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The Role of mental toughness in basketball shooting skill Learning

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ABSTRACT
The purpose of this study was to evaluate the role of mental toughness in basketball shooting skill learning. Participants included undergraduate students (n=100, Age=23.70±2.35) of Gorgan Islamic Azad University who were novice in basketball. Participants based on Mental Toughness Questionnaire-48 (MTQ 48) and pretest scores randomly assign in two equal groups with high and low mental toughness (n_1=n_2= 50). Participants conducted basketball shooting skill acquisition in 12 sessions (each session 30 throw). The retention test was held 24 hours after the acquisition test and the transfer test 24 hours after the retention test from an angle 45 minutes to the side of the hoop. Repeated measures, one-way ANOVA and independent t-test were run to analyze the data. Significance level for all statistical tests was set at α=0.05. Although both groups showed progress during the acquisition phase but progress in high mental toughness group was significant. Also the participants with high mental toughness outperformed the low-mental-toughness subjects in transfer and retention test. The results of this study indicate that mental toughness can be an important factor in learning motor skills.
Key words: *motor learning, basketball shooting, mental toughness*

INTRODUCTION

In recent years high levels of awareness and understanding of the psychological factors in sports activities is obtained. Among these factors the mental toughness (MT) is mentioned as a means of psychological functions [1, 2, 3]. Jones et al. (2002) conducted a proper definition of mental toughness: *Mental toughness is having the natural or developed psychological edge that enables you to:*

• Generally, cope better than your opponents with the many demands (competition, training, and lifestyle) that sport places on a performer.

• Specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure.

The noteworthy point of this definition is, the term "natural or developed" which suggested that mental toughness, partly under the influence of genetics. It may also be developed through experience and learning. One of the first tools to assess MT by Loehr (1986) was used. Psychological Performance Inventory (PPI) was an attempt by Loehr to operate definition of MT. the psychometric properties of this questionnaire does not follow a specific framework [5, 6]. That's why the researchers were looking for a more appropriate questionnaire to both genetic predisposition and natural areas to be found. A good MT assessment tools was developed by Clough et al. (2002). This is only ever questionnaire that is considered MT as a whole [8]. Many researches since 2002 was using this questionnaire to measure MT. Results showed that MT is positively associated with pain tolerance [9], risk-taking [10], intense emotions [11], self-talk, relaxation and mental imagery [12]. Crust (2007) did comprehensive review of MT in sport and pointed to importance of it and stated that little research has been done in this area to evaluate it. This Review showed that mental toughness appears to be multidimensional and most often associated with unshakeable self-belief, the ability to rebound after failures (resilience), persistence or refusal to quit, coping effectively with adversity and pressure, and retaining concentration in the face of many potential distractions. High levels of mental toughness have been found to be related to lower rating of exertion in high intensity exercise [7], pain tolerance/physical endurance [9], sports injury rehabilitation [13] and optimism and coping [14]. Crust & Clough (2005) conducted a research with title "relationship between

mental toughness and physical endurance" and significant correlation between the total score of MT and endurance weight-bearing achieved. Gerber et al. (2013) found that adolescence with high MT better adapted to their perceived stress and MT is a flexible source of stress. Brand et al. (2014) found that adolescent with high MT has higher sleep efficiency and sleep deeper. According to the above mentioned, mental toughness is a key factor in athletic success. But there is need more research in the field of MT especially in motor learning. Therefore our assumption is that MT has role in learning basketball shooting skill.

MATERIALS AND METHODS

Participants

The population of study was included 430 undergraduate students of Gorgan Islamic Azad University. 287 undergraduate students that were novice in basketball shooting skill selected to fill out the Mental Toughness Questionnaire- 48 (MTQ48). The participants were then assigned into two homogenous groups (each group's 50 participants) with high and low MT based on their scores on basketball shooting skill Test.

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

Free throw test: throws were scored based on AAPEHRD's[1] basketball test: 3 point to hit the ball into the basket without hitting the hoop or the board, 2 scores to hit the ball into the basket while hitting the board or the hoop, 1 score to hit the ball to the board or the hoop, 0 score to not to hit the ball to the board or the hoop.

Mental Toughness Questionnaire-48 (MTQ-48): developed by Clough and colleagues (2002), and we used Persian version of it translated by Afsanepurak & Vaez Mousavi (2014), 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 (Perry et al., 2014).

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 287 selected individuals.

The results were used to identify and select 100 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 shooting skill to the participants. One of the researchers explained the procedure to score the participants' performance. Based on their pretest, the participants were divided into two homogeneous groups each with 50 members. The participants in either group were trained on basketball shooting skills for 12 sessions, three sessions per week, for 4 successive weeks. In every training session, the participants performed running and stretching exercises to warm up. Then they practiced the shooting skill two set with 15 shooting throw and one minute rest after first set. In acquisition phase, the participants received verbal feedback as well. The retention test was held 24 hours after the acquisition test and the transfer test 24 hours after the retention test from an angle 45 minutes to the side of the hoop. The test session was similar to training ones except that the participants 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 participants' performance in the acquisition stage, 2 (high and low mental toughness groups) × 12 (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 and transfer test.

