The role of mental toughness in acquisition and retention of a sports skill

Jalil Moradi¹, Mohammad Vaez Mousavi² and Ali Mohammad Amirtash¹

¹Department of Physical Education and Sport Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran
²Department of Psychology, Exercise Physiology Research Center, Baqiyatallah University of Medical Sciences and University of Imam Hossein, Tehran, Iran

ABSTRACT

The present study aims to investigate the role of mental toughness in acquisition and retention of a sports skill. The participants consisted of male undergraduate students (n=26, Age=20.80±1.87) who had no experience of basketball training. The subjects were homogenized into two groups of low and high mental toughness based on the scores they obtained on Mental Toughness Questionnaire-48 (MTQ-48) and their pretest scores of basketball passing skill (n₁=n₂=13). Participants practiced basketball passing skill with verbal feedback in 15 sessions held every alternate day. The retention test was administered one week after the last training session. During the retention test, participants did not receive any augmented feedback on how to do the assigned task. Repeated measures and one-way ANOVA were run to analyze the data. The level of significance was set at α=0.05 in all statistical tests. The results showed that participants in two groups had a significant progress in acquisition the basketball passing task. However, the subjects with high mental toughness outperformed the low-mental-toughness subjects in both acquisition and retention. The present findings suggest that mental toughness, as a personal factor, may play a crucial role in acquisition and retention of skills.

Keywords: Basketball pass, Mental toughness, Motor learning

INTRODUCTION

Learning plays an important role in human life. The survival and flourish of every culture depends on its people to learn skills, behavioral norms, beliefs and values. The survival of every living being requires that its organs be compatible with the environment. Such compatibility necessitates the ability to learn. Various scientists have been studying the determinants of learning for over one hundred years (Anderson, 2000).

There has been a growing body of knowledge on the psychological factors influencing athletic performance. Mental toughness is considered as one of the main characteristics contributing to athletic success (Jones et al., 2007). Mental toughness has been defined in different ways. For example, Jones and colleagues (2002) defined mental toughness as ‘Having the natural or developed psychological edge that enables you to, generally, cope better than your opponents with the many demands (competition, training, lifestyle) that sport places on a performer and, specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure’. The important point in this definition is the epithets ‘natural or developed’ suggesting that mental toughness is partly influenced by genetics though it may also develop out of experience and learning (Crust & Clough, 2011).
A review of the literature on mental skills reveals that mental toughness is an important psychological characteristic in sports. The literature shows that mental toughness is necessary for achieving peak athletic performance. For example, William (1998) and Gould, Dieffenbach and Moffett (2002) reported that mental toughness was an important psychological trait in athletic performance. Several studies have addressed the relationship between mental toughness and other variables. There is evidence that mental toughness is associated with gender, age, and sporting experience (Nicholls et al, 2009), higher levels of sporting achievement (Sheard, 2010), more effective coping in testing circumstances (Kaiseler et al., 2009) and more resistance to pain (Crust & Clough, 2005). Crust and Azadi (2010) found significant positive correlations between mental toughness and using various psychological approaches such as mental imagery and goal setting. Their findings suggest that mentally tough athletes are committed to use alternative ways beyond physical training to improve their performance. Mattie and Munroe-Chandler (2012) investigated the relationship between mental toughness and mental imagery. The results showed that mental imagery could significantly predict mental toughness in the individuals. Specifically, sophisticated motivational imagery proved to be the strongest predictor of all aspects of mental toughness. Thus, mental imagery is one of the key approaches to improve mental toughness.

