

## Non-verbal behaviors-performance relationship among a sample of international table tennis players

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**Abstract:** the main aim of this study was to examine the relationship between non-verbal behaviors of high level table tennis players and their performance during high-stakes table tennis matches. This study also provided descriptive evidence relating to the nature and frequency of the non-verbal behaviors expressed by athletes while competing. Eight high-level matches from the European Top 12 and French pro A championship for a total of 13 different players ranking 10<sup>th</sup>-161<sup>st</sup> on the world ITTF ranking at the moment of the study were analyzed. Coding grid allowed researcher to extract the following quantitative variables from the videotapes of high-stakes table tennis matches: (1) nature of non-verbal behaviors deployed by table tennis players during competition, (2) frequency of non-verbal behaviors deployed by table tennis players during competition, (3) gain vs. loss of match, (4) gain vs. loss of game, (5) gain vs. loss of the previous point, and (6) gain vs. loss of the next point. Quantitative analyses of the videotapes revealed the presence of 25 specific non-verbal behaviors, for a total of 4972 non-verbal behaviors observed during the matches. Results showed that the frequency of non-verbal behaviors was significantly different between: (1) matches won vs. lost, (2) games won vs. lost, (3) previous points won vs. lost, and (4) next points won vs. lost. Particular non-verbal behaviors seem thus to have a causal influence on the result of the next point (won vs. lost). Specifically, players who “run around the playing area” would increase their chances to win the next point. Contrary, players who “remake the gesture” and/or “touch/scratch his face” would decrease their chances to win the next point. The predominant focus in sport psychology has been on pre-performance non-verbal behaviors, with far less attention paid to the non-verbal behaviors expressed by athletes during competition. Support was provided for the usefulness to examine the wide range of non-verbal behaviors expressed by international table tennis players during the competition as well as for their significant influence on the performance of players while competing.

**Keywords:** non-verbal behaviors, video recording, table tennis.

### 1. INTRODUCTION

‘Naïve’ theory of sport psychology is that performers can be convinced of the quality of their opponents, based on non-verbal behavior (body language, extent of eye contact, facial expression) available prior to or during a competition [1]. This, in turn, is proposed to influence perceivers’ thoughts, actions and performance. Unfortunately, despite these ‘naïve’ theory and although there has been much interest in the social psychology literature in studying non-verbal behaviors, little research has examined non-verbal behaviors in sport settings [1].

Non-verbal behaviors could be conceptualized as a component of emotions experienced by athletes while competing. Using Lazarus’s cognitive-motivational-relational theory of emotion, emotion is defined as an organized psychophysiological reaction (e.g. subjective experience, behavioral expression, cognitive processing, and physiological changes) to ongoing relationships with the environment [2]. Although authors agreed to say that there are three main components comprising the concept of emotion (physiological, behavioral and subjective), investigations on the concept of emotion in sport settings have almost exclusively studied the subjective component of emotion [2-3]. This literature consistently showed that: (a) sporting experience is

characterized by many positive (e.g. joy, hope) and negative (e.g. anxiety, anger, disappointment) emotions before and during competition [3-4], and (b) emotions play a role in performance variability by facilitating or impairing athletes’ performance [5]. However, it is unclear how the components of emotions other than subjective experience (e.g. behavioral component of emotion) may affect performance during competition. Therefore, the examination of the wide range of non-verbal behaviors deployed by elite table tennis players while competing and their influence on sport performance during competition may be beneficial. In this perspective, the main aim of this study was to examine the relationship between non-verbal behaviors of high level table tennis players and their performance during high-stakes table tennis matches.

### 2. METHODS

#### 2.1 Participants

A total of 13 male international table tennis players, 17 - 40 years old ( $M_{age} = 29.77$ ,  $SD = 6.95$ ) ranking from 10<sup>th</sup> to 161<sup>st</sup> on the world ITTF ranking at the moment of the study were analyzed through video-recordings.

