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Social influence of sport spectators

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Introduction

Social influence has been summarized as the change in one's beliefs, behavior, or attitudes due to external pressure that may be real or imagined (Cialdini, 2001).

In this chapter, we focus on the question of how (sports-relevant) behavior and athletic performances are influenced by others, especially active and passive (sports) spectators.

You have probably already experienced giving a presentation in front of a group of people. Were you influenced by the presence of your audience? Was your performance better, worse, or unaffected compared to the rehearsal session when you practiced alone? Is your performance influenced differently when the audience listens attentively as opposed to when they are noisily not paying attention? How does this presence of others impact performances and behaviors in the context of sports? In sports, social influence has already been investigated extensively (cf. Epting et al., 2011; Strauss, 2002b). A particular interest within social influence research is the home advantage in team sports (Allen & Jones, 2014; Carron et al., 2005). Research in this field is concerned with understanding whether the performance of the home team is better due to more of *their* fans being in the stadium.

Forms of social influence of spectators

The most basic differentiation of social influence is the one between a “directly evident” and “not directly evident” influence (see Strauss & MacMahon, 2014).

A *directly evident influence* is experienced when it is obvious, directly observable and there is no doubt that one or more spectators had an impact on the performance or behavior of the athletes. This may occur in the form of a spectator running onto the field to stop play or competition or the attempt to hurt or kill a player. A terrible example of the latter is the on-court assault of famous tennis player Monica Seles in 1993 by a fanatic spectator.

A *not directly evident influence* is harder to account for, and thus needs to be explained and embedded in psychological or sociological theory. This may mean that it is doubtful that the influence even exists at all. Moreover, the underlying explanation for the influence is not directly evident, is probabilistic in nature, and has theoretical and empirical support. In this chapter, we give an overview of this *not directly evident influence*.

To continue to generally discuss spectator influences, we can go back to 1935, when Dashiell published a list of potential types of not directly evident influences exerted by people on performers. Dashiell's list is useful to derive ideas for potential areas to study in this field.

Table 1: Types of influencers by Dashiell (1935; cf. Guerin, 1993).

- (1) a passive audience,
- (2) a co-worker not in competition with the performer,
- (3) a contestant,
- (4) an evaluator making comments on the work,
- (5) a co-operator, dedicated to the same goal,
- (6) an information controller, and
- (7) a prestigious or large audience.

This collection of possible types of influencers distinguishes first between the involvement with the actor (e.g., “passive audience”, “competitors”, “co-actors”, “cooperating or interacting”). Secondly, it highlights further characteristics of the other persons (e.g., “size and status of the audience”) and thirdly, it describes specific behaviors (e.g., “giving ratings”, “passing on information”, “volume”). According to Dashiell's classification (1935), a “passive audience” occurs when others are merely present, i.e., when others are only observing the actor and do not interact, support, or discourage them. In the context of sports, various types of influencers may be present: sport spectators, who may either be observing the sporting performance passively (mere presence) or engage in directly influencing behaviors like reinforcement, razzing, and encouragement (Landers & McCullagh, 1976). Spectators may come in small numbers to practice sessions, or in tens of thousands to e.g., the Soccer World Cup final (large and prestigious audiences; Dashiell, 1935). In either situation, the

spectators are commonly separated from the athletes, do not actively participate in the performance, and thus do not interact with the athlete. Spectators' social relationship with the actor of interest may vary from being fans who have never met the athlete, to relatives who are close to the athlete. The relationship between a performer and the audience was also found to impact the performance (Cox, 1966).

On the other hand, an athlete might be influenced by the co-actors and competitors present. Allport (1924) discriminated between effects resulting from the presence of a co-actor and rivalry effects found in competitive situations. The diverging influences are most likely due to the confounding role of competitive motivation in the presence of a competitor (Aiello et al., 1979). Co-actors are a borderline case in terms of their classification as spectators: they perform the same activity (in principle) at the same time as the actors (Zajonc, 1965), e.g., rowers or sprinters. These can be in competition with the actor or not (e.g., chess players in a tournament, who play simultaneously but not against each other). Co-actors and competitors are often more limited in number in comparison to spectators, and in many cases show similar personal characteristics (gender, age).

Coaches and referees are an integral social part of sports. They can be considered interactors that convey important information about the qualitative or quantitative evaluation of the performance. Rather than spectators who pass on general information to the actors (e.g., information about the end of the match, “cheering” as information for a home competition, etc.), coaches, judges and referees provide information about the performance result (e.g., “you were offside when you received that pass”) or the quality of the performance (e.g., “lower and upper leg were at an angle of 90 degrees”). They have other reasons for observing and are therefore not sports spectators in the strict sense of the word.

Starting with the seminal work of Kelman (1958), there have been various attempts to develop general models of social influence to explain the circumstances under which

performance, beliefs and attitudes change (for an overview, see Flake et al., 2017). A prominent example was formulated by Latané (1981), who proposed a *general theory of social influence*. It is kept “general” because this theory should refer to all facets of social influence and not to specific social processes.

