



Competition Field Perceptions of Table-tennis Athletes and their Performance

by

Ying-Chieh Liu¹, Ming-Yueh Wang², Chi-Yueh Hsu³

The distinction between positive and negative perceptions is fundamental in perception models. The purpose of this study was to investigate the correlation between field perceptions of table tennis players and the outcome (net result) during the matches in a competition. Experimental data were collected from 10 elite table tennis players and analysed. The results addressed the following three competition field perceptions: (1) before the service, the player's positive perceptions had significant effect on the positive outcome (winning rate) of that service; (2) the perception after the net result of the previous service increased the positive outcome of the next service, and (3) the player's positive/negative perception during the matches affected the win/loss outcome of that competition. In conclusion, the player's positive perceptions enhanced their winning rate during table tennis competitions. Therefore, during the training program, coaches need to develop positive perceptions and strengthen the psychological quality of table tennis players.

Key words: positive perception, negative perception, psychological quality, table tennis.

Introduction

Table tennis is a racket game that requires functional pairing between perceptual and action modalities under different spatial and temporal demands. A player must be in a good physical shape as well as mental condition and their skill is the decisive factor in the winning of a table tennis game (Kondric et al., 2013). Table tennis players are often not only physically exhausted after a competition, but also highly mentally tense. The winner of a World Championship tournament usually has to remain in top physical and mental condition for many competitive matches over a period of 7 days. Therefore, during a table tennis game, the player's psychological state undergoes rapid changes that directly affect the win/loss (outcome) of the entire competition (Kondric et al., 2013). For example, Yu et al. (2007) reported that table tennis player's positive emotions during matches enhanced the win rate of a competition;

conversely, a nervous or anxious emotional state negatively affected the net result of the competition. It has been also reported that lack of confidence, overstress and inability to cope with opponent's tactics are ranked as the top three psychological factors that interfere with the player's performance during competition (Chen et al., 2010). However, an elite player utilizes his/her psychological skills to fulfil their mental readiness before competition. No matter what challenges they encounter, it is possible to get through them and achieve the set goal (Munivrana et al., 2015).

Perception theory encompasses multiple disciplines including physiology, neural science of perception, physiological linguistics, neural biology and visual humanity. These sets of theories are complied with the required standards of reliability and effectiveness in every domain including table tennis (Zaltman, 2003). Mayer et

¹ - Department of Information Management, Chaoyang University of Technology, Taichung 41349, Taiwan, ROC.

² - Department of Physical Education, National University of Kaohsiung, Kaohsiung 811, Taiwan, ROC.

³ - Department of Leisure Services Management, Chaoyang University of Technology, Taichung 41349, Taiwan, ROC.

al. (2004) suggested that perception was the terminology for one type of reflection of human spiritual states and those phenomena that would affect feelings and behaviours. It is known that one perception affects another perception and finally, external behaviour (Harwood et al., 2015; Martinent and Decret, 2015). Furthermore, human perceptions can affect emotions and work efficiency (White et al., 2005). For table tennis players, physiological perception during competition influences and changes their skills and tactics and further affects the competition outcome to a win or loss (Wolf et al., 2014). Accordingly, it is important to know player's perceptions during competition and to use them in their training program, which can enhance the physiological qualities of the player. Therefore, the competition field perception of table tennis players is a topic that deserves investigation.

Previous studies on table tennis players' competition perceptions were primarily focused on quantification, i.e., data obtained from questionnaires, and made conclusions after statistical analyses (Chen et al., 2011; Martin et al., 2015). Although this method can collect a large amount of data, it is not clear whether it can actually reflect the perceptions of players, and the questionnaire method also lacks a thorough investigation centred on the personal experiences of players. Therefore, it is difficult to identify the changes and transformations of the practical psychological states during competition. This study defines 'field perceptions' as the self-perceived performance state of table tennis players during competitions. Therefore, this study aimed to determine whether the field perceptions of table tennis players correlated with the win/loss competition outcome.

