

Patterns of collective organization associated with positive and negative momentum experiences in football: An expert coach description-based analysis

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ABSTRACT

Purpose: Momentum experiences in sport competition are known to be associated with performance-related behavioural changes. In addition to effort exertion, interpersonal synchronization in small team sports has been identified as a behavioural correlate of momentum experiences. However, there is a lack of research on collective organization related to momentum in larger team sports. The present study aimed to identify and compare patterns of collective organization in football according to positive and negative momentum experiences in the form of gradual and significant score variations. **Method(s):** We analysed expert coaches' video-based descriptions of the collective organization of high level football teams that experienced positive and negative momentum phases during international matches. **Results:** The main results show that positive momentum phases were associated with forward-located and compact team block, as well as with players' runs more often directed towards the opposing goal. Negative momentum phases were associated with backward-located and stretched team block, as well as with frequent backward runs and block-disconnected individual actions. **Conclusion(s):** These initial findings regarding the relationships between momentum experiences and collective organization in team sports pave the way for the training of skills for early detection of momentum phases and skills for reacting appropriately to their onset.

Keywords: Performance analysis, Allo-confrontation, Frequency analyses, Qualitative analyses, Soccer, Team sports.

Cite this article as:

Gautier, H., Cavailles, O., & Gernigon, C. (2024). Patterns of collective organization associated with positive and negative momentum experiences in football: An expert coach description-based analysis. *Journal of Human Sport and Exercise*, 19(2), 667-678. <https://doi.org/10.55860/mtfbn157>

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Submitted for publication January 04, 2024.

Accepted for publication January 26, 2024.

Published April 01, 2024 (*in press* March 04, 2024).

JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202.

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doi: <https://doi.org/10.55860/mtfbn157>

INTRODUCTION

Since Adler's (1981) adaptation of the physical concept of momentum to human behaviours in terms of a “dynamic state of intensity marked by an increase or decrease in speed of movement, grace and success” (p. 29), this topic has received increasing attention from sport scientists. Research has mainly focused on the identification of the antecedents, processes, and consequences of the phenomenon of momentum (e.g., Briki et al., 2013; Den Hartigh et al., 2014; Gernigon et al., 2010; Markman & Guenther, 2007; Perreault et al., 1998; Taylor & Demick, 1994). Thus, it has been shown that, in a context of achievement, the precipitation of events or series of events (Taylor & Demick, 1994) can influence the perception of an individual to approach or move away from the goal to be achieved (Gernigon et al., 2010; Markman & Guenther, 2007; Vallerand et al., 1988). Such a perception then leads to positive or negative changes in the perceptual (Den Hartigh et al., 2018), cognitive, affective, motivational, physiological and behavioural spheres (e.g., Briki et al., 2013; Den Hartigh et al., 2014; Den Hartigh et al., 2016; Gernigon et al., 2010; Taylor & Demick, 1994; Vallerand et al., 1988). These changes which, according to Adler (1981), can be gradual (placid momentum) or brutal (explosive momentum) are likely to influence performance (Briki et al., 2013; Den Hartigh et al., 2014; Den Hartigh et al., 2016; Perreault et al., 1998; Taylor & Demick, 1994; Vallerand et al., 1988). As a result of these characteristics, the momentum experience can be considered to be a complex and highly dynamic phenomenon (Gernigon et al., 2010).

Among the precipitation of events identified as momentum triggers in sport, one of the most often cited by athletes or coaches is how rapidly or decisively the score evolves—in point- or goal-counting sports—or more generally the increase or decrease of distance from victory (Briki et al., 2012; Jones & Harwood, 2008; Taylor & Demick, 1994). Such is the case in team sports, where qualitative (Jones & Harwood, 2008) or experimental (Den Hartigh et al., 2020) research has identified scoring as a major determinant of the development of psychological momentum. Especially, dramatic changes in the score, which are sometimes observed in football, are often associated with the most beneficial consequences for the team that is catching up from behind and the most catastrophic for the team that is losing the lead (see for example https://en.wikipedia.org/wiki/Last-minute_goal).

The behavioural consequences of the momentum experience that have been examined mainly concern energy expenditure in the form of exerted effort (Briki et al., 2013; Den Hartigh et al., 2014; Den Hartigh et al., 2016; Perreault et al., 1998). Vallerand and his colleagues (Perreault et al., 1998; Vallerand et al., 1988) also refer to synchronism as a perceived behavioural characteristic of momentum. Unfortunately, these authors do not define what they mean by synchronism nor do they specify whether the notion of synchronism can also be applied at the inter-individual level, as in team sports. In addition, there is a lack of research focusing on the role of momentum experiences in synchronization, especially at the inter-individual level corresponding to the collective organization of sport teams.

