - less than 35 kg/m^2).

Reliability

In the current study, the Cronbach alpha coefficients of the measurement tool are (0.82) for the (SE-s) scale and (0.85) for the (PS-s) scale, which are values close to (1). It can be said that this result is quite reliable according to (Karagöz, 2017).

Data analysis

For illustrative purposes, we used means and standard deviations as descriptive statistics for the study variables. In addition, we used a one-way ANOVA test to detect differences in means of (SE-s and PSs) items according to the BMI and years of training variables. Pearson’s correlation coefficient was also used to detect potential relationships between study variables using SPSS version 24 with a confidence level of 95% ($p < 0.05$).

Results

The data was collected from female handball and descriptive statistics of SE-e, PSs items and BMI for female handball players are shown in Table 2. Furthermore, the differences in SE-e and PSs items according to female handball BMI are shown in Table 3.

Table 2. Shows the descriptive statistics of SE-e, PSs items and BMI for female handball players

Scale	*Group- kg/m^2	N	Mean	SD	Level
Perceived Stress	Less than 25	78	12.95	3.03	Low
	25- less than 30	34	16.52	3.55	Moderate
	30 and above	10	17.40	4.34	Moderate
	Total	122	14.31	3.97	Moderate
Self-esteem	Less than 25	78	35.98	2.47	High
	25- less than 30	34	32.56	2.12	High
	30 and above	10	30.40	2.43	High
	Total	122	32.50	2.62	High

*Note: Normal: 18.5 - less than 25 kg/m^2 , Overweight: 25 - less than 30 kg/m^2 and Obesity first-degree: 30 - less than 35 kg/m^2

Table 3. Shows the differences in SE-e and PSs items according to female handball BMI (n=122)

Scale		Sum of Squares	df	Mean Square	F	Sig.
Perceived Stress	Between Groups	407.49	2	203.749	4.42	0.014*
	Within Groups	5474.66	119	46.006		
	Total	5882.16	121			
Self-esteem	Between Groups	230.72	2	115.361	10.09	0.000*
	Within Groups	1359.77	119	11.427		
	Total	1590.49	121			

Note: *p<0.05, statistically significant

Descriptive statistics (Table 4) and one-way ANOVA (Table 5) were also used to assess participants' responses to the (SE-s and PSs) items according to the years of training variable.

Table 4. Shows the descriptive statistics of SE-e, PSs items according to the years of training (n=122)

Scale	Category	N	Mean	SD	Level
Perceived Stress	Less than 5 years	48	12.37	1.21	Low
	5- Less than 10 years	46	15.21	2.44	Moderate
	10 years and above	28	16.14	2.27	Moderate
	Total	122	14.31	1.97	Moderate
Self-esteem	Less than 5 years	48	32.41	4.31	High
	5- Less than 10 years	46	32.53	3.20	High
	10 years and above	28	32.58	3.06	High
	Total	122	32.50	3.62	High

Table 5. Shows the differences in SE-e and PSs items according to the years of training (n=122)

Scale		Sum of Squares	df	Mean Square	F	Sig.
Perceived Stress	Between Groups	311.66	2	155.83	3.33	0.039*
	Within Groups	5570.50	119	46.81		
	Total	5882.16	121			
Self-esteem	Between Groups	0.709	2	0.354	0.027	0.974
	Within Groups	1589.78	119	13.36		
	Total	1590.49	121			

Note: *p<0.05, statistically significant

The researchers used Pearson's correlation coefficient, presented in Table 6, to reveal the possible correlations between BMI, years of training, self-esteem, and stress.

Table 6. Shows the Pearson correlation coefficient results between the study variables (n=122)

Variables		BMI	Years of training	Perceived Stress
Years of training	r	0.014		
	p	0.877		
Perceived Stress	r	0.253*	0.221*	
	p	0.005	0.015	
Self-esteem	r	-0.030	0.015	-0.459*
	p	0.744	0.868	0.000

Note. *r* – correlation coefficient; *p* – level of statistical significance; * $p < 0.05$

Discussion

The current study revealed that the mean PS-s of the sample study was moderate (14.31) according to the scoring (PS-s) test, and this requires further verification by a qualified. Furthermore, the researchers found apparent differences by reviewing the means of (PS-s) according to the BMI variable. The results revealed that there are statistically significant differences in PS-s according to the BMI variable and in favour of the normal category (Less than 25) kg/m^2 (12.95), in contrast, the category (30 and above) kg/m^2 obtained the highest level in (PS-s) (17.40). The researchers concluded that the level of perceived stress increased with the increase in the BMI category (normal - 12.95 kg/m^2 , overweight - 16.52 kg/m^2 , and obesity grade 1 - 17.40 kg/m^2). This was confirmed by Scheffé's post hoc test, which showed statistically significant differences in the stress level between the normal BMI category and the overweight category in favour of the lower BMI category. In this regard, Stoeber et al. (2008) indicate that a high BMI is associated with negative psychosocial responses. Stress has also been linked to changes in body composition that can negatively affect performance (Tamashiro et al., 2007).

