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Mental Toughness Analysis in Handball Athletes Based on Gender and Length of Practice

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Abstract

This study aims to find out the difference in the mental toughness of handball athletes based on gender and length of practice, as well as to find out the interaction between the three variables. This research method uses a descriptive quantitative approach. The data in this study was obtained from 56 athletes, 28 handball athletes from Bogor Regency and 28 handball athletes from the city of Bandung, each contingent consisting of 14 male athletes and 14 female athletes. The data collection technique used the Sport Mental Toughness Quistionnaire (SMTQ) compiled by Sheard. Data analysis in this study used independent sample t-test and one way anova. The results showed that there was a significant difference by sex with (Sig. 2-tailed = 0.000; $p<0.05$) especially on the confidence subscale, and the length of practice had an effect (Sig. = 0.006; $p<0.05$) on mental toughness, athletes who trained >2 years showed a higher level of mental toughness than the <1 year group. In conclusion, while gender differences primarily affect confidence, a training duration of more than two years is the key factor in achieving stable mental toughness among PORPROV handball athletes.

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INTRODUCTION

Handball It is a sport with a quick switch between attacking and defending in each match to score points. There are 6 players and 1 goalkeeper in the match (Manchado et al., 2020). The match consists of two rounds that each last 30 minutes, where the players perform many movements such as walking, barlari, jumping, forward, backward, and sideways as well as facing tackles and physical thrusts (Michalsik et al., 2015).

In Indonesia, the popularity of handball continues to increase, culminating in regional-level competitions such as the Provincial Sports Week (PORPROV). PORPROV handball athletes are at a crucial stage of mental and physical development. In that stage, they face various challenges such as difficult training, pressure from coaches and parents, and academic obligations that must be fulfilled simultaneously. The complexity of the physical and technical demands in this sport underscores the importance of the psychological aspect as a determinant of success (Pokhrel, 2024). This is in line with (Moss et al., 2015) which states that One of the factors that affect the success of handball sports is the psychological aspect, one of the most crucial in athletes is mental toughness (Pakyardim et al., 2024).

Mental toughness is one of the essential components in the individual that allows a person to face difficulties and survive stressful situations (Lin et al., 2017), as well as the ability to stay focused in the situation (Coulter et al., 2016). By combining various elements, mental toughness helps athletes become physically and mentally prepared individuals (Nisa & Jannah, 2021), so that athletes are able to face the burden of training and the pressure of heavy competition (Kumar, 2017). Athletes with strong mental toughness tend to be able to control their emotions when in competitive situations, stay calm when facing important situations on the court, and stay focused on making the right decisions throughout the game (Effendi, 2016), therefore mental toughness is the key to success, especially for young athletes who are in the developmental phase (Murod & Jannah, 2021).

Previous studies have shown that mental toughness can be influenced by a variety of factors, including gender (Pokhrel, 2024). Previous research has shown that there is a difference in the characteristics of mental toughness between male and female athletes (Nicholls et al., 2009) . Although a study at the NCAA level emphasizes mental toughness as the most important skill sought and trained intentionally (Danielsen et al., 2017), however, there is still little research conducted in Indonesia that examines the mental toughness of young handball athletes, especially in the PORPROV event. Observations also show that coaches tend to prioritize physical and technical aspects, paying less attention to the mental toughness of athletes on the field (Rahmi, 2021).

Therefore, research on the level of mental toughness in PORPROV handball athletes based on gender and length of practice is very relevant. Bogor Regency and Bandung City were chosen as the research locations because of their achievements as 1st and 2nd place winners of PORPROV in 2022. The achievements of the two city districts show that they have a good training system and high-quality athletes. By comparing athletes from the two most successful contingents at PORPROV 2022 Therefore, this study focused on how prolonged training experiences contribute to the mental toughness of handball players.

This study aims to find out the difference in the mental toughness of PORPROV handball athletes based on gender and length of training, and it is hoped that this study can provide insight into the psychological components that affect an athlete and help coaches make strategies to improve mental toughness and overall athlete performance.