The basic idea by Latané (1981) is that of a social force field in which there are sources of influence and one or more goals of influence. Different forces (the sources of influence) act on one or more goals, which, according to Latané (1981), can be divided into three aspects: “strength”, “immediacy” and “number”. “Strength (S)” can be described as the frequency, significance, power, or intensity of the source of influence and is for example operationalized through the status of the source (e.g., whether the audience includes experts, friends, fans, opponents, etc.), the behavior of the sources of influence (e.g., supportive, unsupportive), or through the predictable relationship to the target (e.g., emotional ties between the athlete and the audience). “Immediacy (I)” is the temporal and spatial immediacy of the source of influence and refers e.g., to the observable, immediate presence of an audience in a stadium, as well as to the not immediate presence of a media audience. “Number (N)” indicates the absolute number of persons present who may act as a source of influence in a specific case.

According to Latané (1981), the social force, “social impact (SI)”, is a multiplicative function of these characteristics: Strength (S), Immediacy (I) and Number (N). The multiplicative relationship signals that if one of the three aspects of a source of influence is eliminated, social influence does not occur. It is also interesting to note that Latané (1981) formulated another principle regarding the influence of the number of spectators, which he called the psychosocial law of the marginal impact (Latané, 1981, p. 349): The more spectators are present, the smaller the influence of each additional spectator. This is

particularly interesting in the context of the presence of others (for more information, see the section on home advantage research in this chapter).

Social facilitation: Social influence of passive spectators

In 1910, Burnham published the first scoping review that synthesized a number of studies on the presence of other performers (as co-actors or in competition). In this article, reference was made to the article “The dynamogenic factors in pace-making and competition” by Norman Triplett (1898), a pioneering study that is included in any textbook on social and sports psychology (for a critical discussion related to the interpretation of the results, see Martin, 2020; Stroebe, 2012).

Triplett (1898) looked at the influence of co-acting persons who are in competition with the performing person. First, in an archival study, he reported that cyclists with pacers (riders setting the cycling pace) were about 25% faster than those without pacers. Triplett (1898) discussed several explanations, e.g., the encouragement, the social comparison between competitors and their reciprocal distraction. He argued that the physical presence of a competitor leads to an “idea” of one’s own movement and thus releases one’s own energy (“dynamogenic explanation”, p. 531).

Secondly, he conducted an experiment in which his subjects (school children) had to turn a crank as quickly as possible on a “competition machine”, while either performing simultaneously with someone standing directly beside them, or whilst alone. Surprisingly, while some subjects’ performance improved as expected, others showed a performance decline or even remained unaffected by the presence of the competitor. The latter was explained by Triplett (1898) as a potential over-stimulation.

Burnham (1905, 1910) also reported some early academic and pedagogical-psychological studies conducted in Germany (e.g., by Mayer, 1904; Meumann, 1904), which did not investigate the effects of the presence of others in a competitive context (like Triplett, 1898), but in a co-acting setting. Meumann (1904), for example, found that children's performance was always poorer in the alone-condition in comparison to conditions where others were co-acting with them. He assumed that the pupils would be distracted by the presence of spectators but would show increased performance through increased effort. On the other hand, Burnham (1910) argued that this difference occurred mainly due to rivalries and the intention to impress, rather than distractions (cf. Guerin, 1993).

During the following decade, a few other seminal studies on the presence of others were conducted (e.g., Moede, 1920; H. Moore, 1917). In 1913, Moede (a former student of Wilhelm Wundt, a German psychologist, who established the first experimental psychological laboratory in Leipzig in 1879, and who is widely considered as one of the founders of experimental psychology, see e.g., Danziger, 2000) conducted a series of experimental studies in Germany with pupils and students who had to complete various tasks (e.g., measures of strength, concentration and memory) alone or in the presence of others ("just watching" as well as under conditions of co-acting with and without competition). The German report "Experimentelle Massenpsychologie" ("Experimental Crowd Psychology"), which strongly influenced the history of psychology – in particular social psychology – could only be published in 1920 due to the First World War.

In his experiments, Moede determined that, on average, performance increased when others were present, but that the variation of the performances compared to the alone-condition decreased. Moede (1920) explained the increases in performance with, among other reasons, people's ambition and striving for satisfaction. Interestingly enough, he was already

indirectly referring to the conditional aspects of strength tasks (and their energetically determined nature).

It was not until 1924 that the term *social facilitation* was coined by Floyd Allport. Allport published an English textbook which had a considerable influence on social psychological research. Here, he laid the foundation for experimental social psychology. He gave two explanations for the findings described when the presence of others was investigated: firstly, the rivalry between the actor and the co-actors, and secondly *social facilitation*, “...which consists of an increase in response merely from the sight or sound of others making the same movement” (Allport, 1924, p. 262).

