The Behavioural Component of Emotions: Exploring Outward Emotional Reactions in Table Tennis

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Abstract

The emotional reactions of athletes in sport competitions are not only fascinating to the spectators, but also illustrate that emotions are transmitted to the outside world, thus suggesting that they are not just intrapersonal processes. From a metacognitive perspective it is important to understand why these reactions occur and how they affect sports performance. In this study the antecedents and consequences of outward emotional reactions were explored using a naturalistic qualitative video-assisted procedure. Twelve German table tennis players were video-recorded during competitive matches in their regular season. Subsequently, based on the footage, self-confrontational interviews were conducted focusing on the antecedents and consequences of outward emotional reactions. The analysis revealed several factors related to whether or not outward emotional reactions were displayed, ranging from more malleable (e.g., state-like psychological states) to less malleable (e.g., trait-like factors). In addition, the analysis revealed how outward emotional reactions have a performance-related effect on one's own mental state (e.g., one's concentration) and on the psychological state of the opponent (e.g., the opponent's confidence). The present findings suggest that it is important to create an awareness of antecedents of outward emotional reactions in athletes in order to improve the use of psychological skills by athletes to control their emotional responses. In addition, the results point to the importance of the behavioural component of emotions in the emotion-performance relationship, as various intra- and interpersonal consequences that interact with the consequences of the purely subjective emotion experience were identified.

Keywords: Video-assisted qualitative procedure, antecedents, intrapersonal consequences, interpersonal consequences, metacognitive knowledge

Introduction

Emotional outbursts, both positive and negative, confer the passion of the athletes to the audience and turn the sport into one of the biggest spectacles in the world. For the athletes themselves, however, it is an important aspect of their competitive attitude to regulate and control their emotions. This is important because the emotional outbursts can affect both your own mental state and the mental state of your opponent. Although the athletes' pure emotions lure the masses into the sports arenas, athletes need to control their emotional responses to perform at their best.

In table tennis, players constantly win or lose points, which changes the likelihood of the ultimate goal of winning the match. Since the goal of winning the match is usually of personal significance, it is not surprising that table tennis players report experiencing a wide range of positive and negative emotions in these situations (Martinent & Ferrand, 2009; Sève et al., 2007). Interestingly, however, a player's visible emotional reaction can be very different across situations throughout a match. While, after losing a point, in one situation a player throws the racket accompanied by a verbal outburst, in another situation it is difficult to tell from the player's reaction whether the point was lost or won. Nevertheless, the fact that many emotional instances are observable from the outside indicates that, besides the individual's subjective emotion experiences (e.g., feeling angry) and physiological processes (e.g., change in heart beat), emotions also have a behavioural component (Mauss & Robinson, 2009). This further points to the importance to view emotions as social phenomena with consequences for people observing the individual (Parkinson, 1996; Tamminen & Bennett, 2017). To make a meaningful contribution to the literature, we explored the behavioural component of emotions aiming to provide preliminary insights to an extended understanding of the role of emotions in competitive sports.

We use the term *outward emotional reaction* when referring to a general integrated impression from the individual's behaviour to his/her emotional state. This impression integrates different body channels that are all related with indicating an emotional state, such as postures, gestures, facial expressions, and verbalizations (Mauss & Robinson, 2009). Importantly, instead of focusing on discrete emotions such as anxiety or anger, we distinguish outward emotional reactions according to their valence. Thus, while a positive outward emotional reaction indicates that something emotionally-pleasant has happened to the individual (e.g., a won point), a

negative outward emotional reaction indicates that something emotionally-unpleasant has happened to the individual (e.g., a lost point). Importantly, outward emotional reactions do not always correspond to the subjective emotion experiences. While even intense subjective emotion experiences are not always accompanied by an outward emotional reaction (Fernández-Dols & Ruiz-Belda, 1995), individuals sometimes pretend experiencing an emotion through outward emotional reactions (Sève et al., 2007). Since emotions are an integral part of sport competitions, the aim of the current study was to understand under which conditions outward emotional reactions are more likely and how these subsequently affect sports performance.

Antecedents of outward emotional reactions

Knowledge about antecedents of outward emotional reactions can help to foster awareness and psychological skills in athletes, with the aim to elicit the occurrence of helpful emotions and reduce the incidence of unhelpful emotions (Uphill & Jones, 2007). This is line with MacIntyre et al. (2014) arguing that metacognitive knowledge is an important factor for sports performance generally and emotion regulation particularly, as it allows individuals to regulate their behaviour and thoughts. Similar to the knowledge component of emotional intelligence (Mikolajczak, 2009), it is therefore assumed that the more knowledge a person has about the situations that trigger outward emotional reactions, and how these in turn influence sport performance, the more effectively the person can deal with emotional situations during sport competitions. Having recognized this similarity, it is important to stress that the construct of metacognitive knowledge is somewhat broader than emotional intelligence, as it includes awareness of and knowledge about mental processes in general (e.g., attention and memory; MacIntyre et al., 2014).