Methods

Participants

Ten male elite table tennis players agreed to participate in the study. The players' activity was studied from the doubles matches held in March 2013 during the competition of the Chaoyang University of Technology Table Tennis Championship. We requested their consent after completion of each match. All players self-reported as Taiwanese and they were right-hand. Their average age was 21.6 yr (SD = 8.7), and their average competitive table tennis experience was

11.5 yr (SD = 9.7).

Research Hypotheses

In the present study, we chose the following three perceptions: (1) the perception before the service would affect the win/loss (outcome) of that rally, (2) the perception after the win/loss outcome of that ball would affect the win/loss outcome of the next rally, and (3) positive and negative perceptions would affect the win/loss outcome of that rally.

Measures

To build a model of field perceptions for this study, seventeen perceptions were observed, which were divided into positive and negative perceptions. The selected 17 field perceptions in this study are presented in Table 1. Using our designed measurement tool, the participants were asked to report their perceptions before the service, when holding the ball, and after the outcome (win or loss) of that rally. The perceptions were provided by the subjects from their recall about the perception during every stage while they were viewing video screens after the competition. The subjects were able to select multiple perceptions. The outcome (win/loss) of each rally and score were recorded for the 3 stages. This type of structured measurement tool can decrease the uncertainty of research results that may be generated from the guiding ability or dialog manner of the research personnel during qualitative research, such as the interview effect, which can lead to unexpected research results.

Procedures

Each athlete played four doubles matches against different opponents, and then the obtained perception (Table 1) data were analysed to verify our hypotheses. The data were gathered by continuous video recording of the players' actions during the doubles matches. The matches were recorded using an 8 mm video camera (Sony Handycam CCD-TRV308). The camera was positioned above and behind the table and was set for a wide-angle, fixed, overhead view that framed the table and the movement of the players, the scoreboard and the umpire. The self-confrontation data were obtained during the self-confrontation interviews. The player viewed the videotape of the match with one of the authors; the corresponding author stopped the tape before a point and asked the player to comment on his perceptions. The player then viewed the point

being scored and completed his descriptions. None of the player participated in another competition during the interval between the match and the interview. To avoid a potential bias, the corresponding author agreed not to analyse the match with the players until the interviews were completed. All the interviews were conducted by the corresponding author, who had been an elite player at the international level in the past.

Statistical Analysis

The data analysis was performed using SPSS software (SPSS, version 17 for Windows). The values are expressed as means and SD. Pearson's product-moment correlation coefficients were used to examine the correlations between variables. Cross tabulation (contingency table) is a fundamental statistical tool to compare and investigate relationships among categorical variables. In this study, the Phi and Cramer's V coefficient were used to determine the correlation between variables. The level of significance was set at $p < 0.05$.

Results

Table 1 shows the psychological factors and their reasons that influenced table tennis performance. The perception effect of before the service on the outcome (win or loss) of that rally was the primary variable of interest in this study. The results are presented in Table 2. It was found that the perceptions before the service significantly affected the outcome (winning) of that rally, as the Phi and Cramer's V coefficient values were lower than the significant threshold. Next, the effect of perception after the outcome of the first rally on the win/loss of the next ball was evaluated. The results of the experiment are summarised in Table 3. The experimental data revealed that the phi and Cramer's V coefficient values were less than 0.05 and thus, statistically significant. Accordingly, the perceptions after the win/loss outcome of that rally affected the win/loss outcome of the next ball. These results confirm that the outcome perception of the first rally has considerable impact on winning the next ball. Our next experiment determined the effects of positive or negative perceptions on the outcome (win/loss) of the next ball. The analysed results are presented in Table 4. The Phi correlation coefficients have a p -value less than 0.10. Accordingly, it can be inferred that the

perceptions after the win/loss outcome of a rally did affect the win/loss outcome of the next rally.