METHOD

This study uses a descriptive quantitative approach to find out the difference between Mental toughness of handball athletes based on gender and length of practice. The population in this study is all PORPROV handball athletes in Bogor Regency and Bandung City. Samples were selected using saturated sampling techniques, namely sampling techniques in which the entire population is used as a research sample (Nainggolan, 2023). The sample consisted of 56 PORPROV handball athletes from Bogor Regency and Bandung City, 28 handball athletes from Bogor Regency and 28 handball athletes from Bandung City, each contingent consisting of 14 male athletes and 14 female athletes.

This study uses the Sport Mental Toughness Quistionnaire (SMTQ) scale which consists of 14 items with 3 subscales, namely confidence, constancy, and control. The assessment on this scale uses a likert scale of 4 points. In items that are favorable, the response is Very Not True (STB) is given a score of (1), while Very True (SB) is given a score of (4). On the other hand, for

items that are unfavorable, the response is Very False (STB) is scored (4), while Very True (SB) is scored (1). The confidence (0.80), constansy (0.74), and control (0.70) subscales are the results of the reliability test (alpha Cronbach) in this study (Roncone et al., 2020)

The data collected will be analyzed using IBM SPSS Statistics 25.0 software. Descriptive statistical analysis was used to see the average difference on each subscale based on gender, region, and length of practice. Furthermore, an independent sample t-test was used to compare mental toughness between men and Female, as well as one way anova to test differences in mental toughness based on the group of long periods of practice.

RESULTS AND DISCUSSION

Results of the descriptive statistical test Sport Mental Toughness Qistionnaire (SMTQ). It can be seen in the **Table 1.**

Table 1. Descriptive SMTQ Statistics – Subscale Based on Several Variables

Variable		N	Means	Std. Deviation
Mental Toughness (Total)	Confidence	56	23	7.8
	Constancy	56	46	21.5
	Controls	56	31	14.6
Gender				
Female	Confidence	28	11	3.9
	Constancy	28	24	11.3
	Controls	28	30	12.6
Male	Confidence	28	12	4.6
	Constancy	28	22	10.2
	Controls	28	9	4.4
Regions				
Bogor Regency (F)	Confidence	28	5	2.2
	Constancy	28	7	3.3
	Controls	28	9	4.5
Bogor Regency (M)	Confidence	28	9	3.0
	Constancy	28	9	4.1
	Controls	28	6	2.7
Bandung City (F)	Confidence	28	6	2.1
	Constancy	28	17	7.6
	Controls	28	20	8.2
Bandung City (M)	Confidence	28	6	2.1
	Constancy	28	14	6.2
	Controls	28	7	2.9
Long Practice				
<1 Year	Confidence	18	9	3.2
	Constancy	18	19	8.5
	Controls	18	20	8.2
1-2 Years	Confidence	28	12	4.4
	Constancy	28	22	10.2
	Controls	28	16	7.0
>2 Years	Confidence	10	5	2.3
	Constancy	10	7	3.3
	Controls	10	6	2.6

Based on the results of the descriptive statistical analysis in **Table 1** above, for overall mental toughness, it was found that the confidence subscale showed an average of 176.2 and a standard deviation of 7.8. The constancy subscale showed an average of 182.3 and a standard deviation of 21.5. Meanwhile, the control subscale had an average of 135.8 and a standard deviation of 14.6. Therefore, the results of the descriptive analysis for mental toughness as a whole, showed that the subscale of constancy had the highest average of 182.3 with a standard deviation of 21.5. This concludes that in general respondents show a high level of constancy.

Judging from the gender variables, male respondents showed higher scores than female respondents on all subscales, namely confidence, Constancy, and control. The average confidence in men was 94.8 with a standard deviation of 4.6, higher than that of Female who only had an average of 81.3 with a standard deviation of 3.9. This also happens on the constancy subscale, where men have an average of 94.0 with a standard deviation of 10.2, while Female only have 83.3 with a standard deviation of 11.3. The control component also showed the same, with an average of 70.3 in men with a standard deviation of 4.4 and 65.5 with a standard deviation of 12.6 in Female.