Emotion appraisal theories (e.g., Lazarus, 1999; Scherer, 2009) postulating that emotions are a result of a person environment transaction provide a useful framework for the study of emotion antecedents. The postulated transaction implies that research can identify typical situations as well as the psychological processes associated with an increased likelihood of emotions. With regard to typical emotional situations, research in the sports context has shown that events evolving in the match (e.g., score configuration, opponent's behaviour), events that were relevant before the match (e.g., the importance of the match, level of the opponent), and events that even go beyond the actual match (e.g., playing for a new contract, current physical condition) appear to influence the athletes' emotions (Lewis et al., 2017; Sarkar & Fletcher,

2014). With relevance for outward emotional reactions, a study in handball showed that players were more likely to show positive outward emotional reactions after scoring in play-off-matches as compared to leagues matches (Moesch et al., 2015). With regard to the relevant psychological processes, studies in the sport context indicate that how much control an individual perceives in a situation, the perceived pressure during a competition, or future expectations about the match outcome are important appraisal processes influencing the occurrence of emotions (Lewis et al., 2017; Thatcher & Day, 2008; Uphill & Jones, 2007). Circling back to the importance of metacognitive knowledge (MacIntyre et al., 2014), advancing the understanding regarding the situational factors and underlying psychological processes that influence the likelihood of an outward emotional reaction, can help to apply emotion regulation strategies tailored to players' current psychological state and the demands of the situation.

Consequences of outward emotional reactions

Regarding the consequences of outward emotional reactions, it is important to consider both potential intra- and interpersonal consequences (Tamminen & Bennett, 2017). In relation to intrapersonal consequences, research on subjective emotion experiences shows how emotions affect performance through performance-related constructs such as concentration, motivation, or physical strength (e.g., Martinent & Ferrand, 2009; Vast et al., 2010; Woodman et al., 2009). As showing emotions can intensify the subjective emotion experiences (Price et al., 2012), it appears to be worthwhile to examine to what degree the consequences of outward emotional reactions interact with the intrapersonal consequences. With regard to interpersonal consequences, a study in football showed that goalkeepers seemingly experienced more positive and less negative emotions, and higher confidence and expectations toward their future performance after viewing a negative outward emotional reaction by an opposing shooter (Furley et al., 2015). On the contrary, opposing shooter's positive outward emotional reaction could lead goalkeepers to experience more negative and less positive emotions and lower levels of confidence and expectations toward their future performance. Thus, similar to the antecedents of outward emotional reactions, advancing the understanding of the intra- and interpersonal consequences of outward emotional reactions can increase athletes' metacognitive knowledge on the role of emotions in sport and, therefore, lay the foundation for the development of performance enhancing emotion regulation strategies (MacIntyre et al., 2014).

Insights about situational and psychological antecedents as well as inter- and intrapersonal consequences of outward emotional reactions can help to better understand the role of emotions in competitive sports. From an applied perspective, helping athletes understand the antecedents and consequences of outward emotional reactions may be used to improve their metacognitive knowledge. This knowledge can eventually help athletes to make use of appropriate emotion regulation strategies (MacIntyre et al., 2014). Thus, the aim of this study was to explore the antecedents and consequences of table tennis players' outward emotional reactions during competitive matches.

Method

Participants and Sampling

Table tennis was chosen as the sport for this study since (a) the high number of points brings many opportunities of outward emotional reactions and (b) its limited surface area allows it to record all the actions of the participating player (Martinent & Ferrand, 2009). Following university ethical approval, the recruitment of table tennis players was guided by a purposeful sampling strategy. In order to ensure an advanced level of expertise and experience in table tennis, at least five years of experience in table tennis as well as the participation in competitive matches were two requirements. Several German table tennis clubs were contacted via e-mail. In this e-mail, the study was described as an attempt to better understand the role of emotions during sports performance. In case players asked questions about the purpose prior to the match they were told that the follow-up interview would focus on various psychological processes of the match, but they were not informed about the specific aim of the study (i.e., outward emotional reactions). This was done to avoid making the players conscious about their appearance during the match. The players were not rewarded for their participation but had the possibility to obtain the footage of the match (in agreement with the opposing player). Seven male and five female German table tennis players who competed at a regional level agreed to participate in the study. The players were between 22 and 51 years (M = 28.41 years, SD = 8.30) with an average competition experience of 18.3 (SD = 6.92).

Procedure

We employed a naturalistic qualitative video-assisted procedure (Martinent & Ferrand, 2009). To ensure the relevance of the match, all included matches were competitive matches of the ongoing season. Specifically, the matches took place in March close to the end of the season.

One match of each player was video- and audiotaped with the camera positioned diagonally to the corner of the table to continuously record the movements of the player, the umpire, and the scoreboard. The footage was then used to conduct self-confrontation interviews no later than 36 hours after the match (M = 15.21 hours, SD = 11.93). Because affective and cognitive processes are inherently associated with the situation in which they take place, in self-confrontation interviews players are first confronted with the footage of previous situations and then asked to comment on their emotions and thoughts during these situations (Sève et al., 2007). All interviews were conducted face-to-face (M = 51.88 minutes, SD = 16.10) by the first author who had had extensive training in qualitative research.

