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PSYCHOLOGICAL MOMENTUM AND ATHLETIC PERFORMANCE: A CRITICAL REVIEW OF RESEARCH

Michael Hamberger
Department of Kinesiology
University of Maryland, MD

Seppo E. Iso-Ahola
Department of Kinesiology
University of Maryland, MD

ABSTRACT

Much research has been done in the last twenty years concerning the phenomenon in sports known as psychological momentum (PM). In general terms, PM is believed by athletes and spectators alike to be a psychological advantage gained by one athlete, or team, on the basis of a series of good plays or early success in the competition. The present review summarizes the psychological momentum research, with a particular focus on the methodological problems and considerations for those studies using observed performance as an outcome measure. Although the causal relationship between momentum and performance is yet to be demonstrated, unequivocally, there is enough evidence to argue that momentum may be a short-lived phenomenon. Non-experimental methods and crude statistical analyses employed may explain this failure to demonstrate the effects of momentum on performance. In the absence of strong scientific evidence, one cannot completely rule out the possibility that momentum is a post hoc explanation for the observed outcome.

The November 10, 2003 edition of *The Diamondback* (a daily newspaper circulated at The University of Maryland), in reference to the university's women's soccer team, stated, "when the Terps [score] first they win…when the

Terps don't score first, they lose" (Aiken, 2003, p. 10). This comment regarding the outcome of the game is indicative of the concept of momentum, or psychological momentum (PM). In popular usage, momentum is a word used to describe a turning point in an athletic contest in which one player (or team) seems to gain the upper hand over the opponent, and subsequently greater control over the outcome of the competition. It is not uncommon for spectators or commentators to refer to a single event (a defensive steal late in the game), or even a series of events (three consecutive aces), as an act to generate momentum to create an advantage for a particular side. In the context of the University of Maryland women's soccer team (as described above) momentum seems to be gained or lost on the basis of the first goal scored in the match; hence, the outcome of the match is apparently determined by this one event. But is momentum in sports really such a powerful force? Is it really something so magical that it transcends the physical and cognitive capabilities of the competitors? Or is momentum merely a word that attempts to describe particular moments in the competition that stand out against the more mundane occurrences of a sporting event? The present review seeks to answer these questions.

Early Definitions and the Premise of Momentum

PM was initially defined by Iso-Ahola and Mobily (1980, pp. 391-92) as an added or gained psychological power that is beneficial because it gives the person a feeling that he/she has an edge over the opponent. As a result, the competitor thinks that if his/her performance is similar to the previous one, then victory will ensue. Most researchers having studied PM have acknowledged Iso-Ahola and Mobily's work as the first attempt to define the phenomenon of PM. Adler (1981, p. 90) went a step further to describe PM in both a positive and negative context. Specifically, he suggested that the catalyst for performing well (positive momentum) can be a derivative of the downfall of an opponent ([negative momentum], p. 90). Adler (1981) concluded that success follows success, and failure follows failure. It has been argued that an awareness of positive turning points during performance may shift the confidence level of an athlete (Richardson, Adler, & Hankes, 1988, p. 69). This increase in confidence leads to the perception of gained PM and advantage in the game. Iso-Ahola and Blanchard (1986) provided evidence for this reasoning. They found that winners rated themselves as better players and more confident in their abilities than losers; thus, winners of one game perceived a greater likelihood of winning the next game, as compared to losers (p. 765).

Several theories have since emerged to explain PM, such as the Antecedents-Consequences Model (see Vallerand, Colavecchio, & Pelletier, 1988). However, results have provided minimal support for the model based on both spectators' perceptions of momentum and actual athletic performance (Burke, Aoyagi, Joyner, & Burke, 2003; Miller & Weinberg, 1991). Researchers (Kerick, Iso-Ahola, & Hatfield, 2000; Mack & Stephens, 2000) have tested the Multidimensional Model of Momentum (see Taylor & Demick, 1994) but only limited support for the model has been found, as neither Kerick et al. (2000) nor Mack and Stephens (2000) could find a significant change in behavior following the establishment of positive momentum. The Projected Performance Model (Cornelius, Silva, Conroy, & Peterson, 1997, p. 483) describes increases and decreases in evaluations of performance as related to shifts in perceptions of momentum. The model appropriately demonstrates how performance fluctuations can be rapidly given the label of "positive momentum" or "negative momentum" when in actuality they may be natural variations of performance around a mean level. However, Cornelius et al. (1997) were unable to support a momentum-performance relationship when testing their model. Finally, Burke and colleagues (Burke, Edwards, Weigland, & Weinberg, 1997, p. 80) described positive and negative momentum as a psychological state of mind affecting performance so that everything seems to "go right" or "go wrong" for the performer, respectively.