When viewed from regional variables, female respondents from Bogor Regency tend to have a slightly higher average mental toughness compared to female respondents from the city of Bandung in all subscales of mental toughness. The confidence subscale of female respondents from Bogor Regency had an average of 42.5 with a standard deviation of 2.2, higher than female respondents from the city of Bandung who only had an average of 38.0 with a standard deviation of 2.1. This also happens on the subscale of constancy, where female respondents from Bogor Regency have an average of 44.8 with a standard deviation of 3.3, while female respondents from the city of Bandung are only 42.8 with a standard deviation of 7.6. The control component also showed the same thing, with an average of 70.3 with a standard deviation of 4.5 in female respon-

dents from Bogor Regency, 31.0 with a standard deviation of 8.2 in female respondents from the city of Bandung.

Meanwhile, male respondents from Bogor Regency showed a higher average mental toughness on the subscale of constancy (47.0>45.8) with a standard deviation of 4.1 and control (35.0>33.5) with a standard deviation of 2.7, while male respondents from the city of Bandung showed a higher average of mental toughness on the subscale of confidence (47.2>46.5) with a standard deviation of 2.1.

Furthermore, when viewed from the variables of the length of practice, in the category of less than 1 year (<1 year), the average value of mental toughness on the confidence subscale was 53.5 with a standard deviation of 3.2, while Constancy was at an average of 55.3 with a standard deviation of 8.5. Meanwhile, the control subscale had the lowest average value, which was 42.3 with a standard deviation of 8.2. This shows that participants who are new to practice generally do not have strong self-control and mental resilience capacity.

In contrast, the category of years of training for more than 2 years (>2 years) showed significantly higher scores of mental toughness on all subscales. The confidence subscale in this category reached an average of 92.0 with a standard deviation of 4.4, while the subscale of determination was at an average of 94.3 with a standard deviation of 10.2. The control component, which was previously the weakest component in the <1-year group, improved significantly with an average of 68.5 and a standard deviation of 7.0. The data showed that longer training experiences contributed to increased mental toughness.

Meanwhile, the group with a duration of 1–2 years of practice showed a value of mental toughness that was somewhere between the two previous categories. In this category, the average confidence was 30.7 with a standard deviation of 2.3, firmness was 32.8 with a standard deviation of 3.3, and control was 25.0 with a standard deviation of 2.6. These values are still in a relatively low range, suggesting that the process of forming mental toughness may have only begun to develop at this stage and has not yet reached the stability of the >2-year group.

There were two main analyses that were performed, both analyses were used to test hypotheses related to differences in mental toughness based on gender and length of practice. The first analysis used a two-category difference test (Independent Sample T-Test) to test the difference in mental toughness between male and female athletes. The second analysis is (One Way Anova Test) to test the difference in the mental toughness component based on the length of training. The test results showed a value of t = 3.813 with a p-value (Sig. 2-tailed) of 0.000. Since the significance value is less than 0.05, it can be concluded that there is a statistically significant difference in the total mental toughness value by gender. Thus, male respondents had significantly higher levels of mental toughness than female respondents

Table 2. Results of the Independent Sample T-Test between Mental Toughness and Gender

Variable	Gender	N	Means	t	Sig. (2 tails)
Mental Toughness (Total)	Female	28	39.4	3813	0.000
	Male	28	43.8		
Confidence	Female	28	17.4	5124	0.000
	Male	28	20.3		
Constancy	Female	28	12.6	1686	0.098
	Male	28	13.4		
Controls	Female	28	9.4	1378	0.174
	Male	28	10.0		

The results of the Independent Sample T-Test in **Table 2** show that there is a significant difference in the level of mental toughness between male and female respondents. Overall, the average mental toughness score of male respondents (Mean = 43.8) was higher than that of female respondents (Mean = 39.4).

On the self-confidence subscale, the results of the analysis also showed significant differences between male and female respondents. Male respondents had an average score of 20.3, while female respondents had an average of 17.4. A value of t = 5.124 with a significance value of 0.000 (<0.05) indicates that this difference is statistically significant. The results of this study show that male respondents have a higher level of confidence than female respondents.