#### 2.2 Procedure

Players’ non-verbal behaviors during competition

were studied in 8 matches (5 matches of the European top 12 and 3 matches of the French pro A championship). For these 8 matches, the non-verbal behaviors of each of the two players have been analyzed (i.e. one player was analyzed twice and one player was analyzed thrice). Continuous video recordings of the players' actions during the matches were gathered using two cameras. The two cameras were positioned above and behind the table and were set for a wide-angle, fixed, overhead view that framed the table, the movement of both players, the scoreboard and the umpire. The cameras were positioned in such a way that we could observe the two players from the front at any time (i.e. the first camera filmed one player from the front and his opponent from the back and the second camera filmed the other player from the front and his opponent from the back).

### 2.3 Data analysis and processing

The videotapes were viewed in order to draw up an inventory of the two opponents' non-verbal behaviors. The players' observable non-verbal behaviors were systematically coded and transcribed into categories. The first step of the analysis consisted to locate in the video-recordings the distinct nature of non-verbal behaviors deployed by table tennis players while competing. Then, a coding grid was created to facilitate the construction of quantitative variables. This coding grid allowed assisting continuously researcher in the construction of quantitative variables during the viewing of the video-recordings by the researchers. Two researchers viewed carefully video-recordings and independently performed quantitative analysis. Coding grid allowed researcher to extract the following quantitative variables from the videotapes of high-stakes table tennis matches: (1) nature of non-verbal behaviors deployed by table tennis players during

competition, (2) frequency of non-verbal behaviors during competition (3) gain vs. loss of match, (4) gain vs. loss of game, (5) gain vs. loss of the previous point, and (6) gain vs. loss of the next point.

### 2.4 Issues of trustworthiness

Analyses of video-recording have been performed by two independent researchers. Comparison of their respective results highlighted only minor differences. Discussions between the two researchers were therefore undertaken to discuss cases where alternative categorizations may have been possible, allowing the researchers to come to agreement on the coding of (a) all the non-verbal behaviors deployed by table tennis players while competing, and (b) all quantitative variables extracted from the video-recordings. Indeed, all aspects of the quantitative analyses were consensually validated by two independent researchers.

## 3. RESULTS

### 3.1 Nature and frequency of non-verbal behaviors deployed during competition

25 distinct types of non-verbal behaviors for a total of 4972 non-verbal behaviors were identified through the analyses of video-recordings. In our sample, a player expressed a mean of 31.07 non-verbal behaviors in a game as well as a mean of 3.27 non-verbal behaviors for each point played.

Additionally, an important fluctuation of the types of non-verbal-behaviors expressed by table tennis players has been identified during high stake matches. Some non-verbal behaviors were observed more than 300 times whereas others were observed less than 20 times. Table 1 presents the main non-verbal behaviors observed in our sample.

Table 1 Nature and number of occurrences of main non-verbal behaviors observed among elite table tennis players.

Non-verbal behaviors	Description of non-verbal behaviors	Number of occurrences
(1) Catching his racket in the non dominant hand		1342
(2) Wiping the table by exceeding the net line	The player exceeds the trawl line and wipes the table with the hand close to the net.	752
(3) Wiping the table without exceeding the net line	The player wipes the table with the hand without exceeding the net line.	578
(4) Fist pump	The player grips his fist, this non-verbal behavior being often accompanied by a verbal demonstration ("tcho!").	346
(5) Practicing the stroke motion		331
(6) Looking at his racket		303
(7) Hopping between points	The player hops between points without moving.	309
(8) Touching his face and/or skull	The player touches, scratches his face and/or skull or tidies hair.	232
(9) Touching his racket	The player touches or wipes his racket.	210
(10) Touching his short-sleeved shirt	The player touches or puts back in place his short-sleeved shirt. This non-verbal behavior was also encoded when the player felt each other the body or dried his hand against his short-sleeved shirt.	133
(11) Shortening time between two points		119
(12) Nonchalant attitude	The player puts his hand on the knees, has the swinging arms and/or	87

	has the falling shoulders.	
(13) Nodding his head		68
(14) Trotting in the playground	The player trots in the playground away from the table. This behavior is not coded when the player will get the ball.	68