Some studies have shown qualitative evidence of deterioration of intra-team interactions and a collective collapse associated with experiences of momentum caused by unfavourable score changes (Apitzsch, 2009; Wergin et al., 2018). Positive momentum experiences, on the other hand, have been rated by team sport players as conducive to team cohesion (Redwood-Brown et al., 2018). The only study (Den Hartigh et al., 2014) that has examined the effects of momentum experiences on interpersonal synchronization in sport focused on rowing dyads experimentally placed in competition—on ergometers—against virtual opponent dyads. Race scenarios, displayed on a video screen, were manipulated to have participants believe that they were catching up with and then overtaking their opponent (positive momentum) or that they were being caught up with and then overtaken by their opponent (negative momentum). The positive momentum

condition was associated with an increase in rowers' perceived cohesion, while the negative momentum condition was associated with a decrease in perceived cohesion. This decrease was more pronounced than was the increase observed for the positive momentum condition. Behaviourally, the level of synchronization between dyad partners was found to be lower and less stable in the negative momentum condition than in the positive momentum condition. In addition, synchronization stability tended to degrade during the negative momentum experience, whereas it tended to improve during the positive momentum experience. While these results shed some light on the effects of momentum experiences induced by reversals of competitive advantage on interpersonal synchronization, their limitation to teams of dyads invites examination of their possible extension to collective organization of team sports teams formed of more than two partners.

While the quality of intra-team interactions (Apitzsch, 2009; Redwood-Brown et al., 2018; Wergin et al., 2018) or interpersonal synchronization (Den Hartigh et al., 2014) have been found to be related to performance-dependent experiences of momentum, how patterns of collective organization are associated with such experiences in team sports remains to be identified. Therefore, the purpose of the present study was to identify and then compare patterns of collective organization in football according to positive and negative momentum experiences considered in terms of gradual and significant score variations. To this end, expert coaches' video-based descriptions of the collective organization of teams experiencing positive and negative momentum phases during international matches have been qualitatively and quantitatively analysed.

MATERIALS AND METHODS

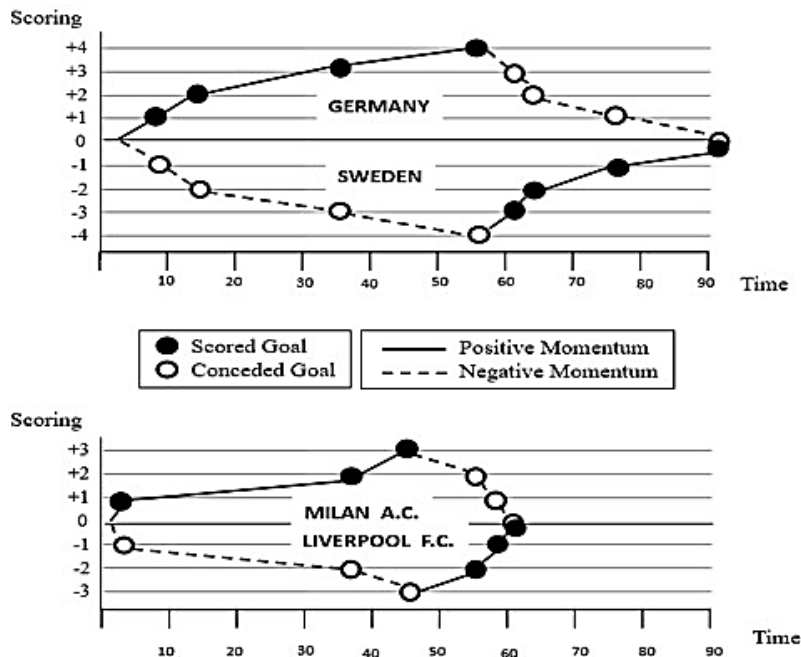
Participants

By means of individual allo-confrontation interviews (Mollo & Falzon, 2004), four expert football coaches were asked to watch videos of two international football matches and describe the collective organization of the teams involved (one expert per team) while these teams were experiencing positive and negative momentum phases, as defined by significant upward and downward score changes, respectively. According to Mollo and Falzon (2004), allo-confrontation interviews consists of confronting experts in an activity with traces (e.g., video) of that activity performed by others, in their absence. The data provided by the experts were processed according to the three steps recommended by Poizat et al. (2012) for third-person data analysis. First, a video-based field study was carried out to describe in detail the activity's features under study, namely, for the present study, collective organization patterns. Second, the players' behaviours were transcribed in terms of interactional organization of their activities. Third, the observed patterns were grouped into broader categories using an inductive method (e.g., Patton, 1980). In addition to this qualitative analysis, the observed patterns were finally quantified for comparison between momentum types.