Discussion

Psychological and physical status in sports has recently received increasing attention in research and practice. Previous studies have indicated that the player's enhanced psychological status can improve their overall performance, while a decreased psychological status concomitantly results in poor performance during the matches in a competition (Ardenska et al., 2016; Martinentet al., 2014). A positive psychological status of a player is experienced as an upward one when everything appears to be going right. In contrast, a negative status is experienced as a downward one when everything seems to be going wrong. Table tennis is regarded as one of the fastest sports in terms of the game speed. Table tennis players aiming to elite need to develop anticipatory psychological skills to be able to quickly and responsively adapt to continuously changing conditions (Raab et al., 2005). Generally, when successful table tennis players are examined, it is seen that they increase their performance by giving importance to psychological training besides technical and tactical sessions as well as conditioning (Liu et al., 2012). Moreover, they must learn the outstanding tactical skills and withstand the psychological demands including concentration and psychological toughness to reach an elite level. The purpose of this study was to examine the field perceptions as a self-perceived performance state of table tennis players during competition. In particular, the positive and negative factors that contributed to perceived exertion in table tennis were assessed. The perceptions evaluated in this study comprised psychological response of the players during competition and they were generated from 3 stages of the competition: before the service, holding the ball, and after the win/loss outcome. Since these perceptions occur within few seconds during a competition and are instantaneously generated (Salazar et al., 1990), it was a challenging task to systematically describe them.

Table 1*The selected field perceptions analysed in the present study*

Perception Category	Perception	Content
Positive Perceptions	Optimism	The player can adopt a positive perspective regarding the next coming ball.
	Courage	The player can welcome the coming ball with positive courage.
	Pleasantness	The player happily and joyfully approaches the ball.
	Luck	An apparent table-corner ball, net-touched ball, or error made by opponent.
	Relaxation	Relaxation can be divided into physiological and psychological relaxation. Physical relaxation and psychological relaxation have their mutually interactive effects on the perceptions before hitting the ball and after the completion of an individual ball.
	Hope	The player has a positive perception of the winning result of the ball before and after hitting this ball.
	Excitement	The player has a positive expectation before hitting the ball, after the completion of each ball, and for the result.
Negative Perceptions	Self-confidence	The player has no doubt about the things that have been done or judgments that had been made.
	Tension	The player experiences high tension, muscle stiffness, inconsistent actions or random tempos, which negatively affect skills.
	Lack of confidence	The perceptions before the ball service and after the completion of each ball, as well as when facing the next coming ball.
	Anxiety	The state of competition. This type of state can easily cause the individual stress and anxiety and might further affect the individual performance.
	Regret	The emotion of regret after ball completion; inactive and harmful emotion.
	Depression	Depression is felt when the expected result did not occur in relation to the performance or a lack of fighting will and activity.
	Anguish	A negative state connected with anger, which arises in the competition or during ball play.
	Fear	Experienced before or during the competition, it may affect performance.
	Hesitation	Confusion generated before and after competition, resulting in a perception of uncertainty in deciding how to hit the ball.
	Loss	A situation of "not knowing what to do" with the coming ball before and after the competition.

Table 2*The effects of perceptions before the service on the outcome (win or loss) of that service*

		Value	Approx. Sig.
Nominal by Nominal	Phi	.309	.022**
	Cramer's V	.309	.022**
N of Valid Cases		306	

** $p < 0.05$

Table 3

After the outcome of the first service, the effects of perceptions on the net result (win/loss) of the next service

		Value	Approx. Sig.
Nominal by Nominal	Phi	.874	.000***
	Cramer's V	.874	.000***
N of Valid Cases		289	

*** $p < 0.05$

Table 4

The effects of positive or negative perceptions on the outcome (win/loss) of the next service

		Value	Approx. Sig.
Nominal by Nominal	Phi	.103	.072*
	Cramer's V	.103	.072*
N of Valid Cases		289	

* $p < 0.01$

It is known that in table tennis, players need to have a good psychological state, well developed perceptions and strategic skills to face each incoming ball and to return it in a different strategic way. It has been previously reported that maintaining positive thinking and emotional management are crucial for table tennis players to win a competition (Elliot, 1999; Fredrickson and Levenson, 1998; Tseng, 2008). Furthermore, Chen et al. (2011) also observed that elite players presented better positive psychological states (concentration, self-confidence, positive thinking orientation, emotional management, and motivation) than lower-level players. The main finding of the study was that the player's positive perceptions such as optimism, courage, pleasantness, luck, relaxation, hope, excitement, self-confidence, contributed to an enhanced winning rate during a table tennis competition. These results agree with those of Yu et al. (2007) who reported that the better table tennis performances were closely associated with the

psychological state of the players.

