

Young table tennis players' involvement in the practice: a test of Eysenck and Calvo processing efficiency theory

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Abstract: The present study tested the Eysenck and Calvo processing efficiency theory. This theory stated that anxious individuals are less efficient but can compensate by expending additional effort on the task. We examined factors of young table tennis players' practice efficiency. Participants were 145 young players. A questionnaire survey was conducted for young players from 21 elementary schools. Hierarchical regression modeling was employed in the analysis. Age and gender were controlled. Self-confidence is a moderating variable. Girl players had less practice hours than boys, but the difference was not statistically significant. Older young players had more practice hours, but the difference was not statistically significant. Young players who like swimming had more practice hours. Young players who like bicycling had less practice hours. Young players of less age had more practice time. Successful young players with better performance had less practice time than the less successful players, and the relationship between past performance and practice hours was moderated by the young players' self-confidence. When young players had stronger self-confidence, their impact of performance on increasing young players' practice hours was weaker.

Keywords: Eysenck and Calvo's processing efficiency theory, young table tennis players

1. INTRODUCTION

The goals of practice mainly are to increase the ability of players' motor skills and competing ability for table tennis players. Study of the injuries of table tennis players revealed that 70% of the injuries related to this sport occurred in young age (Shida et al., 1992). In Shida et al. investigation, the players reported their first injury about 5.9 years after starting to participate in table tennis. In addition, for those players who had the record of injury, they had an averaged time spent in practice of 26.5 hours per week. Shida et al. investigation also showed that the incidence of injury rises with the increase in length of practice. As a result of increasing participation, intensity, demands and longer training periods, the potential risk of injuries in table tennis seems to increase in all levels of athletes (Kondrič, 2008). Hence, it is significant to examine the young table tennis players' wellbeing in terms of their practice.

This study reviewed sport players practice in light of recent development on the concern of the incidence of injury and of systemic disorders among young table tennis players (Yoshikado et al. 1984). The purpose of the present study was to examine the factors that related to young table tennis players practice efficiency. Practice efficiency refers to the situation that players have less practice hours and obtain the same results. The Eysenck and Calvo (1992) processing efficiency theory (PET) provided a meaningful framework in exploring and explaining the findings. This theory stated that anxious individuals are hypothesized to be less efficient but can compensate by expending additional effort on

the task. An increase in anxiety emphasizes the importance of the more practice hours to the individual who may subsequently invests more effort to ensure that performance does not fall below expectation (Woodman, and Hardy, 2001; Williams et al., 2002). In line with this theory, those factors that cause or reduce the young table tennis players' psychological feeling of anxiety have influence on their practice efficiency and on the risk of injuries. We hypothesized that the contextual factors that led to the increase of anxiety in young table tennis players increased their practicing hours.

Empirical studies have shown that psychological factor plays an important role in the wellbeing of young athletes such as avoiding injuries (Demorest and Landry, 2004), increasing performance (Iizuka, et al., 2005). An individual's positive or negative mental state has long been thought to play a crucial role in his or her ability to perform sport specific tasks. This ability of mentality then either augments or detracts from his or her overall success or failures as an athlete. More specifically, self-confidence, mood disturbances, cognitive and somatic anxiety have all been linked as contributing factors to athletic performance (Ussher and Hardy, 1986). Funding, previous performance (Woodman and Hardy, 2001) and self-confidence (Carver and Scheier, 1988) are considered as factors that relate to tennis players' practice efficiency because those factors are considered either facilitative or debilitating to the players. Several studies concluded that successful athletes have lower anxiety than less successful athletes before a game (Highlen and Bennett, 1979; Ussher and Hardy, 1986). Self-confidence is one of the most

important psychological factors that relate to sport performance (Feltz, 1988). Successful performance enhances perceived self-efficacy while repeated failures harms self-confidence (Bandura, 1982; 1997). Hanton and Mellalieu (2002) found that self-confidence is a moderating variable that either increases or decreases the impacts of anxiety levels. We examined those factors in light of past studies, and we also explored some factors that we assume to be associated with young table tennis players' practice hours by conducting a survey investigation.