Measures

Two high-stake international football matches, each presenting a sequence of two phases of momentum with opposite valences (positive-negative or negative-positive), served as support for the study. Although the agreement of the actors whose activity is studied by allo-confrontation is usually required (Mollo & Falzon, 2004), this was not the case for the present study, since the videos of the matches viewed are public, widely broadcasted, and open to examination by many people (e.g., opponents, scouts, recruiters, instructors, journalists). One match was a qualification match for the 2014 World Cup between Germany and Sweden on October 16, 2012. The final score of this match was 4-4 after Germany had led 4-0. The other match was the final of the Champions League of the Union of European Football Associations (UEFA), A.C., Milan vs. Liverpool F.C. on May 25, 2005. Liverpool won the match in a penalty shootout after trailing 0-3 and then making a comeback to 3-3. These two matches were chosen because in each of them, (a) a team gained an advantage and then saw that advantage grow rapidly (+2, +3, and/or +4) before being caught up and

overtaken, and (b) the other team's comeback and equalizer took place well before the end of the match. This choice of a comeback far from the end of the match was made to avoid introducing a second type of momentum specific to the end-of-match context (Den Hartigh et al., 2020). A positive or negative momentum phase corresponded to a series of consecutive goals scored or conceded, respectively (see Figure 1).



Note. Scores are represented in terms of the score difference between two teams.

Figure 1. Phases of positive momentum and negative momentum according to score changes during the Germany vs. Sweden match (top) and A.C. Milan vs. Liverpool F.C. (bottom).

Procedures

Allo-confrontation interviews were conducted with expert football coaches who voluntarily participated in the study and gave their consent for their statements to be recorded and transcribed. They were four French male (ages: 40, 49, 59, and 63) who were chosen for their experience in football coaching. They were UEFA Pro or UEFA A diploma holders, professional or national team coaches, federation technical staff or coaches of teams at the highest regional level. In addition to their high level and highly reputed diplomas, their long experience (between 15 and 35 years) of football coaching at the national level constituted a tangible criterion for identifying them as expert coaches (Côté & Salmela, 1993).

The interviews were conducted by the first author of this article in a semi-structured format, while the expert coaches were watching the video footage of the matches. The periods concerned by the interviews began 5 min before the change in the score marking the start of a momentum phase, so that the expert being interviewed could identify the general pre-momentum organization of the team. The interviews lasted 60 to 100 minutes and were recorded using a Dictaphone. Each interview began with a reminder of the research objectives and the method used during the interview. For a given momentum period, each expert coach was asked to freely comment on the organizational aspects of one of the two teams in the match being viewed. He was free to choose events that he felt were indicative of the collective organization of the team being examined. At all times, he had control over the video's progress (i.e., freeze frame, slow motion, rewind) to support his commentary. The researcher only intervened to ask the expert to clarify certain points or to

refocus on observable facts, avoiding any interpretations or judgment. For example, when an expert declared “*Maybe Milan aren't made to defend like that*”, he was then asked, “*What do you mean, based on what you are seeing?*”, which prompted the following clarification: “*Being very low*”. As another example, when an expert said, “as soon as they lose the ball they are a little less passive”, the researcher asked, “*How can you say they're less passive?*”, which prompted the following answer “*I already think about the fact of having raised their block by 20 m*”.

Analysis

Each expert coach's verbalizations were transcribed in their entirety. Inductive coding and categorization procedures were first carried out by the first two authors of this article. They themselves have extensive experience in the analysis of competitive football. The first author has a 10-year experience as a player at the French national level and performed as a professional player outside France for two years. He holds the UEFA A diploma and is a football teacher at the Faculty of Sports Sciences of the University of Montpellier. The second author is also a football teacher at the same faculty, and also holds the UEFA A diploma. He was a staff member of African national selections for international competitions for 4 years.

