

# The “Home Advantage” in Athletic Competitions

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## Abstract

Game location has a powerful influence on performance outcomes in sport. We reviewed recent research on three conceptual models that outline (a) the various game-location factors that can alter athletes' psychological states, (b) the natural protective response to territorial incursion in humans, and (c) the increased probability of involuntary attentional shifts in the presence of a supportive audience. Investigators recently have accumulated support for each of these models and linked variations in game location to psychological, hormonal, and behavioral states of athletes, coaches, and officials. We considered how an integrative approach might benefit the study of the home-advantage phenomenon and described an assortment of research questions to support the development of an integrative framework. By studying how audience support contributes to physiological reactivity, attention, stress responses, and decision making (among athletes and officials), researchers can achieve a better understanding of the processes through which a home environment can benefit (and occasionally harm) athletes and teams.

## Keywords

cortisol, testosterone, territoriality, stress, aggression

A large body of research has confirmed that athletes and teams perform considerably better when they compete at home compared with away from home. For example, logistic regression models that factor in the home advantage can accurately predict the number of medals achieved by host nations in the Olympic Games (Nevill, Balmer, & Winter, 2012), and meta-analytic reviews (Jamieson, 2010) have demonstrated that home teams will win approximately 60% of all athletic contests. Although a home advantage is more prevalent in some sports than in others (see M. B. Jones, 2013), there are no sports in which athletes or teams are more successful away from their home venue. Comprehensive models have been developed to guide understanding of the home-advantage phenomenon, and our goal in this review was to outline recent research on three such models and to offer practical suggestions for the progression of this field and the possibility for development of an integrative framework. We begin our review with the most well-researched conceptual model of the home advantage.

Schwartz & Barsky, 1977) describes the causal processes connecting game-location factors to performance outcomes. The model considers four important game-location factors—the support of the home audience, travel fatigue of the away team, familiarity with the home venue, and (in some sports) competition rules that might favor the home team. These four factors contribute to the psychological states of competitors and coaches, and even though officials do not have a designated “home venue,” their psychological states are considered responsive to the support of a home audience. The psychological states of competitors, coaches, and officials contribute to the behavior of these individuals (e.g., decision making), and these behavioral responses tend to favor home athletes and generate more home success.

Supporting the proposals of the standard model, archival studies have demonstrated that components of crowd structure (size, density, and propinquity) and crowd behavior (booing, fighting, and cheering) are related to the magnitude of the home advantage (e.g., Armatas &

## The Standard Model

The standard model of the home advantage (Carron, Loughead, & Bray, 2005; Courneya & Carron, 1992;

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Pollard, 2013). Specifically, home teams are more successful in the presence of a large audience that displays positive (encouraging) behavior. Less is known about the processes through which this occurs. Evidence has shown that audience support can influence the decision making of sports officials (Downward & Jones, 2007), but the contribution of audience support to the behavior of athletes and coaches remains unclear. Experimental studies have demonstrated that officials are more likely to award discretionary decisions that favor the home team (e.g., extra time) and harsher punishments for the away team (e.g., warnings) in the presence of crowd noise compared with a no-noise control condition (Nevill, Balmer, & Williams, 2002; Unkelbach & Memmert, 2010). This officiating bias might be explained by motivational factors (officials prefer not to displease the crowd), or crowd noise might simply act as a decision-making heuristic whereby the likelihood that an incident is considered an infringement is increased by the presence of crowd noise (Nevill et al., 2002; Unkelbach & Memmert, 2010).

Alongside audience effects, the standard model considers the important roles of travel fatigue, familiarity with the home venue, and competition rules that favor the home team. The contribution of competition rules appears to be minimal (Allen & Jones, 2013), but home-advantage effects are known to remain high in the absence of an audience (Van de Ven, 2011). Many studies on the relationship between travel and the home advantage have shown that travel effects become important over relatively long distances. In particular, the home advantage is reported to increase by as much as 20% per time zone crossed (Goumas, 2013), and travel effects are potentially more important when athletes are travelling in an eastward direction (Recht, Lew, & Schwartz, 1995). To explore the role of location familiarity, researchers have assessed the home advantage before and after teams move to a new stadium (Loughead, Carron, Bray, & Kim, 2003; Pollard, 2002). These studies have demonstrated that teams experience a decline in the home advantage after they have relocated. This “new-stadium” effect could be related to unfamiliarity effects (e.g., pitch dynamics) but might also relate to another important factor in the home advantage—that of territoriality.

### The Territoriality Model

The territoriality model (Neave & Wolfson, 2003) considers the home advantage a manifestation of the natural protective response to territorial incursion. In many non-human animal species, an invasion of one’s perceived territory invokes a protective response that is associated with heightened testosterone concentrations and a higher occurrence of overt aggression. For example, observational studies of wild chimpanzees (*Pan troglodytes*) have

shown that testosterone concentrations are greatest before and after territorial boundary patrols (Sobolewski, Brown, & Mitani, 2012), and research into the behavior of laboratory mice has shown that offensive aggression is stronger in home environments (own territory) compared with neutral or rival territory (Jansen et al., 2011). Neave and Wolfson (2003) proposed that a similar territorial response operates in humans and should be observable in the competitive context of organized sport. In a sample of association football (soccer) players, they found that testosterone concentrations were considerably higher before home games compared with before away games and neutral training sessions.