Most interestingly, Silva and colleagues (Silva, Hardy, & Crace, 1988) previously noted two other possible facets of PM. "Positive inhibition" labels the process whereby success may actually result in a loss of momentum due to an athlete's contentment and the probability of a subsequent failure is increased. "Negative facilitation" defines those situations whereby failure motivates a player to try harder and the probability of subsequent success increases (p. 347). The latter possibility may be especially true when two opponents are relatively equal in skill (as will be discussed later).

A Belief in the Existence of Momentum

As one might presume, athletes and spectators believe momentum is a cause and effect of outcome (Vergin, 2000, p. 185). In one study, 91% of basketball fans and 75% of NBA players from one team alluded to the fact that a player had a better chance of making a shot after having just *made* his/her last two or three shots than having just *missed* her/her last two or three shots (Gilovich, Vallone, & Tversky, 1985, pp. 297, 302). Other studies have shown that competitors experience positive and negative "grooves," or PM, during contests (Burke &

Houseworth, 1995; Cornelius et al., 1997; Kerick et al., 2000). Furthermore, subjects asked to analyze various sports have reported that coming from behind to tie an opponent creates more momentum, greater confidence, more control, and less anxiety and discouragement for the player or team making the comeback (Vallerand et al., 1988; Eisler & Spink, 1998; Miller & Weinberg, 1991); thus, the momentum team may be predicted to win the game significantly more than the non-momentum team (Miller & Weinberg, 1991, p. 216).

As much as athletes and spectators concur that PM exists, it seems to be a highly subjective matter (Richardson et al., 1988; Burke et al., 1997; Burke et al., 2003). Many researchers (Richardson et al., 1988; Vallerand et al., 1988; Koehler & Conley, 2003; Clark, 2003) conclude that because PM seems to be a highly subjective and individualized matter, coaches and athletes should refrain from singling out particular instances, such as a "hot streak," in which they feel they can gain a psychological edge. Thus, it seems that creating a *formula* for the prediction of success based on PM many not be feasible if the *ingredients* cannot be sustained. Hence, PM may be a weak predictor of competitive outcome.

Evidence that Momentum Predicts Outcome

Based on the early PM literature (Iso-Ahola & Mobily, 1980; Adler, 1981), it is assumed that early success in a game or match leads to future success in that game or a subsequent match. For example, in tennis and racquetball the winner of a match is the first player to win two sets out of a possible three, so it is reasoned that those who win the first set have PM and a greater probability of winning the next *set* (Iso-Ahola & Mobily, 1980, p. 393). Several studies have supported this claim (Iso-Ahola & Mobily, 1980; Iso-Ahola & Blanchard, 1986; Silva et al., 1988) with, overall, an approximate 3:1 win-ratio in the second set for those who win the first set. The winner of the *match* has also been predicted by early success in numerous sports, such as racquetball (Iso-Ahola & Mobily, 1980, p. 397), tennis (Silva et al., 1988, p. 349), hockey (Gayton, Very, & Hearns, 1993), and billiards (Adams, 1995, p. 583). In cycling, those led to believe that they were regaining the lead after trailing experienced positive PM, pedaled faster, and outperformed those in a non-momentum group (Perreault, Vallerand, Montgomery, & Provencher, 1988, pp. 431-32). In volleyball, the team perceived to have more momentum (based on an impartial observer) scored significantly more points than the other team (Burke et al., 1999, p. 306).

One of the statistically most thorough analyses regarding psychological momentum was conducted by Jackson and Mosurski (1997). Based upon the data

from the 1987 and 1988 U.S. Open and Wimbledon tennis tournaments, the authors tested the relative ability of four mathematical models to explain the data: (1) psychological momentum, (2) simple independence, (3) independence with random variation in players' abilities from day to day, and (4) psychological momentum with random variation in players' abilities. Results conclusively showed that the psychological momentum model alone provided the best mathematical fit with the data. The authors concluded that "psychological momentum explains the tennis data extremely well...and is certainly a major factor in the outcome of matches at the Wimbledon and U.S. Open tennis tournaments" (pp. 28, 33). It is important to note that Jackson and Mosurski's analyses took into account players' ability levels (ranking) as a fixed entity and in terms of random fluctuations in ability from day to day. Yet, psychological momentum emerged as the factor to best explain the performance data.

In light of the above findings, it can be stated tentatively that *positive* momentum is the most relevant force functioning to influence performance (Silva et al., 1988; Cornelius et al., 1997; Burke et al., 2003), as opposed to negative momentum. These findings suggest that performing well generates perceived PM, and *PM* is the force causing success. However, studies conducted with the intent of demonstrating that PM predicts performance have several limitations (a) in their methods of research and (b) in the fact they do not consider skill or opponent factors as variables in the outcome. These points will be discussed next.