Allport (1920, 1924), in his numerous experiments, used e.g., association tasks, among others. His subjects were asked to solve the tasks under alone-conditions as well as under conditions with an audience (four or five persons, no competition). With this spectator condition, Allport wanted to distinguish from studies such as Triplett (1898), in which conditions were competitive and thus spectator influence and competition were combined. He hoped to use the conditions of cooperation to investigate the “real” influence of spectators. It turned out that under the conditions of co-action, the quantitative performance with regard to the associative tasks was increased. More ideas were also identified in the production of critical arguments. Contradictory to these findings, Meumann (1904) and Burnham (1910) found that creative tasks that involved active problem-solving were inhibited rather than facilitated in the classroom, where co-actors are present.

This newly identified field of social facilitation was soon picked up by various disciplines: similar experiments were conducted with non-human animals (e.g., monkeys, ants, finches, cockroaches, rats, turtles, sunfish; for an overview of the anthology, see Zajonc, 1969) as well as with human subjects (e.g., pupils, students; workers). The majority of these

studies compared performances in cognitive (or motor) tasks in the presence of spectators or co-actors to performances alone (the usual control group).

After four decades of numerous empirical studies with human as well as animal subjects, which were carried out without a sound theoretical framework (for a detailed overview, see Guerin, 1993; Strauss, 2002a), both performance improvements and deteriorations were observed, yet it was not until 1965 that a satisfactory theoretical framework to explain the contradictory results from human and animal experiments was provided with the ground-breaking work by Robert Zajonc (1965).

Zajonc (1965) developed an integrated activation-theory model to explain the partly contradictory research results. Zajonc (1965) distinguished between two types of tasks: well-learned, i.e., easy tasks, and novel, i.e., complex tasks. He put forward the hypothesis that well-learned, easy routine tasks are more likely to be positively affected by the presence of others (*social facilitation*), while complex, novel tasks are more likely to be negatively affected (*social inhibition*). To support his argument, Zajonc referred to the *drive theory* (Hull, 1943; Spence, 1956), according to which the presence of others from the same species leads to an innate increase in arousal and a willingness to respond to the actions of others.

Figure 1 shows how, according to Zajonc (1965), the presence of others leads to either social facilitation or inhibition. According to this, arousal tends to lead to an increased probability of reactions that have priority in a person's behavioral repertoire, so-called dominant reactions which are considered easy. On the other hand, social presence inhibits non-dominant reactions, i.e., novel and complex behaviors.

Another activation-based model places particular emphasis on the evaluation apprehension of people who perform a task in the presence of others (Cottrell et al., 1968). Here, arousal through the presence of others is not attributed to an innate drive, but to the learned expectation and concern of being evaluated by others. Experimental studies show that

this evaluation could play an important role when performing a task in the presence of others (Maxwell et al., 2008; Worringham & Messick, 1983). These results also follow the expectations arising from the *social impact theory* described above (Latané, 1981). For example, the assumption of being evaluated leads to better performance among people with high self-efficacy expectations (expectations of their own ability) than the assumption of not being evaluated (Sanna, 1992). A subsequent meta-analysis by Uziel (2007) found that subjects with high levels of extraversion and self-esteem (positive orientation) experienced performance increments, while subjects with high levels of neuroticism and low self-esteem (negative orientation) performed significantly worse in both simple and complex tasks.

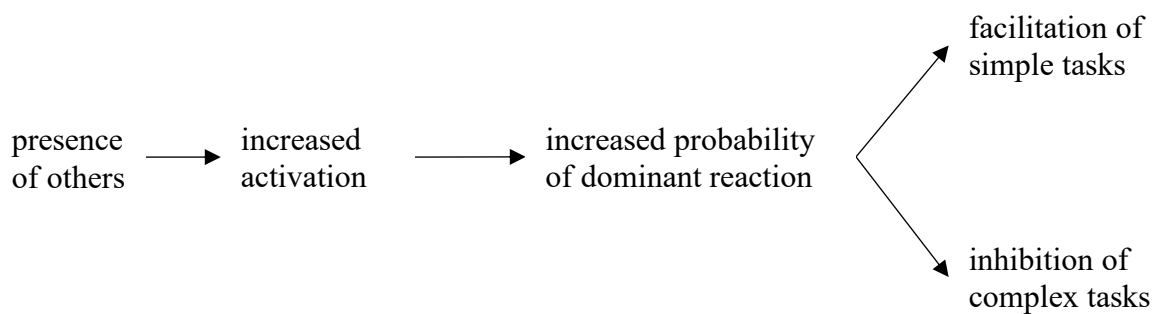


Figure 1. Social facilitation and social inhibition (adapted from Zajonc, 1965).

Other explanatory models following these first two approaches focus on attentional processes (see Strauss, 2002a), which are disturbed by the mere or active presence of others. In these models, it is assumed that the presence of an audience impairs the optimal alignment of the actor's attention to the task to be performed. This can lead to conflicts of attention. Here, two directions can be distinguished: Firstly, there may be a conflict between the attention paid to a social stimulus – such as the audience, the co-actor or the experimenter (see Brown & Harkins, 2020) – and non-social stimuli – such as noise – and the task

(“distraction”). On the other hand, there can be an attentional conflict between the self and the task (“self-attention”).