Thirty points were pre-selected for the interviews to avoid exhaustion of the players: ten from the first set, ten from the last set, and ten from the set with the closest result from the remaining sets, or the remaining set from three-set matches. From these sets, the first four and the last six points were included in the interview, as the beginning of a match as well as the closing phases are psychologically important moments within a match (Hill & Shaw, 2013). Prior to the interview, the researcher informed the players about the actual aim of the study. In particular, it was stated that the study would assess the role of outward emotional reactions, emphasizing that the focus was not on specific body channels but rather on the general integrated impression of all channels (i.e., facial expression, gestures, postures and verbalizations). While a positive or negative outward emotional reaction would indicate that something emotionally-positive (e.g., you won a point) or emotionally-negative (e.g., you lost a point) has happened, the absence of an outward emotional reaction would not allow such a conclusion (e.g., you cannot really tell from the reaction whether you lost or won the point). After seeing the actions on the video, the researcher asked the players to comment on their outward emotional reactions based on a semi-structured interview guide. The first question related to the memory of the point (i.e., "Do you remember the point?"). If the players were not confident about their memory, the researcher made sure that they could actually recall the point and encouraged them to skip the point in case they were not sure. Only when the players confirmed that they could remember the point, the researcher asked questions with the focus on the antecedents of outward emotional reactions (i.e., "Why did you (not) show an outward emotional reaction after the rally?"), and the consequences of outward emotional reactions (i.e., "What were the consequences of your outward emotional reaction?"). To ensure a "natural flow" of the interview, (a) the order of the

questions depended on the players' responses, and (b) the players were encouraged to address relevant personal issues that were not directly related to the research questions.

Data analysis

We took a reflexive thematic analysis approach acknowledging that the themes are actively generated by the researchers as a result from a reflexive engagement with the data (Braun & Clarke, 2019). Specifically, we conducted an inductive thematic analysis in a broader deductive framework with the two research questions as main themes: (1) What are the antecedents of outward emotional reactions? and (2) What are the consequences of outward emotional reactions? The analysis technique followed the recursive six-phase model proposed by Braun et al. (2016). After the verbatim transcription of the interviews, which yielded in 146 single-space typed pages, the first two authors read all the interviews several times to familiarize themselves with the data. In this process, notes were made for potential patterns relevant to the two research questions. Based on these notes, and while constantly re-reading the scripts, codes were systematically built that took into account the difference between positive and negative outward emotional reactions. For instance, the quote "I didn't show my anger to the outside, since the score is 9 − 9." was coded as an antecedent of negative outward emotional reactions. It is important to note that these codes were generated at a semantic level based on explicitly communicated experiences by the players (Braun et al., 2016). The examination of similarities and differences between the codes led to the constant rebuilding and collapse of existing codes. The next steps were to organize the codes into themes and subthemes, constantly revising and refining the structure that was developed. Finally, the constructed themes (e.g., Situational factors) and subthemes (e.g., Score configuration) were defined and named.

Trustworthiness

In employing a naturalistic qualitative video-assisted procedure, it is important to ensure that the results actually correspond to the players' affective and cognitive processes of the past competition (Sève et al., 2007). To this end, in this section we outline the steps taken in the research process so that readers can assess the trustworthiness of the findings themselves (Smith & McGannon, 2018). First, depending on the availability of the players the time between the competition and the self-confrontational interview was shortened as much as possible (range: 30 minutes to 36 hours). This is in line with previous research indicating that players can accurately recall their emotions during the competition up to two days later (e.g., Martinent & Ferrand,

2009). Second, the table tennis team agreed to conduct their own match discussions only after the interviews to avoid a potential impact on the answers of the players (Sève et al., 2007). Third, the warranty of anonymity was emphasized to counteract the potential endeavour of players to create a socially desirable image of themselves. In this regard, the researcher further emphasized that outward emotional reactions are an integral part of sport competitions, which also helped to strengthen rapport with the players. Fourth, three sample interviews were conducted with other table tennis players to test and adjust the interview guide and to sensitize the researcher to his preconceived ideas on the research questions. Fifth, there were frequent meetings throughout the analysis process with the second author of this study, who had also read and independently coded the transcripts. These meetings included a critical dialogue on the coding, the themes and subthemes developed, their organization, and their definitions. Finally, the ongoing discussions with the other two co-authors throughout the research process encouraged the two authors to reflect on alternative interpretations of the data and to improve the comprehensibility of the findings (Martinent & Ferrand, 2009).

Results

Antecedents of outward emotional reactions

In the first part of the results section, we outlined the identified antecedents why players show or, respectively, do not show positive or negative outward emotional reactions after winning or losing a point. In total, the analysis resulted in 6 main themes and 16 subthemes. As illustrated in Figure 1, we consider *trait-like factors* and *sport conduct* as distal factors, which can influence *situational factors* and *state-like psychological processes*. The transaction of these two themes influences the *experienced emotional intensity*, which we consider the most proximal factor of outward emotional reactions. Finally, we consider the theme *thoughts after the rally* rather as a correlate rather than an antecedent of outward emotional reactions.

Trait-like factors

The theme *trait-like factors* including two subthemes referring to antecedents that influence the probability of an outward emotional reaction in a consistent manner over time and situations.

Personality. The players emphasized the role of one's *personality* for both positive and negative outward emotional reactions, as reported by Player 4: "The personality is decisive. I

think that if my teammate did such a (i.e., good) stroke, he would cheer up on himself and express his joy to the outside. But like I said, I'm more of an introverted player."