Problems with Methods

The first problem encountered when attempting to prove that PM influences outcome is the unit of analysis for these two variables. From sport to sport, there are possible *immediate* measures of PM or outcome, such as the winner of a set, inning, quarter, period, half, et cetera. On the other hand, one could also choose to measure PM strictly by the *end result* of the game. However, an issue arises when attempting to generalize findings for PM across sports. For instance, it has been shown that winning games in racquetball and tennis predicts match outcome. But is there an equivalent in football and baseball? Can one automatically assume that the winner of the first quarter, or inning, has greater perceived momentum than the loser? Also, adherents to the notion that momentum influences future success (Adler, 1981; Vallerand et al., 1988) would argue that winning one contest influences the outcome of the next contest. However, professional baseball players play several games per week (sometimes twice a day), but professional football players play only one game per week. Can the perceived PM be

maintained for an entire week in the latter case? Does perceived momentum even last from one day to the next in the former case? Without knowing the longevity of perceived PM, it is unreasonable to deduce that because momentum may carry from game to game in tennis or racquetball, the same would hold true for basketball or baseball players.

To automatically assume that PM causes success based on the results of early outcomes creates another problem. For example, if winning the first game in racquetball generates PM and the winner has a subsequent advantage over the opponent, should not the score of the next game reflect this obtained PM? Should not the score be 15-0 (or 6-0 in tennis), or something close to this score? Iso-Ahola and colleagues (Iso-Ahola & Mobily, 1980; Iso-Ahola & Blanchard, 1986), as well as others (Silva et al., 1988; Adams, 1995; Gayton et al., 1993), failed to provide the scores of matches in their studies. This addition would be relevant because those competitors with greater PM should win the early games of the next set in tennis, or win the early points of the next game in racquetball. However, one does not know if this is the case. Is it not possible for the loser of the first game in racquetball to win the first 10 points in the next game and still lose? Surely, if this 10-0 lead occurred, would one not expect the loser to then have PM? Should not the loser then win the second game? More importantly, does someone with negative momentum (losing the first set) really have the capacity to open a game with a 10-0 lead? One might argue that the time in between games diminishes the effects of PM (Mace, Lalli, Shea, & Nevin, 1992; Burke et al., 1999; Burke et al., 1997; Burke et al., 2003) and this is why the loser is able to perform well early in the next game. However, this line of reasoning would confound the premise of gained PM posed by Iso-Ahola and colleagues (Iso-Ahola & Mobily, 1980; Iso-Ahola & Blanchard, 1986) and others proposing an "early success" model. By not reporting the scores of games or matches, it is not plausible to assume that PM carried over from one game to the next. Again, the loser of the first game must have scored some points in the second game, and evidence does exist to suggest that an opponent scoring may serve to reduce PM (Burke et al., 1999; Burke et al., 1997).

Another problem regarding the methods in studying momentum is that PM has been measured after giving false feedback to subjects (Silva, Cornelius, & Finch, 1992; Kerick et al., 2000, Perreault et al., 1998; McCutcheon, 1997b), as opposed to head-to-head competition where the competitors gauge their own perceptions of PM, as is done in the real context of athletics. Also, PM has been measured with artificial game scenarios (Miller & Weinberg, 1991; Vallerand et al., 1988; Eisler & Spink, 1998), and while perceived to be valuable in testing a theoretical framework, it cannot be concluded that PM is operating based on

scoring or winning patterns without accessing the participants' actual perceptions that are associated with real performance outcomes (Kerick et al., 2000, p. 16). For instance, Gayton et al. (1993) and Iso-Ahola and Mobily (1980) *inferred* that PM had occurred after obtaining unobtrusive data. They failed to measure the athletes' perceptions of PM, which may not have been present at all. For instance, in one study, only approximately 50% of the athletes perceived PM (Richardson et al., 1988, p. 73). Therefore, unless the athletes are directly asked, it is unwise to assume that an athlete perceived positive PM simply because he/she performed well early in a contest. Likewise, it may be a faulty conclusion to assume that PM caused success. Finally, Burke and Houseworth (1995, p. 169) argue that "early success studies cannot explain the driving forces that affect momentum. At best they infer that momentum exists. Early success model do not account for game, event, psychological, physical, or environmental factors which influence the existence and nature of momentum."