Several theoretical advances revolve around this concept of cognitive overload and an exhaustion of the attentional capacity (*overload hypothesis*, Baron, 1986; *capacity model*, Manstead & Semin, 1980; *distraction-conflict hypothesis*, Sanders et al., 1978, Figure 2). To avoid task failure, a “priority ranking” of the conflicting stimuli is created (Boggs & Simon, 1968), which narrows the attentional range and taxes the cognitive capacity. Their hypothesis states that new, complex tasks with high attentional demands are impaired, whereas well-learned tasks that require less attention are not impaired or even facilitated in this context.

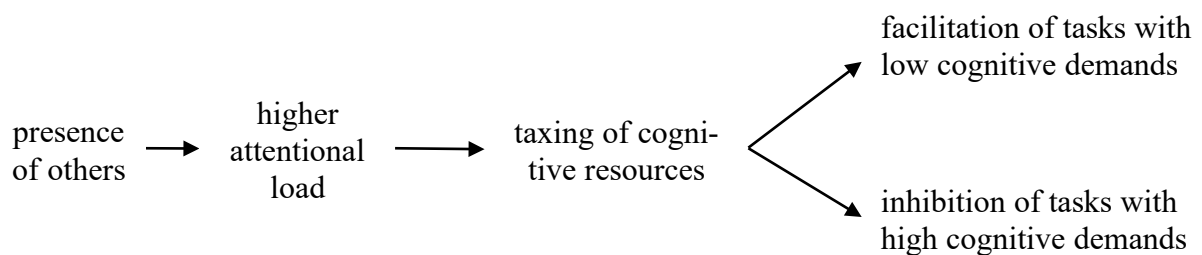


Figure 2. Visualisation of the capacity model (Manstead & Semin, 1980).

The biopsychosocial model by Blascovich and Tomaka (1996) and Blascovich, Mendes, Hunter and Salomon (1999) integrates both theoretical frameworks in the domain of human behavior and emphasizes the social, information-processing processes of the actor. In addition to physiological (e.g., arousal) and cognitive processes (e.g., attention, cognitive assessment), their model addresses emotional processes (e.g., positive or negative feelings). If a situation is perceived as relevant and important to the goal, the person’s own resources and possible actions are evaluated in order to cope with it. This evaluation can be innate or learned, unconscious or conscious. If one’s resources are considered sufficient, the situation is perceived as a challenge, and if insufficient, it is perceived as a threat (Figure 3). This

ultimately influences behavior and performance in this situation. According to Blascovich and colleagues (1999), the mere or active presence of others increases the importance of a situation and thus the probability of perceiving it as a challenge or threat. Derived from this, the presence of others in simple, well-learned tasks is more likely to lead to the situation being perceived as challenging and to better performance than when the task is performed alone. On the other hand, during complex or new tasks, the presence of others will cause the actor to perceive the situation as a threat and should therefore lead to decreased performance.

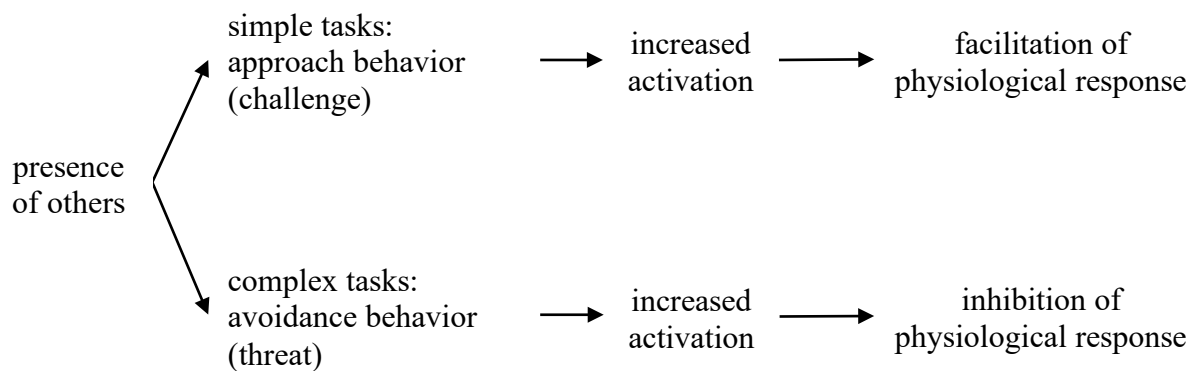


Figure 3. Visualisation of the biopsychosocial model (Blascovich et al., 1999).

The proposal of these theoretical explanations led to a significant increase in the number of studies investigating social facilitation and social inhibition. This growth was especially noticeable for research into social influence on motor performances (Figure 4).

By 1983, the quantity of empirical evidence allowed for the estimation of the overall magnitude and direction of the social-facilitation effect: in a meta-analysis, Bond and Titus (1983) quantified the magnitude of the social facilitation due to the presence of others on human performance. They included 241 studies, in which the participants primarily worked on cognitive tasks. The overall influence of the presence of others was very small and the authors concluded that only 0.3 - 3% of the variance in performance parameters can be

explained by social influence. The task's difficulty (simple vs complex) and its requirements (speed vs accuracy requirements) moderated the influence of others' presence on task performance. Yet it has to be noted that the quality of the experiments was largely low due to low internal validity and the potentially confounding presence of the experimenter (Guerin, 1993).