These two researchers independently coded and categorized the verbatim data from the positive and negative momentum phases of all teams. First, they coded data in terms of meaningful units of collective organization. A unit of meaning is the smallest unit of action that makes sense for an interviewee, according to the continuous flow of the activity he describes (Theureau, 1992). These meaningful units of collective organization were grouped into categories, which could in turn be grouped into higher-level categories, and so forth (e.g., Gernigon et al., 2004). Several precautions were taken to ensure the trustworthiness of the analyses. First, the two researchers in charge of the analyses reviewed the interview transcripts for any questions that might have been too general or that might have influenced interviewees' comments. This verification thus led to the deletion of 5 unreliable action units. Second, these researchers coded the data independently, then compared and discussed the codes until consensus labels were adopted. This operation led to modifying 54 labels. Only what was verifiable and observable in support of the video was kept.

The identified units of meaning were quantified according to their different levels of description and then subjected to chi-square tests (χ^2) to test for possible significant differences in the distributions of their frequencies according to the type (positive vs. negative) of momentum.

RESULTS

The two researchers in charge of coding and classifying the data agreed on 515 units of meaning concerning teams' collective organization during the selected momentum phases. These units of meaning, associated either with experiences of positive momentum or with experiences of negative momentum, were grouped into 14 first-order categories called themes, which could in turn be grouped into 6 second-order categories called dimensions, which could then be classified according to 3 third-order categories ranging from the macroscopic to the microscopic levels of collective organization (see Table 1).

Macroscopic organization

The macroscopic level includes descriptions of the collective organization concerning all the outfield players on a team. A number of descriptions concerned the team block, which is defined, according to the Senior Trainee Booklet (French Football Federation, 2015), as being made up of “*all the lines of the same team (3 lines: defence, midfield, attack) engaged in an offensive action (offensive block) or defensive action (defensive block)*”. Thus, the block reflects the arrangement of all the players on the playing space along the

longitudinal axis of the playing field (i.e., the defended goal/ attacked goal axis). More specifically, a forward block corresponds to the players' location in the opposing camp and a backward block corresponds to the players' location close to their own goal. A total of 67 units of meaning concerned the longitudinal position of the team block. This position was found to vary according to the period of the type of momentum ($\chi^2_{(1)} = 37.3$; $p < .001$). The forward block (e.g., "So, the Swedish block is having fun; it is moving more forward.") was found more frequently in the positive momentum phase ($n = 21$) than in the negative momentum phase ($n = 5$). Conversely, the backward block (e.g., "Their block is visibly much backward and much less aggressive than it was earlier on the ball carrier") appeared more often in negative momentum phases ($n = 38$) than in positive momentum phases ($n = 2$).

Table 1. Patterns of collective organization identified and categorized according to football teams' positive and negative momentum experiences.

Levels of Collective Organization	Positive Momentum	Negative Momentum
<i>Dimensions</i>		
Themes	(n)	(n)
Macroscopic Level		
<i>Longitudinal position of the team block</i>	26	41
Forward Block	21	3
Backward Block	5	38
Mesoscopic Level		
<i>Team Block Compactness</i>	23	46
Compact Block	23	6
Stretched Block	0	40
<i>Team Block Connectivity</i>	12	88
Connected Actions	9	1
Disconnected Actions	3	87
Microscopic Level		
<i>Ball Carrier – Nearest Opponent Distance</i>	23	69
Ball Carrier Close to Direct Opponent	23	0
Ball Carrier Far from Direct Opponent	0	69
<i>Without-ball Offensive Runs</i>	38	30
Toward Attacked Goal	37	4
Non-goal-oriented Runs	0	25
Toward Defended Goal	1	1
<i>Without-ball Defensive Runs</i>	59	60
Toward Attacked Goal	56	5
Non-goal-oriented Runs	0	33
Toward Defended Goal	3	22

Mesoscopic organization

The mesoscopic level includes descriptions of collective organization concerning actions between lines of players. Some mesoscopic descriptions referred to the compactness of the team block, namely, the distance between the lines of players (defenders, midfielders, and attackers) on the longitudinal axis of the pitch. A compact block corresponds to short distances between the lines of the team block, whereas a stretched block corresponds to long distances between these lines. A total of 69 units of meaning relating to team block compactness were recorded. Their distribution reveals that they significantly depend on the type of momentum ($\chi^2_{(1)} = 47.57$; $p < .001$). The team block was found to be more often compact (e.g., "There pam!

it has just tightened, it has just tightened, here, there yes, again! And the ball is recovered of course.”) during phases of positive momentum ($n = 23$) than during phases of negative momentum ($n = 6$). Conversely, the team block was often stretched (e.g., “*The reds are far away; we can't see them; they're in their half-court; the team is cut in half, look, great! See?*”) during phases of negative momentum ($n = 40$), but never during phases of positive momentum ($n = 0$).