Maturation. The players reported to rather show less positive as well as negative outward emotional reactions because of maturation, as illustrated by Player 4: "When I was younger, I also threw my racket quite often. But I learnt from these situations. It's okay to lose. That's what you learn. It's a learning process."

Sport conduct

The theme *sport conduct* touches unwritten socio-moral rules of the sport and their relationship to outward emotional reactions. The players stated they do not show positive outward emotional reactions when they win because the opponent hits the ball against the net, an own ball touches the edge of the table on the other side, or the opponent had made an obvious mistake. To illustrate, Player 2 reported: "You don't show positive emotions, when the opponent makes a service mistake. Calling 'cho' wouldn't be sportsmanlike."

Situational factors

The theme *situational factors* includes seven subthemes of antecedents that fluctuate over time and either are already existent before the match or emerge during the match.

Impact of the match outcome. The players said that both positive and negative outward emotional reactions are more likely when the impact of the match outcome is rated high. For instance, Player 2 reported: "If you (i.e., the researcher) had been here in the middle of the first half of the season, you would have seen much more emotions. Because something was at stake and you would then show it to the outside. In this match, the outcome didn't matter."

Attributes of opponent. The players said playing against an opponent who is perceived to be good or, respectively, an opponent who is perceived to be bad can both reduce or increase the probability of positive and negative outward emotional reactions. For instance, Player 3 reported: "You don't really see my joy out. When I play against such an (i.e., bad) opponent, all I have to do is winning."

Pre-match events. The players highlighted that stress at work or a poor physical pre-match condition can increase the probability of negative outward emotional reactions. Here, Player 10 reported: "Sometimes, when I have had a lot of stress, things are not going the way I want and I also have trained less than usual, then you can see me grumbling at the table."

Time point in the match. The players mentioned that positive and negative outward emotional reactions are more likely at the end of a set/match than at the beginning of a set/match. For instance, Player 8 explained why she showed her fist after winning a point: "Probably because I would have lost the match if I had not won that point. Probably you can see it again at 10 − 10, right?" However, the players reported also that they at times intentionally suppress negative outward emotional reactions late in the match, as illustrated by Player 3: "I didn't show my anger to the outside because the score is 9 − 9. The match is in the crucial phase and the score is very close."

Score configuration. The players reported to rather show positive and negative outward emotional reactions in times of close scores. For instance, Player 3 explained why he did not show a negative outward emotional reaction when he was two sets ahead: "I think if it had been 1 – 1, or if I had even been behind with 0 − 2 in the sets, then I would have expressed it to the outside when doing such a rookie mistake." However, the players also mentioned that they intentionally suppress negative outward emotional reactions when the score is close. In addition, the players mentioned that trailing by a high margin can both increase or decrease the tendency of negative outward emotional reactions.

Match history. The players reported that they are more likely to show a negative outward emotional reaction if they lose many points in a row or when they repeatedly make the same mistake. For instance, player 7 commented on his reaction to throwing the racket after losing a point: "Again (*with emphasis*) …the third time. […] It happened three times. I gave away a point three times. […] I can't control my reaction in such a situation. It's automatic." Conversely, after winning previous points the players reported a lower probability of showing a negative outward emotional reaction. In addition, the players said that losing many points beforehand or catching up many points can increase the likelihood of positive outward emotional reactions.

Behaviour of others. The players stated a higher probability of showing both either positive and negative outward emotional reactions when playing against an opponent who behaves unfairly, as illustrated by Player 4: "Usually I don't let myself be influenced too much by the emotion. Only, if someone abuses me. […]. Then I'd show my fist as well." The players further mentioned that they rather show both either positive and negative outward emotional

reactions when the spectators are engaged in the game and that they rather show negative outward emotional reactions when they are upset about the umpire's behaviour.

State-like psychological processes

The theme *state-like psychological processes* including four subthemes refers to mental states that influence the probability of outward emotional reactions.

Perception of pressure. The players reported that perceiving a high level of pressure increases the probability of both positive and negative outward emotional reactions. Here, Player 6 said: "When I play against people I know I have to win (*with emphasis*) and I'm playing shitty, it often happens that I'm really getting worked up into it."

Perception of commitment. The players highlighted that perceiving a high level of commitment can increase the probability of both positive and negative outward emotional reactions. For example, Player 1 explained why she often showed outward emotional reactions in that particular match: "I showed my fist again – my usual gesture yesterday. I was very motivated especially during that game. That's why I pushed a lot."

Perception of control. The players mentioned that perceiving a low level of control can increase the probability of both positive and negative outward emotional reactions, as illustrated by Player 6 after showing a negative outward emotional reaction: "I realize that things are not going well. Things, that I can usually, just don't work. Then I get really upset." Importantly, however, the players also pointed out that the certainty of winning can increase the probability of negative outward emotional reactions.

Outcome expectations during the rally. The players reported that both positive and negative outward emotional reactions are more likely when the outcome of the points deviates from the expectation developed during the rally. For instance, Player 1 explained why she showed a fist: "My first movement was not that great, but I somehow reached the ball. This was so successful that I shouted 'cho' and showed my fist."