Several studies have investigated the relationship between mental toughness and athletic performance. Crust and Clough (2005) studied the relationship between mental toughness and physical endurance in undergraduate students. The results showed a significant positive correlation between mental toughness and the suspension time of a weight. Kuan and Roy (2007) found that elite Wushu players had higher levels of mental toughness comparing with their non-elite counterparts. Newland and colleagues (2013) studied the relationship between mental toughness and basketball task performance. They reported that mental toughness was typically observed in hard situations. Therefore, athletes needed higher mental toughness in competitive, pressing settings comparing with common basketball task performance. They reported that mental toughness was typically observed in hard situations. Therefore, athletes needed higher mental toughness in competitive, pressing settings comparing with common basketball task performance; however, the complexity varied based on athletes’ sex. In this regard, there was a poor correlation between mental toughness and basketball task performance in women but a strong relationship between the two variables in men. The researchers recommended that further studies be conducted on the relationship between mental toughness and athletic performance. We assume that mental toughness contributes to athletic performance; still, there is scarcity of research on the issue. Newland et al. (2013) contended that there was a complicated association between mental toughness and athletic performance so that there should be further studies to measure the variables more objectively. Gucciardi et al. (2009) suggested that, although self-report measurements are important, further studies need to be conducted with objective data.

The literature shows that mental toughness is a key factor in athletic success. Nevertheless, there has been scarcity of research on the effect of mental toughness on learning and performing sports tasks. Clough et al. (2002) reported that mentally tough subjects performed better on a planned cognitive task. Their interesting finding was that mentally tough subjects had consistent performance regardless of the type of feedback (positive or negative) while the subjects with low mental toughness showed deteriorated performance after receiving negative feedback. Considering the available evidence on the association between mental toughness and performance (Newland et al., 2013) and the role of mental toughness in successful athletic performance (Sheard, 2010), it is likely that mental toughness serves an important role in learning motor skills. Therefore, the present study aimed to investigate the effect of mental toughness on acquisition and retention of basketball passing skill.

**MATERIALS AND METHODS**

**Participants**

A number of 40 undergraduate students were randomly selected in the first round. Mental Toughness Questionnaire-48 (MTQ-48) was administered to them to determine the subjects with high and low mental toughness. Consequently, a number of 26 undergraduate students were selected as the participants. The subjects were then assigned into two homogenous groups based on their scores on Stubbs Ball Handling Test. The subjects had no history of basketball training. They signed informed consent forms before the study was started. The protocol of the study was evaluated and approved by Ethical Considerations Committee at Islamic Azad University of Tehran Science and Research branch.

**Instruments**

Passing test: Stubbs Ball Handling Test was used in the present study. In this test, three circles with a diameter of 30 centimeters are drawn on the wall each with 1.6 meters distance from other circles. The first, second and third circles are 1.51, 1.21 and 1.36 meters above the ground level, respectively. The participants are instructed to stand behind a line at 450 centimeters distance from the wall and pass the ball to the first circle on hearing the stimulus ‘Go’. When the ball is bounced off the wall, the test taker should pass the ball to the second circle and eventually the
third circle. Every athlete should continue this test for 30 seconds. Each pass hitting the circles receives one score. The reliability of the test is reported to be 0.74 (Perkos et al., 2002).

Mental Toughness Questionnaire-48 (MTQ-48): developed by Clough and colleagues (2002), the questionnaire consists of 48 items on a 5-point Likert scale ranging from Completely Agree (1) to Completely Disagree (5). Research has supported the reliability and validity of the questionnaire (Clough et al., 2002; Horsburgh et al., 2009).

Procedure
The qualified participants (novice undergraduates with no history of mental diseases and physical-motor disorders) were identified using a personal data sheet. Then MTQ-48 was administered to a number of 40 selected individuals. The results were used to identify and select 26 individuals with either low or high mental toughness as the participants. The participants who scored over 3.5 and under 2.5 were assigned into high- and low-mental-toughness groups, respectively. Before the intervention was started, a qualified coach described and displayed appropriate basketball passing performance to the subjects. One of the researchers explained the procedure to score the subjects’ performance. Based on their pretest scores, the participants were divided into two homogeneous groups each with 13 members. The participants in either group were trained on basketball passing skills for 15 sessions, three sessions per week, for 5 successive weeks. In every training session, the subjects performed running and stretching exercises to warm up. Then they practiced the criterion skill for 15 minutes. In acquisition phase, the participants received verbal feedback as well. The retention test was administered one week following the acquisition stage. The test session was similar to training ones except that the subjects received no augmented feedback on the appropriate task performance. In order to avoid warm-up-decrement, the participants made five throws and then took the test.