Evidence that Momentum does not Predict Outcome

Most models related to PM offer that consistently performing well facilitates the probability of performing well in the future. Gilovich et al. (1985) may have been the first researchers to demonstrate results contrary to the premise behind most momentum models. Their results, based on one collegiate team and two others from the National Basketball Association (NBA), showed that the outcomes of field goal and free-throw attempts were independent of the outcomes of previous attempts, and shooting percentages ("hot" or "cold" streaks) did not carry over from game to game. Recently, Koehler and Conley (2003), analyzing results from the 1994-1997 NBA three-point shooting contests, supported Gilovich et al.'s original claim that there is no such phenomenon as the "hot hand" in basketball. Another facet of Gilovich et al.'s (1985) study tested the ability of both shooters and observers to predict hits and misses based on previous attempts. Although both the shooters and observers were able to make bets on the outcomes (which led the researchers to deduce that at many points both parties felt there was a "hot" or "cold streak, or PM), neither of them was able to successfully predict hits and misses (p. 309). This finding parallels that of Silva et al. (1992, p. 130), as well as Cornelius et al. (1997, p. 481), who state: "Although competitors rate their performances well above average and these ratings are related to perceptions of positive momentum, they are unable to translate this phenomenological state into a significant improvement in performance." Together, *it seems that performance may cause PM, but perceived PM does not*

cause a change in performance. This inconsistency between perceptions of PM and actual performance is what Gilovich et al. (1985) termed a "cognitive illusion."

Miller and Weinberg (1991, p. 217), studying collegiate volleyball players, found that when comparing teams perceived to have positive momentum with teams perceived to have negative momentum, there were no significant differences in the number of serves won by either team during early or later portions of the game. It is worthy to note that momentum was considered to be in effect once one team met a predetermined criterion for gaining or losing PM, as opposed to obtaining a self-report measure from the athletes. However, the criterion was in the context of one team coming from behind to tie a score, which has been argued to generate PM and alter performance (Vallerand et al., 1988; Perreault et al., 1998). More importantly, when considering which team won the match, there was not significant difference in matches won between those teams coming from behind to tie the score late in the game (positive PM) and those with negative momentum.

Additional evidence has shown that PM was not a valid predictor of performance in many contexts, such as laboratory task (Silva et al., 1992; McCutcheon, 1997b), basketball shooting (Shaw, Dzewaltowski, & McElroy, 1992; Cornelius et al., 1997), target shooting (Kerick et al., 2000, p. 10), tennis (Silva et al., 1988, p. 352), football and wrestling (McCutcheon, 1997a), and baseball (Frohich, 1994, p. 125). Similarly, the probability of wining a game in the NBA or Major League Baseball was shown to be independent of the results of recent games, and the expected number of winning and losing streaks did not differ significantly from what could be expected by chance (Vergin, 2000, pp. 189, 194). Albright (1993) examined the records of Major League Baseball players' batting averages through four seasons, 1987-1990, in an effort to determine whether streaks occur more frequently than would be predicted by a probabilistic model of randomness. The author found that streaky behavior in one year did not predict similar performance in the following year, thus "failing to find convincing evidence in support of wide-scale streakiness" (p. 1183). At the same time, he found that "some players exhibited significant streakiness during a given season but this would be expected under a model of randomness" (p. 1183). Interestingly, these findings may offer a good explanation for why some studies have supported psychological momentum while others have not. That is, the phenomenon (PM) exists at a smaller scale, but cannot be detected by such statistically crude measurements such as Albright's (1993) year-to-year analyses or Gilovich's et al.'s (1985) lumping of all the data from the entire season into one statistical analysis. Such analyses do not allow for the possibility that PM may be

a significant factor for some individual players for a relatively short period of time.

On the other hand, one possible explanation for PM is that *it is a subjective perception, and it does not affect performance*. This cognitive illusion of PM, as offered by Gilovich et al. (1985), could be due to a memory bias. "If long sequences of hits and misses (in the case of basketball) are more memorable than alternating sequences, the observer is likely to overestimate the correlation between successive shots" (p. 310). Gilovich et al. (1985) also state that people not only perceive random sequences as positively correlated, but they also perceive negatively correlated sequences as random (p. 311). Vallerand et al. (1988, p. 97) and Silva et al. (1992, p. 132) lend support to this notion by stating that athletes and spectators are motivated to remember events wherein PM perceptions led to enhanced performance and to disregard events that did not lead to enhanced performance; thus, it seems that the construct of PM is viewed in a retrospective manner, with no actual significant performance change occurring. Likewise, the "turning point" in a contest is synonymous with PM, and this event could be relatively mundane (not a significant deviation from normal performance), but it is the *context* in which the event occurs that enhances the likelihood for the event to be labeled as PM. In developing one of the first definitions of PM as related to sport, Adler (1981, p. 15) states that momentum describes a social process that can be easily misunderstood or wished into being and is highly shaped by the context framing its occurrence.