### 3.2. Relationship between non-verbal behavior and sport performance

A series of  $U$  tests of Mann and Whitney were conducted to compare match winners and losers in terms of non-verbal behaviors. Results showed that the non-verbal behaviors fist pump ( $U = 476, p = 0.002$ ), touching his racket ( $U = 425.5, p = 0.007$ ), hopping between points ( $U = 487, p = 0.002$ ) and trotting in the playground ( $U = 486, p < 0.001$ ) were significantly more observed among match winners whereas the non-verbal behaviors practicing the stroke ( $U = 552, p = 0.016$ ), touching his face and/or skull ( $U = 425.5, p < 0.001$ ), touching his short-sleeved shirt ( $U = 577.5, p = 0.012$ ), nonchalant attitude ( $U = 579.5, p = 0.023$ ) and nodding his head ( $U = 562.5, p = 0.014$ ) were significantly more observed among match losers.

Another series of  $U$  tests of Mann and Whitney were conducted to compare game winners and losers in terms of non-verbal behaviors. Results showed that the non-verbal behaviors fist pump ( $U = 377, p < 0.001$ ), shortening time between two points ( $U = 513, p = 0.004$ ) and trotting in the playground ( $U = 559, p = 0.003$ ) were significantly more observed among game winners whereas the

non-verbal behaviors practicing the stroke ( $U = 566, p = 0.023$ ), touching his face and/or skull ( $U = 350.50, p < 0.001$ ), nonchalant attitude ( $U = 446.50, p < 0.001$ ) and nodding his head ( $U = 543, p = 0.008$ ) were significantly more observed among game losers.

Finally, we conducted a series of tests of difference of proportion to compare the proportion of win points following the non-verbal behavior in comparison to the proportion of win points during the 8 matches (50% of win points). This analysis allowed us to observe whether elite table tennis players tend to win or lose significantly more points following the expression of a non-verbal behavior in comparison to the proportion of win points on the total of matches. Results showed that players had won significantly more points following the non-verbal behavior trotting in the playground ( $p = 0.05$ ) whereas players had lost significantly more points following the non-verbal behaviors practicing the stroke motion ( $p = 0.01$ ) and touching their face and/or skull ( $p = 0.02$ ).

The main significant results of the relationship between non-verbal behaviors and performance were presented in Table 2.

Table 2 Main significant results of the relationship between non-verbal behaviors and performance.

	matches		games		points	
	won	lost	won	lost	won	lost
Fist pump*						
Practicing the stroke motion						
Looking at his racket						
Hopping between points						
Touching his face and/or skull						
Touching his racket						
Touching his short-sleeved shirt						
Shortening time between two points						
Nonchalant attitude						
Nodding the head						
Trotting in the playground						

Note: \* The non-verbal behavior "fist pump" was significantly more noticed in won vs. lost matches (and games). No significant difference was noticed concerning the next point (won vs. lost) for this non-verbal behavior.

## 4. DISCUSSION

Results showed that some non-verbal behaviors belong to table tennis culture in the sense that they are observed frequently among all players (e.g. fist pump, catch his racket in the no dominant hand, wiping the table by or without exceeding the net line or practicing the stroke motion).

Significant relationships between performance and non-verbal behaviors have been identified. Some non-verbal behaviors were significantly more noticed during won matches (fist pump, touching his racket, hopping between points and trotting in the playground) whereas other were significantly more noticed during lost matches (practicing the

stroke, touching his face and/or skull, touching his short-sleeved shirt, nonchalant attitude and nodding the head). Similarly, non-verbal behaviors were significantly more noticed during won games (fist pump, shortening time between two points and trotting in the playground) whereas other were significantly more noticed during lost games (practicing the stroke, touching his face and/or skull, nonchalant attitude and nodding the head).

Additionally, certain non-verbal behaviors seem also to have a causal influence on the result of the next point (won vs. lost). Specifically, players who “trot in the playground” would increase their chances of winning the next point. In contrast, players who “practice the stroke motion” and/or “touch their face and/or skull” would decrease their chances of winning the next point.

The predominant focus in sport psychology has been on pre-performance non-verbal behaviors [1], with far less attention paid to the non-verbal-behaviors expressed by athletes during competition. Support was provided for the usefulness to examine the wide range of non-verbal behaviors expressed by international table tennis players during the competition as well as for their significant influences on the performance of elite table tennis players while competing.

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