Experienced emotional intensity

The players highlighted the central role of the *experienced emotional intensity* for both positive and negative outward emotional reactions. To elaborate, outward emotional reactions are more likely to occur when a player experiences a high level of emotional intensity and less likely when a player experiences a low level of emotional intensity. Player 12 explained why he did not show a positive outward emotional reaction after winning a point: "I experienced a bit of

joy, but it didn't reach the threshold – if you can call it that – that I'd express that joy. The feeling wasn't strong enough."

Thoughts after the rally

The theme *thoughts after the rally* including three subthemes refers to what the players have thought or have said to themselves right after the rally. Because it is difficult to discern a clear temporal order between the thoughts and outward emotional reactions, such thoughts can be regarded as correlates rather than as antecedents of outward emotional reactions.

Evaluation of performance. On the one hand, attributing a won point or a lost point to one's own performance is associated with an increased probability of positive or, respectively, negative outward emotional reactions. For instance, Player 1 outlined her thoughts after making a fist: "I had thoughts like 'This was good!'". On the other hand, attributing a lost point to the opponent's performance is associated with a decreased probability of negative outward emotional reactions. Finally, attributing a won point to luck or, respectively, a lost point to bad luck are related to both either a higher or a lower likelihood of showing positive and negative outward emotional reactions. For instance, Player 7 explained why he showed a negative outward emotional reaction: "He played the ball on the edge of the table and I'm thinking 'Why now??? Why couldn't he do it when the score was 1 − 1?'"

Prediction of outcome. Making positive predictions about the match outcome after winning a point was associated with an increased probability of showing positive outward emotional reactions, as illustrated by Player 1: "I had thoughts like 'Now you can win!' Thoughts like that." Conversely, making positive predictions about the match outcome after losing a point is associated with a decreased likelihood of showing negative outward emotional reactions.

Tactical thoughts. Tactical thoughts after winning a point and after losing a point are associated with a decreased likelihood of positive or, respectively, negative outward emotional reactions. For instance, Player 6 reported: "If I score a point, you almost never see me celebrate or anything like that. […]. I rather think 'That's how you can make a point against her.' Or similar thoughts."

Consequences of outward emotional reactions

In the second part of the results section, we outlined the identified consequences of showing positive or negative outward emotional reactions. In total, the analysis resulted in 3

main themes and 9 subthemes for the consequences of outward emotional reactions (see Figure 1).

Interpersonal consequences

The theme *interpersonal consequences* including three subthemes refers to the consequences that outward emotional reactions may have for the opponent.

Opponents' confidence. While the players associated positive outward emotional reactions with a decline, they associated negative outward emotional reactions with an increase in the opponent's confidence. Here, Player 6 described the effect when she sees a negative outward emotional reaction of an opponent: "When you notice the opponent slouching and complaining, it can be internally encouraging. Even if you don't perceive this consciously, but more things work out. Because you are just more confident."

Opponent's motivation. Contrary to the first subtheme, the players pointed out that positive outward emotional reactions can increase and negative outward emotional reactions can reduce the opponent's motivation. For instance, Player 11 explained why he did not show a positive outward emotional reaction in a given situation: "Sometimes I supress it (i.e., a positive outward emotional reaction) to avoid making the opponent even more motivated. […] Because if I start to push, he will do the same."

Tactical information. Finally, the players mentioned that both positive and negative outward emotional reactions can reveal tactical information, as illustrated by Player 12: "If I make a mistake and get upset about it, then he (i.e., the opponent) thinks 'Yes, keep playing that way. That's his weakness.'"

Intrapersonal consequences

The theme *intrapersonal consequences* including six subthemes pertains to consequences for the player who is showing the outward emotional reaction.

Confidence. The players reported that positive outward emotional reactions can increase one's own confidence, as illustrated by Player 5: "I psych myself up. It was a relief and a good point by me. This definitely increases my self-confidence in such a situation."

Negative feelings. The players stated that showing negative outward emotional reactions can increase their own negative feelings. For instance, Player 6 elaborated: "Sometimes I really work myself up into the rage and then I talk all the time. This happens quite often to me. I just talk too much then."

Motivation. Both positive and negative outward emotional reactions are associated with an increase in motivation, as illustrated by Player 7: "Then (i.e., when you show negative outward emotional reactions) you think you want to win by any means. […] It pushes you. I'm not sure, but I might even sometimes look for a fight."

Concentration. The players mentioned that both positive and negative outward emotional reactions are associated with a reduced concentration. Here, Player 1 outlined the consequences of a positive outward emotional reaction: "I don't calm down again, as I push more and more. Then I start to lose control."

Relief of pressure. The players reported that both positive and negative outward emotional reactions can relieve pressure. For instance, Player 7 reported: "At some point you have to (*with emphasis)* let it out. If you suppress it (i.e., one's anger) all the time, you become tense and think 'ahh damn'. At some point you just have to (*with emphasis*) let it out and then it is gone for a while."

Physical fatigue. Finally, the players associated both negative and positive outward emotional reactions with an increase in physical fatigue, as illustrated by Player 8: "If I did anything to the outside, I would just lose energy. It wouldn't help me at all."

Non-performance consequences

The final theme *non-performance consequences* shows that outward emotional reactions not only have performance-relevant consequences, but also relate to the social environment of sports competition. The players reported that positive and negative outward emotional reactions can contribute to a bad match atmosphere or can lead to a negative social presentation. For instance, Player 7 commented on hitting the table with his hand: "On the outside, of course, this is not the perfect sportsman behaviour."