Secondly, negative perceptions such as anxiety, may lead the athletes to perform abnormally (Fredrickson and Levenson, 1998). It was also reported that table tennis player's competitive anxiety displayed a positive psychological pattern when the score increased and an explosive negative psychological pattern when the score decreased (Gernigon et al., 2010). This study examined the player's negative perceptions such as tension, lack of confidence, anxiety, regret, depression, anguish, fear, hesitation, loss. It was observed that negative perceptions resulted in a negative outcome (loss of game). In addition, our findings also provide further evidence that positive or negative perceptions affect the outcome (win/loss) of the next rally. The psychological response at the moment affects the treatment of a particular ball and therefore decides the win/loss outcome of that ball. However, psychological situations are varied, i.e., some people will be nervous, anxious

and perform abnormally, some people are less motivated and not inclined to learn, while others have easily diverted attention spans and concentrate less, which may affect their performance. Therefore, it is important for table tennis players to maintain positive thinking and emotional management (Kondric et al., 2010). In our study, we indicated that perceptions after the win/loss outcome of a rally significantly affected the win/loss outcome of the next rally. Therefore, the present study provides important insights into how to provide psychological training for different players.

Several limitations to the present study should be mentioned. First of all, the present data were obtained based on a small sample size. Although our findings provide support for hypotheses of the present study, examining their generalizability to a larger sample size and cross section of various age groups (with equal distribution) would be of great importance. Secondly, the participants in the present study were males; however, according to traditional theories females might have different psychological attitudes and different perceptions compared to males (Brody, 1993). Therefore, replication of the present findings in additional samples of both genders is essential. Thirdly, it would be important to examine the importance of positive and negative perceptions in table tennis

players of different performance levels to determine a more reliable correlation between their field perceptions and the competition outcome. Finally, the participants of this study were elite table tennis players from Taiwan, therefore generalization and application of these findings to players from other countries should be treated cautiously.

Conclusions

In conclusion, findings from this study highlight the importance of positive and negative perceptions of table tennis players. In particular, positive perceptions before the service enhanced the winning rate of that service. The perceptions after the win/loss outcome of the first rally affected the outcome of the next rally. Furthermore, positive and negative perceptions affected the win/loss of that ball. Therefore, coaches need to strengthen the positive perceptions and psychological states of players and, teach the players to overcome the negative perceptive disadvantages when a service was lost. Taken together, the results of this study encourage positive training and a competitive environment for table tennis players.

Acknowledgments

The authors are thankful to Chaoyang University of Technology and National University of Kaohsiung for providing research facilities.

References

- Ardenska A, Tomik R, Berber S, Duz B, Çivak B, Çalışkan U, Ogrodnik J. A Comparison of Physical Education Students' Motivation Using Polish and Turkish Versions of the Academic Motivation Scale. *J Hum Kinet*, 2016; 54: 207–218
- Brody L. On understanding gender differences in the expression of emotion. In: Ablon, Steven L., Brown, Daniel, Khantzian, Edward J., Mack, John E. (Eds.), *Human Feelings: Explorations in Affect Development and Meaning*. Analytic Press, Hillsdale, NJ, 87–121; 1993
- Chen IT, Chang CW, Hung CL, Chen LC, Hung TM. Investigation of Underlying Psychological Factors in Elite Table Tennis Players. *Int J Table Tennis Sci*, 2010; 6: 48–50
- Chen YT, Huang CJ, Hung TM. The physiological states of best sport performance in the excellent table-tennis athletes. *J Coll Phy Edu*, 2011; 13(1): 44–54
- Elliot AJ. Approach and avoidance motivation and achievement goals. *Edu Psychol*, 1999; 34: 168–189
- Fredrickson BL, Levenson RW. Positive emotions speed recovery form the cardiovascular sequelae of negative emotion. *Cognition and Emotion*, 1998; 12: 191–220