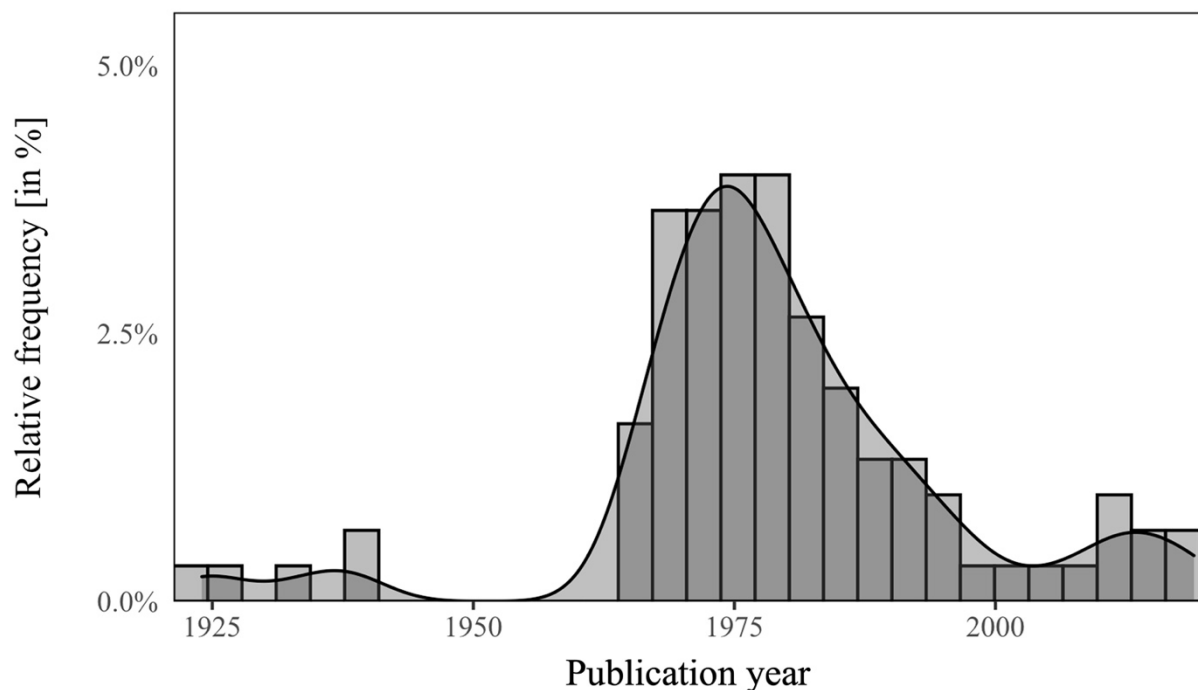


Figure 4. Publications on social facilitation and motor performance since 1924 (see van Meurs et al., 2021, p. 26).

In the context of sports, social facilitation due to the mere presence of spectators was investigated in numerous studies (see Strauss, 2002a). Very few studies used distinct motor tasks. Rather, this research employed cognitive tasks with fine-motor coordination-skill demands: e.g., Pursuit Rotor Task (Martens, 1969a, e.g., 1969b, 1969c; Wankel, 1977) or a finger labyrinth task (e.g., Miyamoto, 1979; Rajecki et al., 1977). Other gross-motor tasks involved balancing (e.g., Landers, 1975; Lau et al., 2019; J. F. Murray, 1982), running and measures of strength (e.g., Feltz et al., 2011; Martens & Landers, 1969; Moede, 1920;

Sheridan et al., 2019). In a comprehensive narrative review, Strauss (2002a) distinguishes between studies on the spectators' influence during predominantly condition-based tasks (performance highly dependent on energetic potentials, e.g., strength, endurance, speed) or during predominantly coordination-based tasks (performance highly dependent on information-processing skills, e.g., fine-motor skills), or during tasks that require a mixture of both condition and coordination. Overall, however, the empirical results do not support one theory. Strauss (2002a) found that the presence of others positively affected condition-based, also called energy-based/effort-based tasks (*general drive hypothesis*, Zajonc, 1965), and negatively affect coordination-based, also called skill-based tasks due to higher cognitive demands (*overload hypothesis*, Manstead & Semin, 1980): During tasks with high condition demands, the presence of others tends to result in an increase in performance; in tasks with high coordination demands, the presence of others tends to lead to a decrease in performance. This is especially true if the task is not yet well learned. If the task requires both condition and coordination, no difference in performance is to be expected when others are present (Strauss, 2002a). A recent and comprehensive systematic review and meta-analysis considering 100 years of experimental research of the existing empirical evidence (van Meurs et al., 2021) indicates a similar trend in line with the findings by Bond and Titus (1983) and Strauss (2002a): Condition-based tasks mostly reliant on speed appear to be facilitated (e.g., Feltz et al., 2011; Worringham & Messick, 1983), while coordination-based tasks performed under time- and precision-pressure show inconsistent results (e.g., Lau et al., 2019; Miyamoto, 1979). Effect sizes for tasks with coordination-demands are smaller and show more variability. Van Meurs et al. (2021) conclude that the findings in the context of motor performances support both the drive and the overload hypothesis as expected.