Discussion

The shown emotions are one of the reasons that make sport competitions so fascinating. Although emotions lure sometimes several thousand people into the arena, they also highlight the emotional struggles players face during a sports competition. Based on a naturalistic qualitative video-assisted procedure (Martinent & Ferrand, 2009), we identified various clusters of antecedents and consequences of outward emotional reactions.

Antecedents of outward emotional reactions

The results of our study highlight that whether or not an outward emotional reaction is shown after winning or losing a point depends on a large number of antecedents. According to our analysis, such antecedents can be broken down into the trait-like factors (e.g., personality), sport conduct, situational factors (e.g., impact of the match outcome), state-like psychological processes (e.g., perception of pressure), experienced emotional intensity, and thoughts after the rally (e.g., evaluation of performance).

In agreement with emotion appraisal theories assuming that emotions are the result of a person-environment transaction (e.g., Lazarus, 1999; Scherer, 2009), our findings revealed various situational factors associated with an increased likelihood of outward emotional reactions. Consistent with previous studies in tennis and table tennis, which focused on the emotion experience (Lewis et al., 2017; Sève et al., 2007), situational factors are often directly related to events in the ongoing match. These factors are related to the scoring system (i.e., score configuration, time point in the match, match history; e.g., Lewis et al., 2017), or also to the general impact of the match outcome. The relevance of the general impact of the match outcome is supported by a study in handball, which shows that players were more likely to show positive outward emotional reactions in play-off-match than in leagues matches (Moesch et al., 2015). The role of social interactions as an important part of individuals' appraisal processes in sports competitions (Tamminen et al., 2016) is highlighted by the players' reports that behaviours and attributes of the opponent or the umpire are factors that influence outward emotional reactions. In addition, the players' reports that stress at work or a poor physical condition can influence the extent of outward emotional reactions during a match, point to the importance of situational factors that are not directly related to the competition (Hanton et al., 2005). It is further important to stress that situational factors are often simultaneously effective and can either reinforce or counteract each other (Neil et al., 2011). For instance, when in a very important match a player is playing against a good opponent and loses a point at the end of a set, a negative outward emotional reaction will be very likely. However, if the player leads by two sets in the match under the same circumstances the occurrence of a negative outward emotional reaction becomes less likely.

The finding that some of the situational factors (e.g., attributes of the opponent; score configuration) can either increase or decrease the probability of an outward emotional reaction underlines the importance of the associated psychological processes in the emotion process

(Lazarus, 1999; Scherer, 2009). For example, if a player is playing against an opponent who is known to play at a lower level, the player can either have a high level of control because she or he has favourable expectancies to win, or a high level of pressure because everyone expects the player to win. In other words, it is not the situation itself that elicits emotions, but rather the way the situation is psychologically appraised (Lazarus, 1999). Because individuals differ in their dispositions for certain appraisal processes (Scherer, 2009), this may explain the stated trait-like factors influencing outward emotional reactions. Concerning the state-like psychological processes, the perception of control, reported as a relevant antecedent for outward emotional reactions, shows how perception of one's own resources is a central part in the appraisal process (Lazarus, 1999). Since perceptions of control during a sports competition are often related to increased confidence (Lewis et al., 2017), players might react less emotionally in such situations. In the same vein, other studies have shown that a lack of control is often associated with the experience of high intensity emotions and stress (Thatcher & Day, 2008; Uphill & Jones, 2007). In accordance with the assumption that a situation appraised as demanding increases the emotionality of a situation (Lazarus, 1999), the players reported that the perception of pressure is associated with an increased likelihood of outward emotional reactions. Because personally relevant goals are usually at stake in sports, feelings of pressure are common to observe (Lewis et al., 2017). However, players sometimes use disengagement strategies when things are not going well, which helps them to downplay the importance of the situation (Gaudreau et al., 2005). These strategies can explain why the level of commitment is an antecedent of outward emotional reactions. Finally, future expectations are also stated to be integrated in the appraisal process, whereby the emotionality of a situation can be increased when the situation develops differently than expected (Uphill & Jones, 2007).

In addition, it is important to distinguish between emotion generation and emotion regulation processes when you try to explain the occurrence of an outward emotion reaction (Koole, 2009). In terms of emotion generation processes, most identified antecedents seem to influence the player's overall level of arousal (Schimmack & Diener, 1997), which in turn can either increase or decrease the probability of an outward emotional reaction. This overall level of arousal can be influenced by antecedents since the beginning of the match (e.g., importance of the match outcome; personality) or by antecedents that emerge during the match (e.g., match history, score configuration). At the same time, the players reported that in certain situations they

consciously modify outward emotional reactions, indicating the role of deliberate emotion regulation processes in sports competitions (Lane et al., 2012). Here, our results support the potential of goal-directed self-talk that can either directly (e.g,, 'Calm down') or indirectly (e.g., 'Focus on the next point') support emotion regulation (Latinjak et al., 2014). Finally, the experienced emotional intensity can be the result of both emotion generation and emotion regulation processes and the decisive factor whether an outward emotional reaction is shown or not. The higher the experienced emotional intensity, the higher the probability that an outward emotional reaction is shown.