In another study of territoriality, testosterone concentrations of elite junior ice-hockey athletes were shown to be higher prior to home games than to away games (Carré, Muir, Belanger, & Putnam, 2006), but rather than home-game testosterone increases from baseline, as found by Neave and Wolfson (2003), the data from Carré et al. (2006) pointed toward a decreasing testosterone response in away games. Carré (2009) more recently explored testosterone responses to competition outcomes and found a considerably higher testosterone increase after victory in a home venue compared with victory in an away venue. Rises in testosterone are thought to benefit athletic performance because they coincide with greater physical aggression and motivation to compete (Wood & Stanton, 2012). There is evidence that testosterone responses can predict subsequent aggression in humans (Carré, Campbell, Lozoya, Goetz, & Welker, 2013), but the tendency for home teams to display more physical aggression relative to away teams has not been fully supported (M. V. Jones, Bray, & Olivier, 2005). Higher levels of testosterone, associated with competing at home, might contribute to the home advantage in other ways, for example, by increasing risk-taking behavior and the metabolic rate of muscles and by improving spatial ability (M. V. Jones et al., 2005; Neave & Wolfson, 2003). However, these possibilities have yet to be tested in competitive sport.

In addition to testosterone, another hormone that changes in response to game location is cortisol. In the study of elite junior ice-hockey athletes, cortisol levels were shown to be lower before away games compared with before home games and baseline measures (Carré et al., 2006). Rather than an increased level of stress incurred from an opponent’s territory, as might be expected, this finding is indicative of higher levels of stress when performing at home. The finding that cortisol levels are highest in home venues supports qualitative evidence that athletes can feel under pressure to perform in front of their own fans (Terry, Walrond, & Carron, 1998). It also suggests that performing at home is not always conducive to better performance, given that cortisol is associated with a “threat” response to psychological stress

(Jamieson, Mendes, & Nock, 2013; M. V. Jones, Meijen, McCarthy, & Sheffield, 2009) and that this response, in turn, has been linked to poor athletic performance (e.g., Turner, Jones, Sheffield, & Cross, 2012). When athletes underperform, under the stress of a supportive home audience, this result is termed the “home disadvantage.”

### **A Home Disadvantage?**

The added pressure of a supportive audience has been proposed to increase the probability of “choking” (poor performance) in competitions of great importance (Baumeister & Steinhilber, 1984). A supportive audience can induce performance pressure and overcautious performance in critical situations—a pressure response that is purportedly moderated by experience and personality characteristics (Wallace, Baumeister, & Vohs, 2005). Moreover, athletes’ motivation to achieve success may be overridden by a desire to avoid failure (Wallace et al., 2005), and a common finding in competitive sports is that avoidance motivation predicts a higher occurrence of choking under pressure (Jordet & Hartman, 2008). Experimental evidence has indicated that supportive audiences contribute to a decline in athletic performance (Butler & Baumeister, 1998) or, at best, do not enhance it (Law, Masters, Bray, Eves, & Bardswell, 2003), even though participants in these experiments believed that the supportive audience helped them perform better.

The mechanism considered most responsible for choking in critical situations is pressure effects on attentional focus (Wallace et al., 2005). In most situations, athletes complete their movements automatically without having to consciously think about what they are doing. In win-imminent situations of high importance (e.g., championship point in a tennis grand slam), athletes will naturally try to do everything in their control to ensure they execute their task as well as possible. This desire often results in attention shifting from an external to an internal focus as athletes pay more attention to their movement responses (Wallace et al., 2005). This attempt to consciously control previously automatic movements often unfortunately results in poor performance (Masters & Maxwell, 2008). Experimental studies have revealed a choking response when too much attention is allocated to processes that usually run automatically (Beilock, Jellison, Rydell, McConnell, & Carr, 2006), and studies of professional sports leagues have demonstrated a disadvantage for home teams during win-imminent (high stress) situations (McEwan, Martin Ginis, & Bray, 2012). Nevertheless, the contribution of audience support to shifts in attentional focus remains an area for future research.

### **Moving Forward**

Research into the home advantage has progressed steadily in recent years, and archival material (from professional sports leagues) has provided a great deal of information about the factors involved in between-location variations in athlete and team performance. Research into the psychological and behavioral processes that underlie these relationships unfortunately is rather sparse and unfocused. Some evidence exists that athletes’ psychological states differ between home and away locations (see Carron et al., 2005) and that audience behavior contributes to the decision making of sports officials (see Nevill et al., 2002). But little is known about athletes’ and coaches’ responses to audience support or how attention and stress responses might shift in home and away conditions. Research into the home-advantage phenomenon would benefit from a more targeted focus on the psychological states of athletes. This focus might include assessments of decision making, attention, and stress responses. Such an approach would elucidate under what circumstances, and how, competing at home can enhance (and occasionally harm) athlete and team performance.