Nonetheless, Strauss' narrative review (2002a) as well as van Meurs et al.'s (2021) review and meta-analysis suggest that theoretical models on the influence of spectators in

relation to a precise taxonomy of sporting performance still need to be developed. In general, the social influence of the passive or co-active presence of others during sporting performance – as well as during cognitive tasks (Bond & Titus, 1983) – seems to be rather small. Yet, several questions remain unanswered to this day: Is social facilitation driven by activation or attention? What is the role of the experimenter in empirical studies? How does virtual presence affect cognitive and even motor performance? This latter question has received particular attention in the last decade. In the *social impact theory* (Latané, 1981), a virtual presence is represented by the immediacy aspect. Several studies have made first advances to study whether a social influence occurs in digital virtual realities without the physical presence of others (Feltz et al., 2011; E. Murray et al., 2016; Snyder et al., 2012). College students were able to hold a plank position (fitness exercise) longer when co-planking with another subject via Skype in comparison to planking alone (Feltz et al., 2011). Female subjects performed better on a rowing ergometer if they were not only presented with a virtual reality environment, but also with a virtual teammate with whom they co-operated (E. Murray et al., 2016). New empirical and theoretical insights into the social influence of others are expected in using digitalization and the development of ever-improving virtual-reality (VR) environments. The research should be mindful of the difference between virtual and real-world situations, however, and avoid simple generalization of results from one to the other.

E. Murray and colleagues (2016) developed a study design to test the use of virtual reality during exergaming. More specifically, they wanted to know how a virtual environment might affect both performance and subjective evaluation measures as well as the additive effect of a virtual co-actor. To do so, they had $N=60$ female subjects ($M=20.20$ years old) row in either of three conditions:

No virtual reality (NVR): no virtual-reality environment was presented during the rowing exercise;

Individual virtual reality (IVR): participants saw a virtual-reality environment; however, no team-mate was present, and no mention was made of it;

Co-actor virtual reality (CVR): participants saw a third-person virtual-reality environment with another boat rowing next to them. They were told that they were rowing simultaneously with another subject (which was a cover story and “confirmed” via a telephone call with a confederate).

In the CVR condition, participants were told that the team score would be derived from the shortest distance rowed in nine minutes. Meanwhile, the team-mate’s performance was manipulated in such a way that the second boat was 40% faster than the baseline performance by the subject.

While the CVR-group covered a significantly greater distance than the IVR-group and thereby had a higher heart rate, this difference was not associated with the other performance measures (power and strokes per minute). Moreover, the subjective self-reports of felt arousal, positive feelings, affect and enjoyment during the exercise, perceived exertion and intrinsic motivation did not differ between the two groups, indicating that these psychological measures did not account for the increase in performance in the presence of a team-mate. The authors suggest that the team-mate’s performance may have been used as a benchmark or that a more representative pacing strategy was employed.

While this experiment does add to the objective quantification that another person’s presence (physical or virtual, see also Blascovich & McCall, 2013; Feltz et al., 2011, 2014) may positively affect performance outcomes, it does not yet clarify the psychosocial or attentional processes at the heart of this effect.

Home advantage and disadvantage: Social influence of active spectators

Spectators in a sports-relevant context are usually not merely present or co-acting, but also behave, sometimes consciously, and may exert social influence, e.g., to support the actors during their performances. Additionally, they may have a negative influence, e.g., by behaving dismissively, which prevents actors from performing optimally. These behaviors include visual characteristics (e.g., waving flags, distracting clothing, etc.) as well as auditory (such as noise, shouting, singing, etc.). As long ago as 216 BC, the writer Polybius reported that a fistfight at the Panhellenic Games in Olympia between Cleitomachus and Aristonikus (see Guttman, 1986) was significantly influenced by the audience's shouts. These other behaviors that spectators can engage in determine the "strength" aspect in the *social impact theory* by Latané (1981), or, with regard to the immediacy aspect, the direct or indirect presence of spectators (e.g., spectators may be in the stadium, but also on the internet or in front of the TV). The influence of digitalization on the "number" (N) aspect has increased massively in the last few years, as can be seen in the TV ratings and the online streaming services, next to the physically present number of spectators in the stadium.

Laird (1923) carried out what was likely the first experimental investigation of the influence of the hostile behavior of spectators in a sports-relevant context. He examined the influence of a mocking ("razzing") audience on various motor skills. "Razzing" represents an attempt to discourage the athlete and can be understood as negative feedback. In Laird's (1923) experiment, the test subjects had to complete several tests in the presence of calm and friendly spectators at first, followed by the same tests, this time performed in front of scoffing spectators. It turned out that, especially in coordination tests, performance dropped significantly when the subjects had to perform in front of razzing spectators.