On the constancy subscale, the average score of female respondents was 12.6, while male respondents were 13.4. The value of t = 1.686 with a significance value of 0.098 (>0.05). Because the p-value was greater than 0.05, there was no statistically significant difference between male and female respondents on the constancy subscale. In other words, both groups had relatively the same level of constancy even though the average male respondents were slightly larger than female respondents.

Meanwhile, on the control subscale, female respondents obtained an average score of 9.4, while men had an average of 10.0. The value of

t = 1.378 with a p-value of 0.174 (>0.05). These results show that the difference in the value of the control subscale between male respondents and female respondents is not statistically significant. This means that the ability to control pressure or difficult situations does not differ significantly between the two groups.

Table 3. Anova One Way Test Results between Mental Toughness and Long Practice

	Number of Squares	F	Sig.	Desc
Intergroup	1141.964			
In a Group	1273.554	36.851	0.006	Significant difference
Quantity	131.589			

Based on the results of the analysis of the One Way ANOVA test in **Table 3**, it shows that there is a difference in the level of mental toughness based on the length of practice. The F value obtained was 36.851 with a significance value of 0.006. Because the p-value is less than 0.05. Thus, statistically there was a significant difference between the value of mental toughness in the three groups of long training (<1 year, 1–2 years, and >2 years).

Table 4. Tukey HSD Test Results between Mental Toughness and Duration of Training

(i) Long Practice	(J) Long Practice	Average Difference	Sig.	Description
<1 Year	1-2 Years	-3.080*	0.049	
	>2 Years	-8.460*	0.000	
1-2 Years	<1 Year	3.080*	0.049	Significant difference
	>2 Years	-5.380*	0.000	
>2 Years	<1 Year	8.460*	0.000	
	1-2 Years	5.380*	0.000	

Based on the results **Table 4** of the Tukey HSD follow-up test, information was obtained about the difference in average mental toughness between the groups of long practice. The results of the analysis showed that there was a significant difference between respondents who practiced for less than one year (<1 year) and respondents who practiced for one to two years (1-2 years), which was indicated by a significance value of 0.049. In addition, a significant difference was also found between the group that practiced for one to two years (1-2 years) and the group that practiced for more than two years (>2 years), with a significance value of 0.000. Significant differences were also seen when comparing respondents with a training duration of less than one year (<1 year) with respondents who had a training duration of more than two years (>2 years). A mean difference of –8,460 with a significance value of 0.000 showed that respondents who had practiced for more than two years (>2 years) had a significantly higher level of mental toughness than respondents who had only practiced for less than one year (<1 year). Thus, the results of the Tukey HSD test show that the transition period in the first year of training has begun to form mental toughness, but the most stable and strong psychological maturity is only achieved optimally after passing the training period of more than 2 years.

Table 5. Results of the One Way Anova Test between the Mental Toughness Subscale and the Long Practice Category

	Number of Squares	F	Sig.	Description
Confidence				
Intergroup	11530.778	506.229	0.000	
In a Group	170.883			
Quantity	11701.611			
Constancy				
Intergroup	7746.000	61.558	0.000	Significant difference
In a Group	566.250			
Quantity	8312.250			
Controls				
Intergroup	3838.500	46.970	0.000	
In a Group	367.750			
Quantity	4206.250			

Based on the **Table 5** above, the confidence subscale shows that there is a significant difference in the level of confidence based on the category of length of practice (F = 506,229, p < 0.05). A very high F-value indicates a strong difference between groups. These results indicate that the longer an athlete's training period, the higher the level of confidence he has. Furthermore, for the subscale of firmness, the test results again showed significant differences between the groups of long practices (F = 61.558, p < 0.05). This means that the longer an athlete's training period, the higher the level of endurance he has. Similarly, the control subscale had a value of F = 46.970 and p < 0.05 which showed that there was a significant difference between the groups of long practice.