Other mesoscopic descriptions referred to connectivity, which is the coherence of individual actions with the ongoing collective organization of one's team. A total of 100 units of meaning relating to connectivity to the team block were identified. Connectivity showed significant differences depending on the type of momentum ($\chi^2_{(1)} = 64.02$; $p < .001$). Connected actions (e.g., “*Yeah, there're four of them in the (German) box, they're there anyway. There pam! there.*”) were found more frequently during positive momentum phases ($n = 9$) than during negative momentum phases ($n = 1$). Conversely, disconnected actions (e.g., “*Look, how can we walk like this, they're in the 14th minute, you've got guys walking; look!*”) were much more frequent during negative momentum phases ($n = 87$) than during positive momentum phases ($n = 3$).

Microscopic organization

The microscopic level includes descriptions of players' individual actions in relation to the group. First, the experts' attention was aroused by several notable cases of distance between the ball carrier and the first defender to come up on him. A total of 92 units of meaning relating to this distance were counted, the distribution of which varied greatly depending on the type of momentum ($\chi^2_{(1)} = 92.00$; $p < .001$). Typical cases of short ball carrier – nearest opponent distances (e.g., “*we have completely reversed the trend, we have Swedes who are close.*”) were observed during the defending team's phases of positive momentum ($n = 23$), but not during its phases of negative momentum ($n = 0$). Conversely, instances of long distances (e.g., “*He's there; he's not going to get any closer and... the Swedish defender is far from the German ball carrier.*”) were frequent during the defending team's phases of negative momentum ($n = 69$) but absent from its phases of positive momentum ($n = 0$).

The experts' attention was also drawn by the direction of certain runs without the ball made towards one's own goal, towards the opponent's goal, or not directed towards one of the two goals (i.e., non-goal-oriented runs) during either the offensive phases (i.e., when the team is in possession of the ball) or defensive phases (i.e., when the team is not in possession of the ball) of the game.

For offensive phases, 68 meaning units relating to typical runs without the ball were identified, with a significant difference in frequency depending on the type of momentum ($\chi^2_{(2)} = 51.33$; $p < .001$). Offensive runs without the ball in the direction of the goal to attack (e.g., “*They're already in the forward movement and therefore automatically they create, as we can see, that they have created a greater possibility of forward play.*”) were found to be more frequent in positive momentum phases ($n = 37$) than in negative momentum phases ($n = 4$). Non-goal-oriented offensive runs without the ball (e.g., “*First action where I tell you there is no one moving; there is no projection.*”) were observed in negative momentum phases ($n = 25$), but not in positive momentum phases ($n = 0$). Finally, offensive runs without the ball in the direction of one's own goal (e.g., “*It's difficult to advance, eh. There they are forced to retreat.*”) were extremely rare, in both positive ($n = 1$) and negative ($n = 1$) momentum phases.

For defensive phases, 119 meaning units relating to runs without the ball were recorded, with different frequencies depending on the type of momentum ($\chi^2_{(2)} = 90.08$; $p < .001$). Defensive runs without the ball in the direction of the opposing goal (e.g., “*You have the guys who are there to defend like demons and there behind there are some moves; look at the impact; he was over there; then he finds himself there [a much*

more advanced place].”) were found to be more frequent in positive momentum phases ($n = 56$) than in negative momentum phases ($n = 5$). Non-goal-oriented defensive runs without the ball (e.g., *“on the block, they are quite passive”*) were observed in negative momentum phases ($n = 33$), but not in positive momentum phases ($n = 0$). Finally, defensive runs without the ball in the direction of one's own goal (e.g., *“There is no harassment from the carrier so it is a defensive withdrawal.”*) were found to be more frequent in phases of negative momentum ($n = 22$) than in phases of positive momentum ($n = 3$).