However, it cannot be assumed that non-supportive behavior always leads to a decrease in performance (and supportive behavior to an increase), as a study by Kozar (1973)

showed. He had his subjects learn a balancing task either alone, in front of a supportive or a non-supportive audience. The learning progress across multiple trials did not depend on the behavior of the audience.

Other coordination-based skills that have received research attention were closed motor skills from different sports. Epting, Riggs, Knowles, and Hanky (2011) examined individual actions in basketball (free throw), baseball (pitching) and golf (hitting a golf ball) in an experimental study design (with the three observer-conditions cheering, jeering and silence). The free-throw performances remained unaffected by the experimental manipulation, while baseball players were negatively influenced by the jeering and golfers performed significantly worse both in the cheering- and the jeering-conditions. Hence, the influence appears to be dependent on the type of sport, however, it remains unclear why these differences exist.

For predominantly condition- (or energy-/effort-) based tasks (requiring the consumption of oxygen, e.g., endurance, speed, power tasks), it is often assumed that encouragement of an active spectator leads to an increase in effort and motivation and finally to an increase in performance, resp. to an decrease in the case of discouragement of an active spectator (see e.g., Strauss & MacMahon, 2014; Wallace et al., 2005). However, there are only a few controlled experiments testing this assumption. Recently, Edwards et al. (2018) showed that a verbally encouraging spectator leads to relevant performance increments in an endurance task (20 minutes on an ergometer) and a speed task (a sprint cycling test with two 30 sec bouts) when compared to a control condition with a passive spectator. Otte et al. (2020) experimentally tested the effect of noise on passes (passing times and accuracy) of soccer players in a standardized technical training environment called “Footbonaut”. The players were faster (passing times) in the (0) baseline condition (constant light signals and beep sound signals, 75dB) in comparison to the condition in which (1) no auditory information was

available, as well as in comparison to (2) the negative auditory-cue condition (e.g., loud crowd booing presented through speakers, 85 dB), but not in comparison to (3) the positive auditory-cue condition (loud crowd singing, also presented through speakers, 85dB). Passing accuracy was not affected by the noise conditions.

The direct or indirect social influence of active sports spectators has been studied in the context of home advantage, where the outcome of a competition on a group level but also individual level in so called home and away situations (e.g., winning and losing statistics at home, won yards in football etc.) is investigated. From here on, we will focus on large audiences as categorized by Dashiell (1935, Table 1).

In an article in the New York Times on 9 January 1972, the renowned sports columnist Leonard Koppet was probably one of the first observers to introduce a definition of home field advantage in a sports context: “Being at home increases your chance of winning”. In the sports-science literature, home advantage is described as the increased probability of successfully completing a sporting competition under “home” conditions (one’s “own” sports stadium, one’s “own” bobsleigh run, etc.; see examples in Carron et al., 2005; Courneya & Carron, 1992).

A home advantage in individual sports has rarely been documented to date, and if so, the effect was found to be relatively small (see e.g., the concerned chapters in Gómez-Ruano et al., 2021; Jones, 2013). In a recent study, the opposite – a home disadvantage – was found for biathlon shooting performances across tournaments from 2001 to 2017: athletes from the top quartile of the ranking missed significantly more shots when performing in their home country as opposed to when performing abroad (Harb-Wu & Krumer, 2019). However, after a review of the available literature, Jones (2013) concludes that a home advantage in individual sports can only be identified (and if so, only at a very low level) if the result is mediated by a subjective component, for example because refereeing judgements are included.

Unlike in individual sports, it has been shown consistently that a home advantage exists in team sports (for a comprehensive overview, see the edition by Gómez-Ruano et al., 2021). Many comparing overviews show a lot of variation in the size of the home advantage (see e.g., Carron et al., 2005; Courneya & Carron, 1992; Jamieson, 2010; Pollard et al., 2017; Staufenbiel et al., 2015; Strauss & MacMahon, 2014): Interestingly, the magnitude of the home advantage differs as a function of the type of sport. In reviewing the existing evidence, the home advantage was strongest in soccer and weakest in baseball and cricket (e.g., Jamieson, 2010; Jones, 2018). Moreover, a number of archival studies show that home advantage in soccer and other sports varies between countries (e.g., Pollard et al., 2017; Pollard & Gómez, 2014b; Riedl et al., 2014) as well as between men and women (Pollard et al., 2017; Pollard & Gómez, 2014a). In male team sports leagues, the home advantage is usually higher than in female leagues. For soccer in particular (but also in other team sports), it was found that home advantage has declined in recent decades, in some cases significantly (Palacios-Huerta, 2004; Peeters & van Ours, 2020; Pollard & Pollard, 2005; Riedl et al., 2014).

A key question in the understanding of home advantage revolves around the underlying mechanisms. The most frequently investigated reasons so far are the influence of spectators as well as that of referees (see e.g., Pollard & Armatas, 2017). However, travel factors, (competition/tournament) rules, familiarity with the venue, tactics/strategies of coaches, and physiological and psychological variables are also taken into account. These potential influencing factors can be found in the seminal additive framework model developed by Carron et al. (2005).