- Gernigon C, Briki W, Eykens K. The dynamics of psychological momentum in sport: the role of ongoing history of performance patterns. *J Sport Exerc Psychol*, 2010; 32(3): 377–400
- Harwooda CG, Keegan RJ, Smith MJ, Rained AS. A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity. *Psychol Sport Exercise*, 2015; 18: 9–25
- Kondric M, Furjan-Mandic G, Kondric L, Gabaglio A. Physiological demands and testing in table tennis. *Int. J. Table Tennis Sci*, 2010; 6: 165–170
- Kondric M, Zagatto AM, Sekulic D. The physiological demands of table tennis: a review. *J Sports Sci Med*, 2013; 12(3): 362–370
- Liu W, Zhou C, Ji Z, Watson JC. The effect of goal setting difficulty on serving success in table tennis and the mediating mechanism of self-regulation. *J Hum Kinet*, 2012; 33: 173–185
- Martin C, Favier-Ambrosini B, Mousset K, Brault S, Zouhal H, Prioux J. Influence of playing style on the physiological responses of offensive players in table tennis. *J Sports Med Phys Fitness*, 2015; 55(12): 1517–1523
- Martinent G, Decret JC, Isoard-Gauthier S, Filaire E, Ferrand C. Evaluations of the psychometric properties of the Recovery-Stress Questionnaire for Athletes among a sample of young French table tennis players. *Psychol Rep*, 2014; 114(2): 326–340
- Martinent G, Decret JC. Motivational Profiles Among Young Table-Tennis Players in Intensive Training Settings: A Latent Profile Transition Analysis. *J Appl Sport Psychol*, 2015; 27(3): 268–287
- Mayer JD, Salovey P, Caruso DR. Emotional Intelligence: Theory, Findings, and Implications. *Psychol Inq*, 2004; 15(3): 197–215
- Munivrana G, Petrinovic LZ, Kondric M. Structural Analysis of Technical-Tactical Elements in Table Tennis and their Role in Different Playing Zones. *J Hum Kinet*, 2015; 47: 197–214
- Raab M, Masters RSW, Maxwell JP. Improving the ‘how’ and ‘what’ decisions of elite table tennis players. *Hum Movement Sci*, 2005; 24: 326–344
- Salazar W, Landers DM, Petruzzello SJ, Han MW, Crews DJ, Kubitz KA. Hemispheric asymmetry, cardiac response, and performance in elite archers. *Research Quarterly for Exercise and Sport*, 1990; 61(4): 351–359
- Tseng HC. The strategies to Eliminating Physiological Tensions and Anxious Emotions of Sport Athletes before the Competitions. *J Liaoning Seni High Vocat Edu Sch*, 2008; 10(3): 102–103
- White M, Hartel C, Panipucci D. *Understanding Cross-Cultural negotiation: A Model Integrating Affective Events Theory and Communication Accommodation Theory*, in Hartel, Zerbe & Ashkanasy (eds), *Emotions in Organizational Behavior*, Lawrence Erlbaum Associates, Publishers, New Jersey, 167–182; 2005
- Wolf S, Broz E, Scholz D, Ramos-Murguialday A, Keune PM, Hautzinger M, Birbaumer N, Strehl U. Winning the game: brain processes in expert, young elite and amateur table tennis players. *Front Behav Neurosci*, 2014; 8: 370
- Yu FY, Ning CY, Li PC. The effects of emotional adjustments on the competition performance of table-tennis. *J Xingguo*, 2007; 7: 293–299
- Zaltman G. *How Customers Think: Essential Insights into the Mind of the Market*. Boston, MA: Harvard Business School Press; 2003

Corresponding author:**Chi-Yueh Hsu,**

Department of Leisure Services Management, Chaoyang University of Technology,
Taichung 41349, Taiwan, ROC.

Tel. +886-4-23332000 ext. 4444. Fax: +886 23742321;

E-mail: cyhsu@gm.cyut.edu.tw