DISCUSSION

The aim of this study was to qualitatively identify, and quantify for comparative purposes, patterns of collective organization in football according to momentum experiences, defined here by gradual and significant variations in score. To this end, interviews were carried out with expert football coaches who were shown videos of positive momentum and negative momentum sequences from high-stakes international matches. Based on an inductive approach, the qualitative data collected for the phases of positive and negative momentum were classified into themes, themselves grouped into dimensions ranging from the macroscopic to the microscopic level of description of the teams' collective organization.

At the macroscopic level, the team block appeared to be more frequently located towards the front of the field and less frequently towards the rear of the field in phases of positive momentum than in phases of negative momentum. These forward or backward positions of the team block had been identified by Gréhaigne et al. (1997) as manifestations of offensive and defensive intentions, respectively. It should be noted that offensive intentions, in the form of performance-approach goals (i.e., beating the other) have already been found to be associated with positive momentum (Briki et al., 2012; Gernigon et al., 2010), while defensive intentions, in the form of performance-avoidance goals (i.e., to avoid being beaten by the other) have been found to be associated with negative momentum. (Briki et al., 2012).

At the mesoscopic level, the team block appeared more often compact in the positive momentum phase than in the negative momentum phase. According to Gréhaigne et al. (2011), an extended team block is typical of a disorder within the team, particularly during defensive phases for which the team block is normally and wisely more contracted (Gréhaigne & Godbout, 2013). Consequently, the accentuated stretching of players' lines that is observed during negative momentum phases reflects a greater heterogeneity of behaviours and shows that negative momentum is the corollary of deterioration in collective organization. As regards the block's connectivity, disconnected individual behaviours were much more frequent in negative momentum phases than in positive momentum phases. This disconnection associated with negative momentum adds to the list of task-irrelevant behavioural responses identified by Apitzsch (2009) when a team collapses (e.g., focus on the referee).

At the microscopic level, the distance between the ball carriers and their direct opponents were shorter during the defending team's phases of positive momentum and longer during their phases of negative momentum. These findings reflect a greater combativeness to recover the ball during positive momentum phases than during negative momentum phases. Since a team in possession of the ball is by definition in an offensive situation, these behaviours of quick ball recovery can be interpreted as another behavioural manifestation of the offensive intentions (i.e., performance-approach goals) classically associated with positive momentum.

As regards the direction of runs without the ball, the number of runs towards the goal to attack is significantly higher in positive momentum than in negative momentum, regardless of whether the players' team is in an attacking or defending role. This rush forward during positive momentum phases is consistent with the

findings of Jones and Harwood (2008) who observed that a positive momentum experience leads teams to want to increase their advantage by scoring more goals. These forward runs are consistent with forward positions of the team block, observed at the macroscopic level, as well as with offensive intentions that are usually associated with positive momentum in the form of performance-approach goals (Briki et al., 2012; Gernigon et al., 2010). Runs without the ball towards the defended goal or not directed towards a goal are more frequent in negative momentum phases than in positive momentum phases, whether the team is in attack or in defence, with the exception, however, of runs towards the defended goal which are always rare in attacking situations. While the need to protect its goal is not salient for an attacking team, it is not surprising that it becomes so as soon as this team is no longer in possession of the ball, especially when it is experiencing a difficult negative momentum pass (Silva et al., 2014). Runs towards the goal to be defended then constitute behavioural responses to the emergence of this need. These withdrawal runs are consistent with the retreat of the team block observed at the macroscopic level, as well as with defensive intentions that are usually associated with negative momentum in the form of performance-avoidance goals (Briki et al., 2012). Positive momentum or negative momentum phases might have been expected to be characterized by more attack situations or more defence situations, respectively, consistent with the observation that most of the time spent in the opposing 30 meters reflects positive momentum (Higham et al., 2005). However, it is not the number of offensive or defensive runs that differ according to the momentum phases, but much more the forward or backward direction of these runs.

CONCLUSIONS

This study constitutes a first attempt to characterize the relationships between momentum experiences generated by significant changes in score and certain patterns of collective organization in football. Based on the analyses carried out by expert coaches of videos of high-level football matches, this research has identified specific collective indicators of positive and negative momentum experiences. Nevertheless, the results of this research should be considered with caution due to the small number of matches on which it is based ($n = 2$). Matches with spectacular score increases are rare, and the available videos of these matches are often of too poor a quality to support accurate analysis. The present results based on a very small sample of matches should therefore be considered with caution, particularly with regard to their generalizability to other football matches and other levels of practice.