Cornelius et al. (1997, p. 483) and Shaw et al. (1992, p. 143) suggest that a competitor may alter perceptions of positive or negative PM following performance, especially if this performance is coupled with successful or unsuccessful outcomes, respectively. The changes in PM do not guarantee a change in performance; rather, there are greater factors at play, such as the skill of the competitors.

Considering Ability/Skill as a Factor More Important Than PM

Those studying momentum have noted that factors other than PM might be more important in determining the outcome of a contest (Miller & Weinberg, 1991, p. 219). Sports are games of skill and the better teams win more often than the inferior teams (Vergin, 2000, p. 195). So, rather than attribute victory to psychological momentum gained from early success, one should consider that "athletically superior teams tend to get ahead [early] and stay there"

(McCutcheon, 1997b). For instance, if superior ability causes a player to win the first set of a tennis match, that same superior ability, rather than PM (as was originally suggested by Iso-Ahola and Mobily, 1980; Iso-Ahola and Blanchard, 1986), most likely produces the win in the second set (Silva et al., 1992, p. 122). For example, in a study of nearly 1000 collegiate tennis matches, 76% were won in straight sets, so the authors concluded that an ability factor cannot be conclusively ruled out (Silva et al., 1988, p. 352). Also, there is some evidence that match outcome can be predicted from early success significantly better for preliminary rounds of tournaments (when there may be more inequality of skill) as opposed to final rounds ([when skill is probably more closely matched]; Iso-Ahola & Mobily, 1980, p. 399). On the other hand, there is evidence that at the highest level of professional tennis (in Wimbledon and U.S. open tournaments), when players' abilities are controlled, early success predicts the outcome better than the independence of the previous score or random variation in players' abilities from day to day (Jackson & Mosurski, 1997).

Nevertheless, it is unwise for researchers to make assumptions that players or teams in similar "classes" or tournaments are inherently equal in terms of skill. For instance, Gayton et al. (1993) found that between 1974 and 1987 the winner of the first period in the Stanley Cup finals (professional hockey; played the best of seven games) won the game 73% of the time. The authors then concluded that these outcomes were the result of PM because the Stanley Cup finalists "[would be expected] to be relatively similar in athletic ability" (p. 123). However, Gayton and colleagues failed to mention that during the 14 professional hockey seasons they analyzed in the study, the Stanley Cup was won by only 4 teams! The Philadelphia Flyers won the first two, the Montreal Canadians won four in a row, the New York Islanders won the next four in a row, and the Edmonton Oilers won the last three out of four (The other being won again by the Canadians). Clearly, these four teams were *not* of equal ability to that of their opponents in the finals; undoubtedly, they were far superior and PM may not have been a factor at all. In addition, Gayton and colleagues did not mention that 9 out of these 14 Stanley Cup series were decided in a 4-0 or 4-1 fashion, indicative of superior ability[1].

In examining no-hitters in baseball (a rare occurrence where a pitcher allows base-runners only by walks and error), Frohlich (1994, p. 27) concluded that the number of no-hitters thrown per year is expected by chance (with the one exception of 1990-1991 when there were significantly more). Furthermore, approximately 25% of the no-hitters from 1900-1993 belonged to pitchers ranged among the top 60 in fewest hits allowed per nine innings over a career. Richardson et al. (1988, p. 72), in studying collegiate tennis, reported that winning any of the first 8 games in the first an/or second set was a significant of success in the tennis match; however, 82% of the sets in the two-set matches resulted in 6-0, 6-1, or 6-2 scores. In addition, when matches became more competitive (sets went to more than eight gams) the outcome could only be predicted by three games in the first set and one game in the second set (p. 73). It seems that when sets are more competitive, it is due to an equal match in skill, not alternating shifts in momentum, as fewer games are predictive of match outcome.

What Happens to PM when Player Abilities are Matched?

Iso-Ahola and Mobily (1980, p. 393) state that "when two highly experienced players compete, the loser of the first game does not automatically assume he is inferior or his probability of winning is smaller than the opponents. He is able to maintain self-confidence despite losing because his vast experience." This idea is especially true when the two players, or teams, are compatible in abilities. For instance, a highly skilled racquetball player has enough experience and knowledge of strategies to adapt to the opponent's superb skill even after suffering an early setback, therefore diminishing the opponent's likelihood of establishing positive momentum. However, the reported data appear somewhat contradictory. Some evidence suggests that PM is less prominent for a given athlete or team when skill is matched (McCutcheon, 1997a; Taylor & Demick, 1994), while the others have shown PM to have powerful effects even after players' abilities are controlled (Jackson & Mosurski, 1997)

In racquetball and tennis, when two players split the first two games or sets, respectively, what happens to the PM effect? One study demonstrated an exact split in tie breakers won by first-game winners and second game-winners over the course of an entire tournament (Iso-Ahola & Mobily, p. 399), while the other study (Iso-Ahola & Blanchard, 1986) showed that the first-game winners were more likely to win the tie-breaker game than the second-game winners. It has also been reported that when competitors were matched in ability, the more they experienced negative momentum (up to a point), the better they performed

[1] These researchers also failed to mention why they chose the years 1974-1987, considering the study was published in 1993. Methodologically, they should have included all years of the NHL Stanley Cup, which began in 1926.