Based on the Tukey HSD follow-up test in the **Table 6** above, on the confidence subscale, the largest difference was seen between athletes who trained <1 year and athletes who trained >2 years, which was 61.333 (p = 0.000). In addition, a large difference was also seen between the 1–2 year and >2 year groups, which was 38,500 (p =

0.000). These values show that the longer an athlete trains, the higher his or her confidence. The huge change from <1 year to >2 years illustrates that the long experience of training makes a strong contribution to athletes' confidence in the face of competitive pressure.

Table 6. Tukey HSD Test Results between Mental Toughness Subscale and Long Practice Category

(i) Long Practice	(J) Long Practice	Average Difference	Sig.	Description
Confidence				
<1 Year	1-2 Years	22.833*	0.000	
	>2 Years	-38.500*	0.000	
1-2 Years	<1 Year	-22.833*	0.000	Significant difference
	>2 Years	-61.333*	0.000	
>2 Years	<1 Year	38.500*	0.000	
	1-2 Years	61.333*	0.000	
Constancy				
<1 Year	1-2 Years	22.500*	0.000	
	>2 Years	-39.000*	0.000	
1-2 Years	<1 Year	-22.500*	0.000	Significant difference
	>2 Years	-61.500*	0.000	
>2 Years	<1 Year	39.000*	0.000	
	1-2 Years	61.500*	0.000	
Controls				
<1 Year	1-2 Years	17.250*	0.010	
	>2 Years	-26.250*	0.001	
1-2 Years	<1 Year	-17.250*	0.010	Significant difference
	>2 Years	-43.500*	0.000	
>2 Years	<1 Year	26.250*	0.001	
	1-2 Years	43.500*	0.000	

On the constancy subscale, the difference in values between the exercise groups was also very noticeable, even being the largest among the three subscales. The highest difference occurred between <1 year and >2 years, which was 61,500 (p = 0.000), slightly higher than the other subscales. In addition, the difference between 1–2 years and >2 years was also large, at 39,000 (p = 0.000). These values show that constancy is the mental toughness aspect that is most affected by the length of the training experience. This means that the longer athletes train, the greater their ability to stay firm in various situations.

On the control subscale, the pattern of differences between the exercise groups was also significant, although the difference value was not as high as the previous two subscales. The largest differences occurred between <1 year and >2 years with a value of 43,500 (p = 0.000), and between 1–2 years and >2 years of 26,250 (p = 0.001). This shows that the ability to control emotions and attention continues to improve over the duration of the training experience, but the effect is not as great as on the aspects of confidence and determination.

Therefore, from the results of the follow-up test, the length of practice is very important in improving mental toughness. Constancy is the highest component of improvement, followed by the Confidence component. Significant results from the 1-2 year to 2-year > 2-year category across all subscales showed that the first two years were periods of adaptation, and the next two years showed where strong mental toughness traits began to form consistently

This study aims to test the difference in mental toughness in handball athletes based on gender and length of training. Based on data obtained from 28 male and female handball athletes in Bogor Regency and 28 male and female handball athletes in the city of Bandung. In general, the results of the analysis found that there were significant differences in the mental toughness of the sexes, the results in **Table 2** showed that the Independent Sample T-Test (Sig. 2-tailed) was 0.000 which means that there was a significant difference between the mental toughness of men and Female. Male athletes have higher mental strength on average than female athletes. The confidence subscale showed the most obvious significant differences, but the differences in the constancy and control subscales were not statistically significant. The results of the one way anova test in **Table 3** show that the p-value is less than 0.05. So statistically there was a significant difference between the value of mental toughness in the three groups of long training (<1 year, 1–2 years, and >2 years). The results of the Tukey HSD test made it clear that the most significant difference appeared between athletes with the category of long-term training <1 year and >2 years.

The results of this study are in line with various theories and previous studies that emphasize the role of mental toughness in managing psychological pressure when participating in sports competitions. An athlete has an excellent mental state called mental toughness (Sholicha & W, 2020). mental toughness An athlete greatly influences his behavior, responds emotionally and acts on every possibility that will be encountered during the match (Hudaniah & Masturah, 2024). By developing mental toughness athletes can manage their anxiety well, be able to maintain concentration, optimize physical abilities and impro-

ve performance in every competition.