2. METHODS

2.1 Participants

Participants were 145 table tennis players, 104 females and 41 males, whose ages ranged from 9 to 13 years. They were the rosters of school teams that competed in the 2010 national table tennis tournament for elementary school level held in Tainan City. All the participating teams came from various schools cross the island. There was a total of 21 schools.

2.2 Measurements

Self-confidence

The definition of self-confidence in this study was the expected probability that a person will achieve a goal in a certain situation (Stevens, 2002). We constructed the scale of self-confidence of young players according to Stevens' definition of self-confidence. There are three items in measuring the degree of young players' confidence, inclusive of "I feel that I am not so good at table tennis as what my parents think", "I cannot achieve my parents' expectation in terms of performance", and "my parents are always too optimistic about the outcomes of games." The reliability of these three items is good with the value of Cronbach $\alpha = 0.708$. Self-confidence was measured on 4-point Likert scale (i.e., 1 = very agree, 4 = very disagree). The higher score denoted higher self-confidence. Self-confidence was a moderating variable in our hypothesis.

Performance

Performance refers to young players' performance in the past. The prizes that young players won in the past were categorized by the level of the contests, which were four levels of school, district, national and international. The performance index was combined with the total counts of the prizes for each level weighed by 1 (school level), 2 (district level), 3 (national level), and 4 (international level) respectively. The index of performance was transformed into its natural logarithm form.

Practice hours

Practice hours were the averaged time that players

spent in practice for each day. The practice hours was regarded as the dependent variable in the following analysis.

Funding

Funding is a dummy variable that refers to the situation of whether the players receive any funding or not.

Hobby sports

The hobby sports are the sports that young players regularly exercise. Both swimming and bicycling were examined in the current study. Both variables were dummy variables denoted by 1 if the players reported to do it regularly, and 0 if otherwise.

Control variables

Age and gender were control variables.

3. RESULTS

We employed hierarchical multiple regression analysis. Three blocks of variables were entered into the model in the order of controlling variables (gender and age), other predictors (swimming and bicycling), and main exploratory variables (funding, performance, interaction between performance and confidence). The F-ratio represented the ratio of the improvement in prediction that results from fitting the model, relative to residual. Hence, table 1 is split into three sections: one for each model. The change of R^2 (ΔR^2) from model 1 to model 2 is 0.106. The change of R^2 (ΔR^2) from model 2 to model 3 is 0.097. For the model 1, the F-ratio is 1.231, which is not significantly different from the null hypothesis under the degree of freedom (2, 154). For the model 2, the F-ratio is 9.206, which is significant under the degree of freedom (2, 152). For the model 3, the F-ratio is 6.185, which is significantly different from the null hypothesis under the degree of freedom (3, 149). Durbin-Watson statistic tests for correlations between errors. Field (2009) suggests that value less than 1 or greater than 3 causes for concern even though values closer to 2 may still be problematic depending on the sample and model. In this model, the value of Durbin-Watson statistic is 2.405, which is close to 2 and the assumption of independent errors is tenable.

Hierarchical regression analysis showed the following results:

- (1) Female table tennis players had less practice hours than male players ($p > 0.05$).
- (2) Older young players had more practice hours ($p > 0.05$).
- (3) Young players liking swimming had more practice hours.
- (4) Young players liking bicycling had less practice hours.
- (5) Young players with funding had more practice time.

- (6) Successful young players in terms of their past performance had less practice time than less successful players. It means that young table tennis players decrease their practice time when their performance is getting better. When young players' performance is getting worse, they will increase their practice time.
- (7) The relationship between performance and practice

hours was moderated by young players' self-confidence. When young players had higher self-confidence, their increase or decrease of practice time resulting from their performance will be more moderate. When young players had lower self-confidence, their increase or decrease of practice time resulting from their performance will be more dramatic.

Table 1. correlation, mean, and S.d.