(Perreault et al., 1998; Ransom & Weinberg, 1985). These findings resemble the idea of negative facilitation (Silva et al., 1988, p. 346), and may explain why PM sometimes has less of an effect when players are comparable in abilities. It may be that when trailing in a contest, the competitors will still strive to win as long as they feel winning is a possibility, specifically, when competing again an opponent of equal or lesser ability. For instance, volleyball players reported higher mental effort as the match became tighter (Smith, Bellamy, Collins, & Newell, 2001, p. 329); thus, effort increased as an apparent equality of skill increased.

It appears that it may be difficult to create and sustain PM in skilled performance when players possess similar competence levels (Silva et al., 1988, p. 353). Additional forces, like alterations in tactics or concentration (as suggested by Ransom & Weinberg, 1985; Smith et al., 2001; Perreault et al., 1998), are likely to return exceptional performance to more average levels (Cornelius et al., 1997, p. 483). For negative facilitation not to occur, either one competitor must be dominant (too much skill for the opponent), or the onset of early success (i.e., jumping out to a big lead) has caused an increase in anxiety in the opposition and subsequent performance suffers for the competitor already trailing in the match. It is possible that both occur simultaneously, but each possibility will now be considered separately.

The Effects of Anxiety as a Factor to Explain Perceived PM

Taylor and Demick (1994, p. 59) argue that in order for momentum to have a significant impact on competitive outcome, positive momentum would have to occur for one athlete, or team, *and* negative momentum must occur for the other. This explanation is central to Taylor and Demick's notion of "opponent effects." There is some empirical support for this claim. Burke and colleagues (Burke et al., 1999; Burke et al., 1997) found that spectators noted the beginning of momentum in basketball games of varying levels to be often characterized by a combination of good performance by one team *and* poor performance by the other. It can be reasoned that the poor performance is equivalent to, or at least a predictor of, negative momentum. This poor performance may be the result of anxiety, or worry. Processing Efficiency Theory (Eysenck & Calvo, 1992; Smith et al., 2001) states that pre-occupied concerns about evaluation and personal performance (i.e., worry) are characteristic of the content of thoughts of anxious individuals. Eysenck and Calvo (1992) thus attempt to explain the influence of state-anxiety on performance. Other researchers have noted that worrisome thoughts interfere

with attention to task relevant information, causing decrements in performance (Smith et al., 2001; Kerick et al., 2000).

Impaired performance as a result of anxiety is considered to be more prominent when the task is difficult than when it is easy (Eysenck & Calvo, 1992, p. 409). For example, Krane, Joyce, and Rafeld (1994, p. 65) found that athletes had higher cognitive anxiety under high situation criticality (late innings during a close game) when compared to situations of low criticality (a team has a substantial lead in the early innings of a game). In addition, there is evidence that athletes *low* in trait-anxiety can actually increase effort and improve performance in critical situations (Smith et al., 2001, p. 330), and such athletes believe that victory is never out of reach in critical situations or when losing (Miller & Weinberg, 1991, p. 216). Based on these results, it seems that opponent factors are indeed playing a role in the likelihood of a player or team experiencing positive momentum. In other words, if the opponent "refuses to go away" late in the game or when losing, and does not experience *negative* momentum, then the ability of the other team to experience *positive* momentum is diminished. It should be considered that additional factors other than simply losing, like trait anxiety (Smith et al., 2001, p. 330), play a role in whether or not an athlete will experience negative momentum. Also, one must consider the skill of the opposition in discussing the anxiety levels of the athletes in question and their perceived ability to generate positive momentum in the face of failure.

Perceptions of Opponents' Skills Influence Performance

It is believed that by demonstrating early success in a game, a person provides highly favorable and relevant information about his/her abilities to the opponent (Iso-Ahola & Mobily, 1980, p. 392). However, early success *per se* does not guarantee positive momentum. A study by Burke and Houseworth (1995) showed that 65% of athletes in the sample reported that the *opponent* was factor influencing their perceptions of positive PM. For instance, jumping out to an early lead in a volleyball match may not generate positive PM against a weak opponent because the early success was expected. It has been suggested that with competitive inequality, it is unlikely that momentum is a major factor in the outcome of a contest since there is a limited need for psychological edge (Richardson et al., 1988, p. 72). It should be noted that the "underdog" is less likely to experience positive momentum in the first place, and there is little opportunity for potential shifts in PM when opponents are mismatched

(Richardson et al., 1988; Vallerand et al., 1988). Moreover, Thuot, Kavouras, and Kenefick (1998) showed that cognitive and somatic anxiety were higher for basketball players when playing the toughest teams compared to teams perceived to be moderately difficult or weak. This same study found that confidence was higher when playing the weakest or moderate teams compared to the toughest. Smith et al. (2001, p. 329) claim that negative emotions are experienced when winning is unlikely, as in playing the top-ranked team.