The study also emphasizes that there is a difference in mental toughness based on gender and length of practice. The results of the hajil test show that there is a difference in mental toughness based on gender. This is in line with research conducted by Nicholls et al (2009) explaining that there is a significant difference between the mental toughness of men and Female. The results of this study are also in line with this research instrument. In addition, in the study, it was explained that there are three components that affect the mental toughness of trust, constancy, and control.

The trust aspect is the athlete's confidence in their abilities when competing against their playing opponents. In this aspect, it was obtained that the average score of male athletes was 94.8, while female athletes got an average score of 81.3. The difference in the score is too far, men have an average score of confidence compared to Female (Rinaldi, 2010). In terms of endurance, male athletes have an average score of 94.0, while female athletes have an average score of 88.3. Next to the last is the control aspect, male athletes have an average score of 70.3 and female athletes have an average score of 65.5. Therefore, it can be concluded from the results of the test of the mental component of the toughness of male athletes that are superior to female athletes in line with previous research.

Furthermore, regarding mental toughness based on gender. Experience in training and competition is suspected to have a positive impact on the development of mental toughness. Involvement in a variety of training and match situations can help build mental toughness through a process of adaptation and continuous learning (Crust & Clough, 2011). From the results of this study, it was shown that there was a significant difference in mental toughness based on the length of practice (Sig=0.006; $p<0.05$), so statistically there was a significant difference between the value of mental toughness in the three groups of long practice (<1 year, 1-2 years, >2 years). Athletes with the 2-year-> category have a higher mental toughness score than the <1-year category. This shows that mental toughness is a psychological ability that is built over a long period of time. Athletes' mental readiness to face challenges is determined by their experience with a variety of training environments, the pressures of matches, successes and repeated failures. Because they are still in the process of adapting to the physical and psychological demands of the sport, the group of athletes who have not trained for more than a year may not yet have good mental resilience and emotional control. Thus, it can be concluded that a process is necessary to achieve achievements but rather requires a fairly long process, where training is carried out regularly, continuously, and in a directed manner in accordance with a training program that has been specially designed for athletes (Taufik & Abdi Alam, 2021).

The analysis on each component of mental toughness based on the length of practice subscale of the firmness is the highest component, through the length of practice the ability to remain consistent, disciplined, and persist can develop significantly. Over time of practice as well, confidence increases strongly, especially through success and the mastery of skills that continue to develop. Compared to the other two subscales, the control element increases less. This shows that physical exercise is not the only way to control emotions and focus, more systematic mental training is also needed.

Overall, the findings of this study suggest that the formation of handball athletes' mental toughness is an ongoing process influenced by training experience, exposure to competition, and the environment in which they train. The length of training is the main component in maintaining the mental fortitude and mental stability of athletes, while gender differences have a major effect on athletes' confidence. Therefore, athlete development must be carried out systematically and continuously in addition to improving physical and technical abilities.

CONCLUSION

Based on the results of research on the mental toughness of handball athletes, it can be concluded that athletes in general have a good level of mental toughness, with the most prominent element of constancy. In addition, the study showed a pronounced difference between the sex of male athletes having higher mental toughness compared to female athletes especially in terms of confidence. However, the differences that exist in terms of constancy and control are not negligible, suggesting that gender does not affect both aspects overall. The most important finding from this study is that long periods of practice have a huge influence on mental toughness. Athletes who have been training for more than two years have higher mental strength than athletes who train for a shorter period of time. The results of follow-up tests also showed that each category of long practice had significant changes, the comparison between the <1-year and >2-year groups

showed the largest improvement. This shows that the first two years are the adaptation stage after more than two years of training, the athlete gains a new mental toughness stability. During the exercise, all three subscales of confidence, constancy, and control changed, with constancy experiencing the greatest increase, followed by confidence, and control experiencing the smallest increase. Overall, the study shows that prolonged psychological adaptation, competition exposure, and training experience are important components in creating the mental strength of handball athletes. Gender differences mainly affect the strength of confidence.

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