Consequences of outward emotional reactions

The results revealed various consequences of outward emotional reactions that interact with the consequences of the subjective emotion experience. With regard to their effects on sports performance, the consequences of outward emotional reactions can be divided into interpersonal (e.g., opponent's confidence) and intrapersonal (e.g., one's own concentration) as well as facilitative (e.g., increase of own confidence) and debilitative (e.g., increase of opponent's motivation) consequences. The finding that both positive and negative outward emotional reactions, similar to the subjective emotion experiences (Hanin, 2007), can have facilitative and debilitative effects on sports performance, is consistent with observational studies that have found no clear link between the valence of outward emotional reactions and sports performance (e.g., Moesch et al., 2018; Van Raalte et al., 2000).

In relation to intrapersonal consequences of outward emotional reactions, in line with findings for the subjective emotion experiences (Martinent & Ferrand, 2009; Vast et al., 2010; Woodman et al., 2009), it was reported that they influence performance-relevant psychological constructs such as concentration, motivation, or confidence. In light of the reciprocal relationship between the behavioural component of emotions and subjective emotion experiences (Price et al., 2012), one can speculate that showing emotions to the outside can cultivate the consequences of the subjective emotion experiences through an internal feedback loop (Moesch et al., 2015). This reciprocal relationship between one's observable behaviour and the internal psychological processes is interesting from an applied point of view, as it underlines the importance of body language for self-regulation. Another interesting point is the reported association of outward emotional reactions and the relief of pressure. Although the evidence questions the existence of such a "catharsis effect" (Bushman, 2002), the results of our study suggest that it may be

beneficial to show outward emotional reactions when the emotional intensity experienced during the match has reached a high level of intensity.

The fact that emotions can be perceived by onlookers highlights the importance of investigating the interpersonal consequences of emotions (Tamminen & Bennett, 2017). Since the players in sports competitions constantly try to influence their opponent psychologically, outward emotional reactions can be regarded as an integral part of this "psychological battle" (Sève et al., 2007). Our findings are in line with previous studies (Furley et al., 2015; Sève et al., 2007) which suggest that one's own positive outward emotional reactions impair and own negative outward emotional reactions increase the confidence of the opponent. However, our results also highlight possible opposite effects of outward emotional reactions (e.g., a positive outward emotional can increase the opponent's motivation), which underlines the importance of considering contextual factors in relation to the direction of an outward emotional reaction

Lastly, when considering the antecedents and the consequences of outward emotional reactions it is important to consider sport in its social context. Most sports have "unwritten rules" that discredit outward emotional reactions in certain situations (e.g., when you win a point because the ball had touched the edge of the table in table tennis). In addition, it is interesting to note that there is evidence that inexpressive winners are generally perceived more positively (Kalokerinos et al., 2014).

Applied implications

Metacognitive knowledge about antecedents and consequences of outward emotional reactions can help players to self-regulate more effectively according to the task demands (MacIntyre et al., 2014). One technique suggested to increase players' metacognitive knowledge of psychological processes related to sports performance are reflexive self-talk interventions (Latinjak et al., 2019). In reflexive self-talk interventions, players should identify their typical thoughts in psychologically challenging situations during sports competitions. These thoughts could reveal situational factors and psychological processes associated with outward emotional reactions. This knowledge is useful to tailor the application of psychological skills (e.g., self-talk, imagery, relaxation) to the emotional demands of the situation (Lane et al., 2012). Furthermore, changing dysfunctional attribution styles (Parker et al., 2018), or irrational performance beliefs (Turner & Barker, 2014) can be used to deal with the state-like psychological processes associated with dysfunctional outward emotional reactions. Since players often deliberately use

outward emotional reactions to gain an advantage in competition (Sève et al., 2007), knowledge of the inter- and intrapersonal consequences can also serve to adapt outward emotional reactions in accordance with the demands of the situation. In situations where a player loses consecutively points and therefore feels little confidence, it can be helpful to show positive emotions after winning a point in order to get back in the match. With regard to interpersonal consequences, although positive outward emotional reactions may be used to intimidate the opponent (Furley et al., 2015), our results suggest that, depending on the situation, at times they may also have detrimental effects such as an increase of the motivation's opponent.

Considerations and future directions of research

Several aspects of this study require consideration in the interpretation of the results. First, although the video-assisted procedure helped players remember past affective and cognitive processes, we cannot rule out memory biases. The knowledge of the match outcome and the emotional state during the interview are potential confounding factors (Levine & Safer, 2002). Here, future studies using concurrent methods such as thinking aloud procedures (Samson et al., 2017) or descriptive experience sampling (Dickens et al., 2018) may help to counter the limitations of retrospective methods. Second, all identified antecedents and consequences of outward emotional reactions are based exclusively on the perceptions of the players. Especially with regard to the reported interpersonal consequences, it is important to note that individuals tend to overestimate how well their emotional state can be read by other people (Gilovich et al., 1998). Third, although the findings appear to highly relevant for sports with similar characteristics such as tennis, squash, or badminton, the behavioural component of emotions seems to be less relevant for other sports such as climbing, swimming, or cycling. Fourth, it should be emphasized that the extent to which an outward emotional reaction is genuinely related to the player's emotion experience is a critical point. Players may intentionally use outward emotional reactions to gain an advantage in the sport competition (Sève et al., 2007). While the identified antecedents in this study appear to primarily influence the occurrence of automatic outward emotional reactions, future research may focus on the situations when players intentionally use outward emotional reactions. Finally, considering that players at higher levels usually have better self-regulation strategies (Cleary & Zimmerman, 2001), the findings should be generalized to other levels of competition with caution.