Self-efficacy theory predicts that individuals who experience success should increase their self-efficacy, thereby leading to future success, and those who lose should decrease their self-efficacy and experience subsequent failures (Shaw et al., 1992, p. 136). However, Shaw et al. (1992, p. 145) were unable to find support for this pattern. Instead, negative facilitation occurred, with athletes falling behind striving to win in the face of imminent failure. Additionally, these authors argue that PM cannot be completely explained by changes in self-efficacy. Likewise, as the situational importance of a task increases, people will exert greater effort in response to the threat of losing (Smith et al., 2001, p. 329). However, effort can only go so far when one is clearly outmatched in terms of skill. Thus, perhaps is anxiety or worrisome thoughts about losing that are causing poor performance. However, one of the factors leading to such thoughts is likely to be negative momentum caused by early failures against the opponent.

Again considering opponent effects, an opponent in golf that may often be overlooked is the actual layout of the course. Clark (2003) analyzed streakiness among golfers from the 1997 and 1998 Professional Golfers' Association (PGA) Tour and Senior PGA Tour. Streakiness was defined as fewer clusters of "par or better" and "above par" rounds than would be expected by chance. Clark initially concluded that there was evidence of streakiness for players on both Tours, but upon further analyses Clark posited that "scores showing a significant tendency for players' par or better rounds to occur together and for their above [par] rounds to occur together [were] due to course difficulty...the easier the course, the greater was the likelihood of a clustering of par or better rounds, and the harder the course, the greater was the likelihood of a clustering of above par rounds" (p. 71). Hence ,the streaks that did occur were due to the difficulty of the courses (opponent effect) rather than players' dispositions to streak (p. 77).

Summary and Conclusions

It is well-known that athletes and spectators alike believe there is such a phenomenon as momentum, and that momentum causes better athletic

performance. Evidence suggests that momentum does not have much influence when two opponents are unequal in skill (because there is less need for a psychological edge). What about when two opponents are equal in skill? Evidence seems ambiguous as some studies support the PM effect in this latter context while others do not. This controversy may be due to three factors. First, some sports (e.g., tennis and racquetball) are more conducive to PM than other sports (e.g., baseball and basketball). Jackson and Mosurski (1997, p. 28) suggested that the probability of "success in basketball and baseball depends to a large extent on the situational variables." On the other hand, in tennis, "the sets are supposedly identical in the sense that the format is for practical purposes identical and designed not to convey an advantage to either player." Second, there are methodological problems and questions about previous studies and statistical analyses reported in them. Some of these analyses have been crude and wide-scale (e.g., non-streaky performance in baseball from year to year), thereby potentially not allowing for PM effects to emerge. Third, PM effects may vary as a function of individual differences and duration of time. That is, certain individuals are more likely affected by PM, and PM effects may exist but may be short-lived and thus cannot be captured by crude statistical analyses.

It is clear that momentum must manifest itself in a measurable or noticeable way in order to make a claim that PM does not indeed influence behavior. In terms of positive and negative momentum, this manifestation probably occurs in the form of increased confidence of increased anxiety, respectively. In light of the research on PM and athletic performance, it may even be reasonable to suggest that positive momentum is a word used *after* one has experienced an increase in confidence, and negative momentum is a word to describe a situation when an athlete has *already* experienced an increase in anxiety. Moreover, the increases in confidence and anxiety are most likely a result of assessing the opponent's skill during competition (Smith et al., 2001).

Vergin (2000, p. 195) and McCutcheon (1997a) argue that it is time to conclude that momentum is mostly myth in terms of winning and losing streaks, and that coaches and players should realize that such streaks do occur occasionally. Burke et al. (1997, p. 91) state, "It is plausible to suggest that for athletes and spectators, momentum is merely a post hoc explanation for events that have already occurred. In essence, it may be that only after seeing the outcome of a particular play or point does the play take on the label of a momentum event." After winning the conference championship and preparing for the national tournament, a member of the University of Maryland women's volleyball team was quoted as saying, "We have all the momentum and all the confidence in the world right now" (Volleyball Wins, 2003, p. 10). The Maryland

team went on to win their first-round match in the national tournament. While it is possible that momentum and increased confidence played an important role in the team's victory, it should also be remembered that athletes experience more self-confidence and less anxiety when playing a home match (Bray, Jones, & Owen, 2002; Thuot et al., 1998) (the Maryland team played at home). In addition, Maryland was ranked higher than their opponent, American University, and probably had more skill. And interestingly enough, Maryland was actually losing early in the first and second games of the match. If they had positive momentum entering the game, would it not be expected that Maryland should have jumped out to an early lead? This again poses a question regarding the duration and longevity of PM.