Data analysis
Independent t test was run to compare mental toughness and test performance in the pretest between the two groups. Subsequently, in order to evaluate the subjects’ performance in the acquisition stage, 2 (high and low mental toughness groups) × 15 (training sessions) ANOVA was used with repeated measures on the training sessions. Afterwards, Independent t test was used to compare the mean performance between the two groups in retention test.

RESULTS
Following the exclusion of the individuals with average scores on MTQ-48, the mean scores were compared between the high- and low-mental-toughness groups. The results showed a significant difference in mental toughness between the two groups (t (24) =15.94, P=0.001). A comparison of the two groups in the pretest showed no significant difference at the beginning of the study (t (24) =-0.15, P=0.88). In the acquisition stage, the data was analyzed using 2×15 ANOVA (group × training sessions) with repeated measures on training sessions. The results revealed that the training sessions proved to be effective (F (4.89, 117.4) =24.57, P<0.001). Besides, the group effect (F (1, 24) =12.98, P<0.001) and the interaction effect of group by training sessions was found to be significant (F (14, 336) =2.97, P<0.001). Therefore, there was a significant difference between the two groups in the acquisition stage.

FIGURE 1. Performance scores of the experimental groups in pre-test, last session of acquisition and retention test
Independent t test comparison of mean scores showed a significant difference in retention test performance between the two groups (t (24) =3.23, P=0.004). Figure 1 illustrates the mean scores of either group in the pretest, the last training session and retention test.

DISCUSSION

The present study aimed to investigate the role of mental toughness in acquisition and retention of basketball passing skill. Evaluating the performance of two groups of participants showed that training sessions proved to be effective. In other words, regardless of the mental toughness profile, training improved task performance over time. The results also revealed that the group interaction effect in training sessions and the main group effect were significant. That is, there was a significant difference in skill acquisition between the two groups. A comparison of the mean scores showed that the high-mental-toughness group outperformed the low-mental-toughness group in learning the passing task. As with the acquisition stage, it was expected that the former would outperform the latter in retention test. The results showed that not only in the acquisition stage but also in the retention test, the former group outperformed the latter.

This finding suggests that mental toughness is a key factor in acquisition and learning basketball passing skill. Definition of mental toughness implies that mentally tough individuals tend to be competitive in most situations and may deal with the demands (e.g. competition, training and lifestyle) that sports press upon them (Jones et al., 2002; Clough et al., 2002). The present findings correspond to the above definition, implying that mentally tough people perform better than low-mental-toughness individuals not only in competitive, pressing situations but also in acquisition and retention of motor skills.

Crust and Azadi (2010) found significant positive correlations between mental toughness and the use of various psychological approaches such as mental imagery, emotional control and goal setting in training and competitions, which suggests that mentally tough athletes are committed to seek alternative ways (beyond physical training) to improve their performance. Mattie and Munroe-Chandler (2012) investigated the relationship between mental toughness and mental imagery. The results showed that mental imagery could significantly predict mental toughness. Research has shown that the above psychological techniques play a key role in performing and learning motor skills (Short et al., 2006; Chroni et al., 2007, Cutton & Landin, 2007; Johnson et al., 1997). As with the above psychological techniques, mental toughness may also serve an important role in acquisition and retention of skills.

As mentally tough individuals have better control over the performance setting, they may also involve more actively in the problem-solving processes of a learning situation comparing with low-mental-toughness individuals.

Considering the effect of mental toughness on skill acquisition and retention, the learning environment should be set to develop this trait. Crust and Clough (2011) asserted that mental toughness may be improved through appropriate training/practice structure and consideration of competition requirements. Training sessions should not only stretch the physical capabilities of athletes, but should incorporate some form of psychological pressure or simulation training. This could include environments that are distracting or that create pressure and problem-solving. The challenge is for coaches to be creative and for athletes to be forced to solve problems independently.

Overall, the present findings suggest that mental toughness may be a key factor in acquisition and retention of skills. As this study is the first in its kind to investigate the role of mental toughness in acquisition and retention of basketball passing skill, it is recommended that the present findings be interpreted and applied with caution. It is recommended that future studies investigate the role of mental toughness in acquisition and retention of a variety of skills under various conditions.

REFERENCES