A critical question is whether the different models of the home advantage complement each other and can be amalgamated into a more general framework. For example, the occurrence of a home disadvantage in win-imminent situations might relate to fluctuating concentrations of testosterone and cortisol. Research has demonstrated that reproductively relevant behaviors (e.g., aggression) are related to a complex interaction between testosterone and cortisol such that testosterone relates to dominant behavior only if cortisol concentrations are relatively low (Denson, Mehta, & Ho Tan, 2013). If high levels of stress (cortisol) can block the effect of testosterone on dominant responses, this effect could help explain why athletes choke in win-imminent situations in which cortisol concentrations can increase rapidly. Furthermore, both audience pressure and territorial threat have a strong connection to motivational orientation (approach and avoidance) and this, in turn, is related to distinct physiological and cognitive consequences (see Blascovich & Mendes, 2010) that are similar to those observed in studies of game location (e.g., Carré et al., 2006). The balance of audience pressure (avoidance motivation) relative to the protective response to territorial incursion (approach motivation) might explain changes in neuroendocrine markers and why a home advantage can shift to a disadvantage in critical in-game situations.

Exploration of these effects will require a variety of experimental designs, and investigators might look to manipulate home and away locations (e.g., students in a “home” university laboratory and a “rival” university

laboratory) in which attention (e.g., eye movement) and autonomic markers (e.g., total peripheral vascular resistance) can be measured more easily (see, e.g., Rees et al., 2013). Video-based studies (in which crowd noise can be manipulated) can also provide useful information on how officials and coaches might react in real-world settings (see Nevill et al., 2002). Such experimental designs will no doubt incur a loss in ecological validity but are likely to complement the descriptive data collected from naturally occurring high-pressure competitions. A targeted recommendation might be to isolate/identify the different information (e.g., displeasure, encouragement) that is being transferred from audiences to athletes/officials and examine how this information contributes to subsequent decisions and behavior (e.g., aggressive actions, attention allocation). “Working the officials” is a common strategy among athletes and coaches, and spectators might also raise their noise levels (in response to unfavorable decisions) to increase the probability of more favorable decisions later in the contest. It is well documented that officials use prior knowledge and previous decisions to influence their current decisions (Bar-Eli, Plessner, & Raab, 2011), and an interaction between prior decisions and audience noise (venue) might better predict the decision making of sports officials.

## Conclusions

Game location has a powerful influence on performance outcomes in sport. The conceptual models discussed here each provide a unique take on the home-advantage phenomenon, and there are ample experimental and archival data to provide reasonable (but not robust) support for their main propositions. Indeed, the decisions of sports officials appear to be influenced by the behavior of the crowd (e.g., Downward & Jones, 2007), athletes show a territorial response that is consistent with that shown by nonhuman animals (e.g., Carré et al., 2006), and home support seems to disrupt athletic performance in win-imminent situations of high importance (e.g., McEwan et al., 2012). It is interesting that more is known about the responses of sports officials than about the responses of athletes and coaches. Officials tend to respond to crowd noise in a manner that favors the home team, but athletes are more complex—sometimes they respond well and other times they do not. This complexity is why a general model of home advantage for athletes is flawed, because athletes will not always conform to the model. For athletes, we need an integrative model that explains why a home environment can sometimes benefit, and at other times harm, athletic performance.

We have reviewed new studies that contribute to a better understanding of the home-advantage phenomenon. We consider this phenomenon an important avenue

of inquiry because these data not only can support consultants who target athletes’ stress responses to varying environmental conditions but also can provide a context to explore more generally how humans respond to territorial incursion and social pressure. Investigating territorial responses in humans can be challenging, but organized team sports present an ideal setting to capture the natural biological and behavioral changes that occur in a competitive environment. We recommend that researchers target their efforts toward developing a new conceptual model that can explain the psychological processes that govern success and failure in home and away locations.

## Recommended Reading

- Carron, A. V., Loughead, T. M., & Bray, S. R. (2005). (See References). A comprehensive overview of research on the standard model of the home advantage that separates research on game-location effects on psychological states from research on game-location effects on behavioral states.
- Jamieson, J. P. (2010). (See References). A comprehensive meta-analysis of the home advantage that targets the magnitude of the home advantage and explores potential moderator variables, including type of sport, length of season, and era of competition.
- Jones, M. B. (2013). (See References). A detailed narrative review of the home advantage in individual (rather than team) competitions that considers differences in the home advantage between sports that are subjectively judged (e.g., gymnastics) and sports that are objectively scored (e.g., tennis).
- McEwan, D., Martin Ginis, K. A., & Bray, S. R. (2012). (See References). An exploratory study into the home (dis)advantage in loss-imminent and win-imminent situations that shows how different competitive situations might influence how athletes respond to a supportive home audience.
- Neave, N., & Wolfson, S. (2003). (See References). The original proposal and experiments into the territoriality model of the home-field advantage, with multistudy explorations of differing concentrations of testosterone among athletes competing at home and away.

## Author Contributions

Both authors contributed equally to the writing of the paper.

## Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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