McCutcheon (1997a) attempted to answer this questions by observing whether or not there were any immediate short-term effects of momentum in basketball and football at the collegiate and professional level, as well as high school wrestling. The result for all three sports was the same – there were no significant differences in the number of "momentum scoring events" (i.e., a slam dunk or touchdown) between teams immediately following the establishment of momentum by either team (as determined by panels of experts). However, in basketball and football, but not wrestling, there appeared to be long-term benefits of establishing momentum, as winning teams tallied significantly more "momentum points" (i.e., 2 points for a steal, or 1.7 points for a first down) than losing teams. Future research in the field should attempt to better delineate the issue of the duration of PM.

Before concluding the PM is a myth or a post hoc explanation, the most fundamental issue should be kept in mind. That is, evidence has shown that early success leads to subsequent success. The question then is how much of that subsequent success is attributable to PM and how much to ability/skill. Research has already indicated that early success significantly increases three psychological factors: self-confidence, perceived likelihood of winning, and perceived superiority in ability over the opponent (Iso-Ahola & Blanchard, 1986). These factors constitute an athlete's psychological core, and it is this psychological core that is the most important intrapersonal force affecting athletic performance (Iso-Ahola, 1995). Thus, early success enhances the competitor's psychological power over his/her opponent. If this manifestation of PM then leads to increased physical and mental effort on the competitor's part, it is likely that PM increases the likelihood of subsequent success. This, in essence, is the psychological mechanism of PM. Why this mechanisms does not always provide clear-cut findings, however, is due to the fact that perceptions of PM are not a zero-sum game. That is, while the early winner's psychological power is greater than the

opponent's, the latter can nevertheless have enough psychological strength left in him/her to launch a counterattack; indeed, research has shown that negative momentum often leads to increased effort (e.g., Perreault et al., 1998). If this improved effort due to negative momentum changes the early loser's thinking into one according to which "I can still win," then the winner starts losing his psychological advantage. If, on the other hand, improved effort due to negative momentum does not lead to much positive cognitions, then it is only a matter of time before the early loser begins giving up.

According to this formulation of PM, increased effort (both physical and mental) plays an important role in the final outcome. In some sports, however, adding to one's effort does not help. In fact, in baseball and basketball, trying too hard can be detrimental to performance. For example, hitting the fast-moving baseball requires precision of motor control, not hustle. The same reasoning is true for a basketball player who attempts to make a long field-goal. On the other hand, in tennis and racquetball while some precision of execution is required, increased physical effort can often make a significant contribution to the desired outcome. All of this means to fully account for PM effects, one has to analyze the extent to which the gained psychological power (due to early success) improves physical effort on the one hand and mental effort or capacity (e.g., concentration) on the other. Similarly, it is important to know for how long this increased effort or improved mental capacity can be maintained. Future research should explore these issues.

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IMPORTANCE OF IN-GAME ENTERTAINMENT AMENITIES AT PROFESSIONAL SPORTING EVENTS: A CASE FOR NBA SEASON TICKET HOLDERS

James J. Zhang[1], Dennis M. Piatt[2], David H. Ostroff[3] and John W. Wright[4]

[1] College of Health and Human Performance, University of Florida, FL
[2-4] College of Journalism and Communications, University of Florida, FL

ABSTRACT

The purpose of this study was to examine professional basketball season ticket holders' desirability of in-game amenity activities and their relationships to the game consumption levels. Season ticket holders (N=350) of a major NBA team responded to a mail survey that was designed to collect information related to demographics, consumption levels, amenity programs, and artist preference. Descriptive statistics, t-tests, chi-square analyses, and tests of intercorrelations revealed that in-game amenity activities and contests, halftime amenity activities, various music amenity programs, and a number of artists were highly desired by the season ticket holders. These variables were predictive of game consumption levels. The findings reinforce the importance and specific directions of formulating in-game entertainment amenities at professional sport events.

INTRODUCTION

In the early history of professional basketball, games used to be nothing more than spectators going to arenas and watching players of two teams compete. As time has passed and the sport industry as a whole has evolved, professional basketball games have evolved into just that – an entertainment event. Yet, unlike