The current study showed a statistically significant association between BMI and stress level ($r=0.253$). Study (Singh et al., 2024) indicate a negative association between BMI and stress. The association between BMI and stress can be explained by the mechanism of the body's response to stress through the action of the cortisol hormone, which is released indirectly through the sympathetic system (immediate response) or activation of the hypothalamic-pituitary-adrenal axis (Rotenberg & McGrath, 2016). Cortisol makes glucose available in the blood by analyzing glycogen or gluconeogenesis, which enhances the intake of energy-rich foods by enhancing appetite (Choudhary & Sharma, 2023). Moreover, it increases the feeling of hunger (Tomiyama, 2019). Researchers believe that BMI is linked to body image, which is very important for female athletes.

On the other hand, the results related to self-esteem showed that the study sample achieved a high level in general (32.50), and it is noteworthy that all BMI categories achieved high levels of self-esteem with an advantage over the normal weight category (35.98). The study also showed statistically significant differences in self-esteem according to the BMI variable and in favour of the normal weight category. These

results are inconsistent with the study by Esroy and Abdullah (2021), which indicated that self-esteem among handball players was below average. Studies also indicate that participation in sports activities contributes to developing leadership skills and self-esteem (Sharma et al., 2018). Studies also show that practicing handball with female players contributes to their self-confidence, and practicing team sports contributes to developing personal and social traits among athletes (Kuravatti & Malipatil, 2017).

Simultaneously, the researchers noted decreased self-esteem as the BMI increased. As for the correlational relationships, the results did not show a statistically significant relationship between BMI and self-esteem among female handball players ($r=0.30$; $p=0.740$). These results do not agree with the study of Chen et al. (2007), which indicated that the overweight category was associated with weak self-esteem. In the same context, studies indicate a negative association between a higher BMI and self-esteem (Anwar et al., 2020). Maciej et al. (2023) also indicate that BMI was associated with a statistically insignificant relationship with self-esteem. Ahsan and Ali (2023) also indicate that BMI is significantly associated with self-esteem.

Regarding the variable of years of experience, our analyses of the participants in the current study showed clear differences in the means in favour of the less than (5) years category (12.37), and among the strange results is that the category with the most experience (10 years or more) obtained the highest level of stress (16.14). The researchers believe this category has excellent experience dealing with the pressures of competition and training. However, this category may feel close to retirement, and the presence of young players ready to take their place in the team is a reason for this. In other words, these situations are viewed as obstacles or threats; therefore, there is a defect in the coping strategies that the player will follow in these situations.

On the other hand, there are statistically significant differences ($p=0.039$) in the level of stress according to the years of training variable and in favour of the category (less than 5 years). This result does not agree with the study of Žakula and Tubić (2015), which indicated statistically significant differences in dealing with stress among handball players according to competitive experience, as the longer the experience, the greater the efficiency in dealing with stress. As for the field of correlational relationships, the results showed a weak statisti-

cally significant correlation (0.221) between years of experience and stress level.

By reviewing the data related to self-esteem according to the years of training variable, the level of self-esteem was generally high (32.50), with an advantage for the more experienced category (32.58). In addition, there were no statistically significant differences ($p=0.974$) in the level of self-esteem according to the years of experience variable. On the other hand, there was a statistically significant negative relationship between stress and self-esteem ($p=-0.459$). In other words, the lower the stress contributes to the increase in the higher self-esteem level, or the higher the self-esteem contributes to the lowering the stress. This is confirmed by the data in Table (2), where the category with the lowest body mass index had a low level of stress (12.95) and the highest level of self-esteem (35.98). Studies indicate that players with high self-esteem can recover from negative events faster than those with low self-esteem (Sedikides et al., 2004). Negative psychological and social responses also affect self-esteem (Stoeber et al., 2008).

These findings emphasize the importance of studying the psychological aspects of athletes in general, and female handball players in particular, given their positive role in helping athletes recover from the negative effects of competition. The significance of this study is further enhanced by its examination of the correlation between psychological factors and BMI. Coaches can utilize the findings as a valuable tool in developing psychological preparation programs for athletes. Future research should investigate the relationship between psychological factors and BMI while controlling for other variables such as gender, playing position, skill level, and athletic achievement. Although this study offers important insights into the significance of psychological factors in athletes, some limitations should be noted. For instance, the study was limited to a few variables, and further research should encompass a broader range of variables.

Conclusions

Based on the analyses of the responses of the current study sample, the stress level was moderate, which was a clear advantage for the category with a normal BMI. Simultaneously, stress increases with the increase in BMI. There were also differences in the level of perceived stress according to the years of training variable in favour of the category (less than 5 years). As for self-esteem, the study showed an increase in self-esteem in all categories of BMI in favour of the normal weight category and all categories of years of training in favour of the more experienced category. At the same time, the correlations showed a negative relationship between self-esteem and stress. In general, the results of the current study were consistent with some previous studies in the field and also differed from the results of other studies. The authors hope that the results of the current study will be used to develop the methods used in psychological preparation and to develop individual psychological rehabilitation programs according to reliable scientific analyses. The researchers recommend paying more attention to players approaching retirement, and future studies can be conducted that address other variables such as gender and playing position.

Conflicts of Interest

The authors declare no conflicts of interest.

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