[1] American Association for Physical Education, Health, Recreation and Dance

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. Kolmogrove-smirnov test showed that scores of pretest has a normal distribution. The results showed a significant difference in mental toughness between the two groups (t (98) =21.68, P=0.001). A comparison of the two groups in the pretest showed no significant difference at the beginning of the study (t (98) =-0.65, P=0.44). In the acquisition stage, the data was analyzed using 2×12 ANOVA (group × training sessions) with repeated measures on training sessions. The results revealed that the training sessions proved to be effective (F (5.21, 98) =46.04, P<0. 001). Besides, the group effect (F (1, 98) =56.41, P<0.001) and the interaction effect of group by training sessions was found not significant (F (5.21, 98) =2.02, P>0.05). As you can see it in the figure1 there was a significant difference between the two groups in the acquisition. Independent t test comparison of mean scores showed a significant difference in retention test performance between the two groups (t (98) =3.67, P=0.001). Also Independent t test comparison of mean scores showed a significant difference in transfer test performance between the two groups (t (98) =5.79, P=0.001).

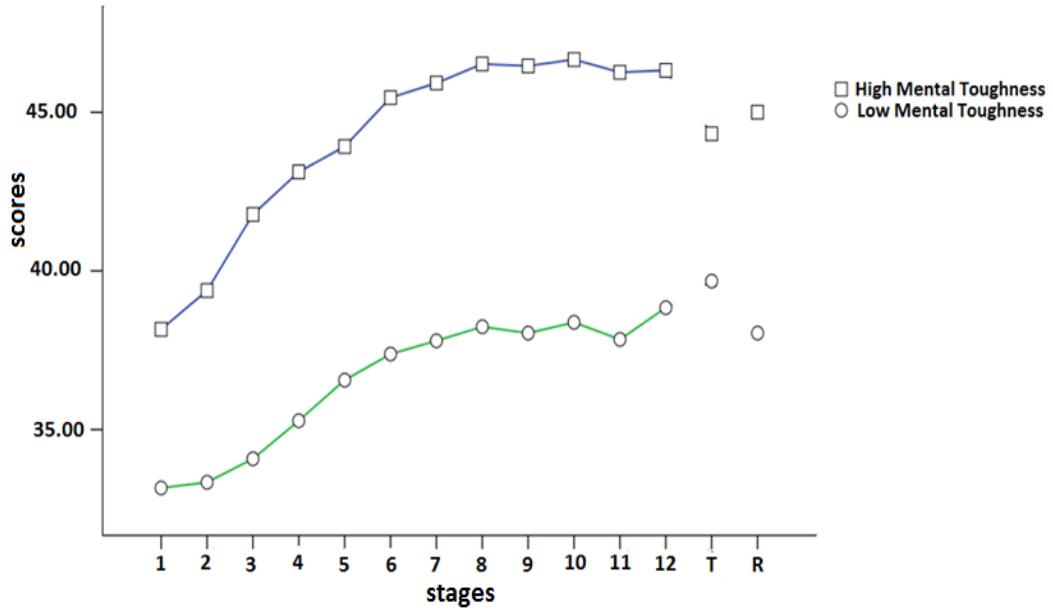

Figure 1: scores of two groups with high and low MT in acquisition phase, Transfer and Retention test.

DISCUSSION

The present study aimed to investigate the role of mental toughness in learning basketball shooting skill. In this study we found people who were more mentally tough able better to learn basketball shooting skill. Thus, these results in terms of MT variable influence were consistent with some researches like: Clough et al. (2002), Gerber et al. (2013) and Brand et al. (2014).

The result of present study is consistent with Jones et al (2007) definition. They were considered MT as a "natural or developed psychological edge" which enables you to cope better than your opponents with the many demands (competition, training, and 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. Also in this research, results showed that if peoples with higher MT don't give scores, they will not give up and greater consistency to continuing their practice. So perhaps we can say that it is possible that these peoples less talented in motor skill learning but they are submitted later than others. Jones et al. (2007) claimed that mentally tough athletes were 'better' at psychologically coping with demanding circumstances, but this is problematic given that these researchers made no comparisons with less tough or less successful athletes. Although it seems reasonable to assume that mentally tough athletes are better at coping with demanding circumstances, it is clear that, the descriptive nature of most mental toughness research to date has not allowed this proposition to be satisfactorily tested. Therefore in this research, a direct comparison was made between peoples with different levels of MT and statement made

by Jones et al. (2007) was confirmed. Most previous studies were considered elite athletes and used sport-specific questionnaires for assess MT, because they believed MT is influenced by the environment. Horsburgh et al. (2008) showed that MT is largely depending on genetic factors. Clough et al. (2010) reported a positive correlation between higher MT scores (measured by a questionnaire) and more grey-matter tissue volume in the right frontal lobe. Results were interpreted in light of this region's well-documented role in reality assessment, monitoring, and strategic thinking. The existence of significant brain-structure difference in their research is strongly suggestive of a genetic component. So we can say that MT is dependent on both genetic and environmental factors. Therefore in this study we used MTQ48 questionnaire for assess MT, because both factors are considered.

The result of these study was consistence with Nicolls et al (2007) study, in their research particularly high level of MT was correlate with strategies to deal with situations and solve problems (e.g. mental imagery, effort, thought control, and rational analysis). Novice persons to learn a motor skill they need to increase effort and control over their thoughts, in early learning they have to visualize good analysis of the skill in their minds. After that when they are away from the initial stages of learning the skill to be automated. So when a novice with higher MT in basketball shooting skill has better learning experiences than those with lower MT, all of these things can be done to high scores in basketball shooting skill acquired.

Overall, the present findings suggest that MT may be a key factor in learning of skills. As this study is the first in its kind to investigate the role of mental toughness in learning of basketball shooting skill, it is recommended that the present findings be interpreted and applied with caution. But it is suggested that coaches take advantage of players who have higher MT. it is recommended that researchers also do similar research in other skills.

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