Research into the behavioural component of emotions opens up several interesting directions of future research. The biggest advantage is probably that it allows studying naturally occurring emotions during real sports competitions. Using observational study designs, future research could shed more light on the effects of the individual antecedents of outward emotional reactions as well as potential personal (e.g., mental state before the match) and situational (e.g., level of the opponent) moderators that explain the relationship between outward emotional reactions and sports performance (Moesch et al., 2018). In addition, it seems intriguing from both a theoretical and an applied perspective to explore the relationship between the behavioural component of emotions and the subjective emotion experiences. An interesting question is whether the emotions that are visible from the outside have a different impact on sports performance than those that remain inside the player. Finally, interpersonal consequences of outward emotional reactions differ in their direction depending on the relationship between the person showing the outward emotional reaction and the onlooker (Furley et al., 2015). Since in this study we focused on the impact on the opponent, an explicit focus on the consequences of outward emotional reactions on members of one's own team is warranted.

Conclusions

This study investigated the antecedents and consequences of outward emotional reactions during competitive table tennis matches using a naturalistic qualitative video-assisted procedure (Martinent & Ferrand, 2009). From a metacognitive perspective (MacIntyre et al., 2014), knowing the wide range of antecedents of outward emotional reactions can help athletes to use psychological strategies to influence the emotion generation as well as the emotion regulation processes. In addition, the fact that both positive and negative outward emotional reactions can have facilitative and debilitative effects underlines the importance of taking the contextual conditions into account when assessing their impact on sports performance. Overall, these preliminary findings encourage the explicit consideration of the behavioural component of emotions that may help to gain a better understanding of the relationship between emotions and sports performance.

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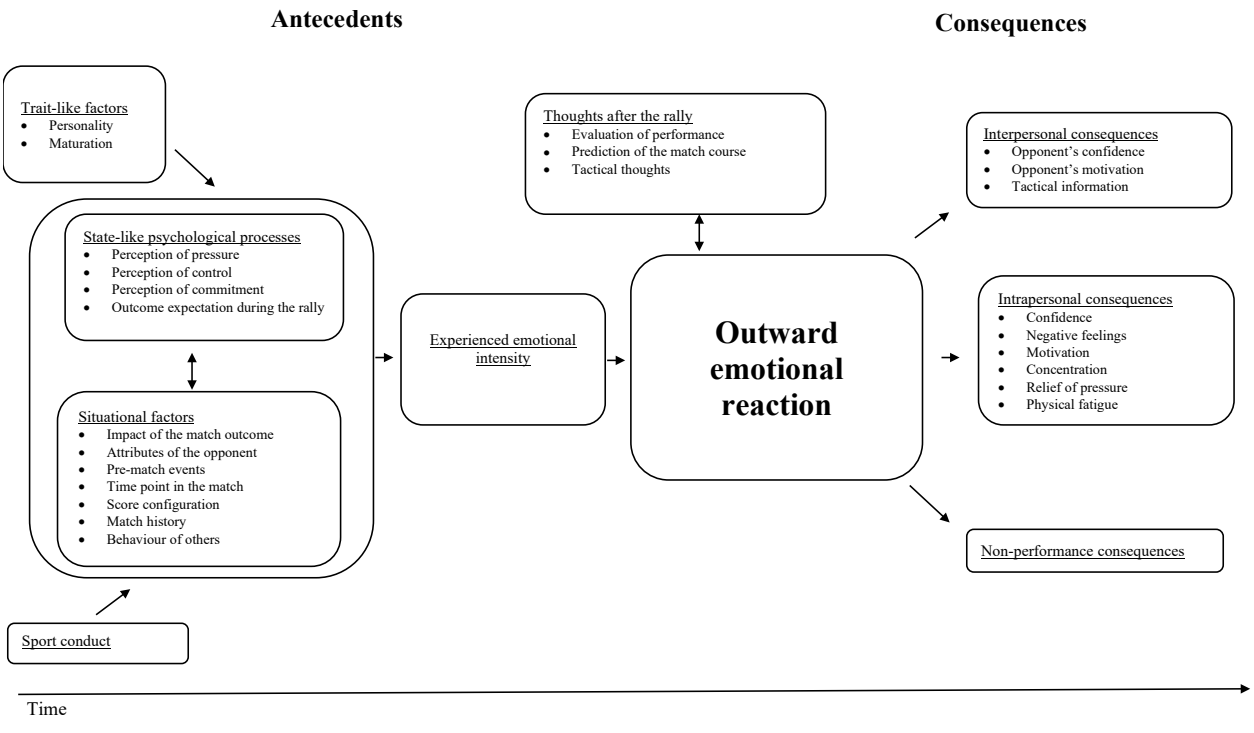

Figure 1. Temporal representation of the antecedents and consequences of outward emotional reactions.

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