	Age	Swimming	Bicycling	Funding	Performance (LN)	Performance X Confidence	Practice hours	Mean	S.d.
Girl	-.203*	.176*	.279**	-.151	.038	.047	-.110	.27	.44
Age		.101	-.062	.017	.110	.072	.093	10.70	1.20
Swimming			.581**	.098	.130	.171*	.216**	.15	.36
Bicycling				-.020	-.091	-.065	-.093	.13	.33
Funding					.188	.200*	.224**	0.27	.45
Performance (LN)						.954**	.217**	.03	2.49
Performance x Confidence							.285**	.08	6.69
Practice hours								2.71	2.7

*p < 0.05, **p < 0.01, ***p < 0.001

Table 2. Hierarchical multiple regression analysis of young table tennis players' practice hours

	<i>b</i>	<i>S.E.</i>	β	
Model 1				
(Constant)	4.050	2.017		R ² =.016
Gender (1:Girl, 0: male)	-.771	.462	-.130	F(2,154)= 1.232 p-value=.295
Age	.048	.169	.022	
Model 2				
Swimming (1:Yes,0:No)	2.192	.688	.299**	R ² =.122 , Δ R ² =.106
Bicycling (1:Yes,0:No)	-1.795	.746	-.226*	F(2,152)=9.209 p-value<.001
Model 3				
Funding (1:Yes, 0: No)	1.024	.448	.171*	R ² =.219 , Δ R ² =.097
Performance (Ln)	-.556	.243	-.524*	F(3,149)=6.185
Performance (Ln) x Confidence	.272	.092	.684**	p-value<.001 Durbin-Watson=2.405

*p < 0.05, **p < 0.01, ***p < 0.001

4. DISCUSSION

We examined the impact of four different types of psychological factors (hobby sports, financial support, performance, and self-confidence) on the practice time of young table tennis players. First, we evaluated whether young players doing different exercises lead to different practice efficiency. We were interested in whether people who participated in swimming or

bicycling exercises are able to release their anxiety of playing table tennis. We found that swimming predicted more practice time and bicycling predicted less practice time. One reason is that the motor skills between table tennis and bicycling are closer so that it helps the saving of the practice time. It is noted is that the findings need further study to validate this result.

Our results also showed that young players with funding predicted more practice time. It was unexpected that young players with funding either were encouraged or pushed to practice in longer hours to obtain an

expected good performance in the future game. Our finding possibly revealed the mental pressure of a young player and his/her coach, in terms of having funding. The anxiety of losing the game in the future increased the opportunity of practice inefficiency for young players. It is suggested that the funding project of young players should include the project of preventing sport injuries and of sport protection.

Our interesting finding is that past well-performance predicted greater practice efficiency. That is, well-performers needed practice time, and hence, had less chance to be injured. The results suggest a higher psychological anxiety to win in the game among moderate performance table tennis players. It is possible that it is very important for young players to win the games in Taiwan because of the expectation of parents or coaches. It is suggested that it is important for young players to learn how to enjoy the games.

The main finding is that self-confidence will result in psychological stability for young players. The interaction effect between self-confidence and performance on practice time in regression model suggests a moderating impact of self-confidence on the relationship between performance and practice time. The positive coefficient on table 2 of performance \times self-confidence stated that confidence reduces the impact of performance on practice time. Poor performance would increase the practice time which causes the practice inefficiency and increases the opportunity of injury. However, if a person has high self-confidence, it would reduce practice time through a stable psychological situation for young players.

5. CONCLUSIONS

1. It is important to keep young players have less anxiety by having them with the successful experience, and by having them with less pressure from their parents.
2. The increase of self-confidence reduces the risk of injury of young table tennis players because of the reducing of practice hours.
3. Exercise such as bicycling is related to the less practice time of table tennis players. This finding suggests that bicycling increases the practice efficiency.
4. It is surprising that funding led to more practice hours. This finding suggested that funding produced a degree of pressure for the young table tennis players.

Our findings support Eysenck and Calvo processing efficiency theory. Factors related to anxiety such as poor performance, low self-confidence, and with funding are associated with less practice efficiency. That is, players with anxiety need to work harder. Moreover, low self-confidence worsens the situation.

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