Another limitation relates to the impossibility of verifying that the momentum phases chosen objectively on the basis of score changes corresponded to momentum phases subjectively experienced by the players. Yet, the behavioural effects of momentum are widely recognized as resulting from perceptual, cognitive, affective and motivational processes (e.g., Taylor & Demick, 1994) and the literature on momentum is mainly based on concepts such as psychological momentum (e.g., Gernigon et al., 2010; Markman & Guenther, 2007; Taylor & Demick, 1994; Vallerand et al., 1988) or the momentum experience (e.g., Hubbard, 2015). The present study deserves to be replicated with the players themselves as interviewees, which would require that elite players be available to take part, which is often not the case.

In terms of practical applications, coaches' knowledge of prototypical collective organization patterns of momentum phases is valuable. For Higham et al. (2005), any football match includes, to varying degrees, three phases of momentum: neutral, with one's team, and against one's own team. It is important for every coach to be able to recognize the early warning signals of the collective configurations associated with these different types of momentum to be able to provide the players very quickly with the necessary instructions to implement appropriate behavioural responses. These instructions can be given during stoppages in play, such as throw-ins, set-pieces, injuries, etc. The coach's ability to anticipate and the players' ability to react

appropriately require specific training based on the characteristics and consequences of momentum. Therefore, players, too, would gain responsiveness by accessing this kind of knowledge: “If players know what they have to do in the match and, when psychological momentum is against their team, and what they have to change to give themselves a chance, then they will feel in control of events.” (Higham et al., 2005).

AUTHOR CONTRIBUTIONS

Gautier, Cavailles and Gernigon wrote the paper and collected the data. All authors approved the final submission.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest were reported by the authors.

REFERENCES

- Adler, P. (1981). *Momentum: A theory of social action*. Beverly Hills, CA: Sage.
- Apitzsch, E. (2009). A case study of collapsing handball team. In S. Jern & J. Näslund, (Eds.), *Dynamics within and outside the lab, Proceedings from The 6th Nordic Conference on Group and Social Psychology* (pp 35-52). May 2008, Lund.
- Briki, W., Den Hartigh, R. J., Hauw, D., & Gernigon, C. (2012). A qualitative exploration of the psychological contents and dynamics of momentum in sport. *International Journal of Sport Psychology*, 43(5), 365-384.
- Briki, W., Den Hartigh, R. J., Markman, K. D., Micallef, J.-P., & Gernigon, C. (2013). How psychological momentum changes in athletes during a sport competition. *Psychology of Sport and Exercise*, 14(3), 389-396. <https://doi.org/10.1016/j.psychsport.2012.11.009>
- Côté, J., Salmela, J. H., Baria, A., & Russell, S. J. (1993). Organizing and interpreting unstructured qualitative data. *The sport psychologist*, 7(2), 127-137. <https://doi.org/10.1123/tsp.7.2.127>
- Den Hartigh, R. J. R., Gernigon, C., Van Yperen, N. W., Marin, L., & Van Geert, P. L. C. (2014). How psychological and behavioral team states change during positive and negative momentum. *PloS one*, 9(5), e97887. <https://doi.org/10.1371/journal.pone.0097887>
- Den Hartigh, R. J. R., Van der Sluis, J. K., & Zaal, F. T. J. M. (2018). Perceiving affordances in sports through a momentum lens. *Human Movement Science*, 62, 124-133. <https://doi.org/10.1016/j.humov.2018.10.009>
- Den Hartigh, R. J. R., Van Geert, P. L. C., Van Yperen, N. W., Cox, R. F., & Gernigon, C. (2016). Psychological momentum during and across sports matches: Evidence for interconnected time scales. *Journal of Sport & Exercise Psychology*, 38(1), 82-92. <https://doi.org/10.1123/jsep.2015-0162>
- Den Hartigh, R. J. R., Van Yperen, N. W., & Gernigon, C. (2020). Psychological momentum in football: The impact of a last-minute equalizer in a knock-out match. *Science and Medicine in Football*, 4(3), 178-181. <https://doi.org/10.1080/24733938.2019.1665704>

- Gernigon, C., Briki, W., & Eykens, K. (2010). The dynamics of psychological momentum in sport: the role of ongoing history of performance patterns. *Journal of Sport & Exercise Psychology*, 32(3). <https://doi.org/10.1123/jsep.32.3.377>
- Gernigon, C., d'Arripe-Longueville, F., Delignières, D., & Ninot, G. (2004). A dynamical systems perspective on goal involvement states in sport. *Journal of Sport & Exercise Psychology*, 26(4), 572-596. <https://doi.org/10.1123/jsep.26.4.572>
- Gréhaigne, J. F., Bouthier, D., & David, B. (1997). Dynamic-system analysis of opponent relationships in collective actions in soccer. *Journal of Sports Sciences*, 15(2), 137-149. <https://doi.org/10.1080/026404197367416>
- Gréhaigne, J. F., & Godbout, P. (2013). Collective variables for analysing performance in team sports. In T. McGarry, P. O'Donoghue, J. Sampaio (Eds.), *Routledge handbook of sports performance analysis* (pp. 119-132). Routledge. <https://doi.org/10.4324/9780203806913>
- Gréhaigne, J. F., Godbout, P., & Zerai, Z. (2011). How the "rapport de forces" evolves in a soccer match: The dynamics of collective decisions in a complex system. *Revista de psicología del deporte*, 20(2), 747-765.
- Higham, A., Harwood, C., & Cale, A. (2005). Momentum in soccer: Controlling the game. *Coachwise 1st4sport*.
- Hubbard, T. L. (2015). The varieties of momentum-like experience. *Psychological Bulletin*, 141(6), 1081-1119. <https://doi.org/10.1037/bul0000016>
- Jones, M. I., & Harwood, C. (2008). Psychological momentum within competitive soccer: Players' perspectives. *Journal of Applied Sport Psychology*, 20(1), 57-72. <https://doi.org/10.1080/10413200701784841>
- Markman, K. D., & Guenther, C. L. (2007). Psychological momentum: Intuitive physics and naive beliefs. *Personality and Social Psychology Bulletin*, 33(6), 800-812. <https://doi.org/10.1177/0146167207301026>
- Mollo, V., & Falzon, P. (2004). Auto-and allo-confrontation as tools for reflective activities. *Applied ergonomics*, 35(6), 531-540. <https://doi.org/10.1016/j.apergo.2004.06.003>
- Patton, M. Q. (1980). *Qualitative evaluation methods*. Sage.
- Perreault, S., Vallerand, R. J., Montgomery, D., & Provencher, P. (1998). Coming from behind: On the effect of psychological momentum on sport performance. *Journal of Sport & Exercise Psychology*, 20(4), 421-436. <https://doi.org/10.1123/jsep.20.4.421>
- Poizat, G., Bourbousson, J., Saury, J., & Sève, C. (2012). Understanding team coordination in doubles table tennis : Joint analysis of first- and third-person data. *Psychology of Sport and Exercise*, 13(5), 630-639. <https://doi.org/10.1016/j.psychsport.2012.03.008>
- Redwood-Brown, A. J., Sunderland, C. A., Minniti, A. M., & O'Donoghue, P. G. (2018). Perceptions of psychological momentum of elite soccer players. *International Journal of Sport and Exercise Psychology*, 16(6), 590-606. <https://doi.org/10.1080/1612197X.2017.1313295>
- Silva, P., Travassos, B., Vilar, L., Aguiar, P., Davids, K., Araújo, D., & Garganta, J. (2014). Numerical relations and skill level constrain co-adaptive behaviors of agents in sports teams. *PLoS ONE*, 9(9), e107112. <https://doi.org/10.1371/journal.pone.0107112>
- Taylor, J., & Demick, A. (1994). A multidimensional model of momentum in sports. *Journal of Applied Sport Psychology*, 6(1), 51-70. <https://doi.org/10.1080/10413209408406465>
- Theureau, J. (1992). *Le cours d'action: Analyse sémiologique. Essai d'une anthropologie cognitive située* [The course of action: Semiological analysis. Essay in situated cognitive anthropology]. Bern, Switzerland: Peter Lang.

- Vallerand, R. J., Colavecchio, P. G., & Pelletier, L. G. (1988). Psychological momentum and performance inferences: A preliminary test of the antecedents-consequences psychological momentum model. *Journal of Sport & Exercise Psychology*, 10(1), 92-108. <https://doi.org/10.1123/jsep.10.1.92>
- Wergin, V. V., Zimanyi, Z., Mesagno, C., & Beckmann, J. (2018). When suddenly nothing works anymore within a team: Causes of collective sport team collapse. *Frontiers in psychology*, 9(2115). <https://doi.org/10.3389/fpsyg.2018.02115>



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