When athletes, coaches, referees or fans themselves are interviewed, they report that they perceive spectators to be the most important factor for the home advantage (Anderson et al., 2012; Fothergill et al., 2014). Fothergill and colleagues (2014) interviewed professional

soccer players and coaches and asked for their views on home advantage. Overall, the respondents assumed that fans have an influence on the players. For example, one soccer player explained that it is very important for players to have the fans' support: "[...] of course for a player the big thing is to have the fans behind you [...] the best thing when you play at home is the fans" (Fothergill et al., 2014, p. 323). The influence of the spectators is therefore often considered to be the decisive factor for the home advantage, e.g., when a loud audience supporting the home team or local athletes is assumed, or even when spectators are present in large numbers. This is frequently called the thesis of social support (Strauss, 2002b).

The "classic" assumption is that higher spectator numbers (or the measures derived from them) are advantageous for the home team and disadvantageous for the away team. Schwartz and Barsky (1977) argue that a large number of spectators would indicate higher social support for the home team from "their" home audience and at the same time create social rejection for the away team. In line with this thinking is the idea that a larger number of spectators would result in a higher degree of partiality, which is expressed in the form of different public behavioral characteristics such as cheering, booing, etc. This is used to forecast increases in performance for the home team and decreases in performance for the away team.

Various studies (e.g., Peeters & van Ours, 2020; Pollard & Armatas, 2017; Strauss & Bierschwale, 2008; Strauss & Höfer, 2001) examining a large number of games have shown that the number of spectators significantly correlates with the result, but only slightly at best, i.e., a weak effect. It is consistent with the results reported by Leite and Pollard (2018), who, in a worldwide analysis of 47 countries, found that the home advantage in the second soccer division is almost always higher than in the first division. As a rule, however, the average number of spectators in the first division is higher than in the second division. Moreover, some studies have shown that there is a relevant home advantage in youth soccer (e.g.,

Staufenbiel et al., 2018) and in amateur soccer leagues (e.g., Wunderlich et al., 2021), although the number of spectators is usually very small in these games (often only 50-200 spectators, if spectators are present at all).

The few studies on games behind closed doors that have been published in peer-reviewed journals before the COVID-19 pandemic started, commonly report a very small N (and are thus fraught with high uncertainty). Generally, they show no change in home advantage when no spectators are present, e.g., in a small archival study of Italian soccer, Van de Ven (2011) examined 20 games behind closed doors (due to restrictions on clubs where there had been previous spectator riots). Moore and Brylinsky (1993) similarly observed eleven basketball games in the North American college league, which were played without spectators due to a measles epidemic. When compared to matches played by the same teams in the presence of spectators, there were no significant differences in various performance measures (e.g., number of points, free-throw rate). However, these studies are limited by the small number of matches that can be considered as matches without spectators, and by the fact that the home advantage statistics in a league vary considerably from season to season (see e.g., Peeters & van Ours, 2020; Pollard & Pollard, 2005; Riedl et al., 2014). Several thousand matches are necessary to identify substantial trends and correlations. This necessity is probably caused by the random variability in team success that is particularly high in soccer, averaging 80% in one game, as physicist Heuer (2020) has calculated for the German Premier league in soccer. Consequently, this means that only 20% of the total variance (on average) is left for substantial possible cause to explain differences in the home advantage.

In 2020, the number of games behind closed doors across many countries and sports increased substantially. As a result of the COVID-19 pandemic, from May 2020 onwards, soccer matches in the professional leagues throughout Europe and worldwide were played without (with the German soccer league being the first to declare this) or very few spectators

until the end of the 19/20 season in July/August 2020, and again in some parts in the season 20/21. The number of publications analyzing the now available data on the absence of spectators increased quickly (for an overview, see Benz & Lopez, 2021), conducted by various research groups (cf. international comparisons: Benz & Lopez, 2021; Bilalić et al., 2021; Bryson et al., 2021; McCarrick et al., 2021; Wunderlich et al., 2021), but often only analyzing one or a few soccer leagues (e.g., Tilp & Thaller, 2020 for the German Premier soccer league). These differ considerably not only in the direction of the results but also regarding the number of leagues included, the number of matches that were considered, the characteristics of the matches chosen for comparison as well as the methodologies and performance indicators. Although this special situation in the stadium appears to be similar to previous games held behind closed door, there are a few disparities that may distort the results if not considered. The additional hygiene protocols and regular tests for COVID-19 in combination with a tightened match schedule and hardly any preparation are assumed to affect the players' performance. Additionally, the change of rules, allowing five substitutions rather than three, has considerable potential to alter the individual demands of the game. Notwithstanding these limitations, the large international comparison studies like Bryson et al. (2021) are the most informative. This study examined all matches from 23 professional soccer leagues in 17 countries and compared the matches without spectators during the pandemic to those with spectators before the COVID-19 pandemic (a total of $N=6,481$ matches). Bryson et al. (2021) showed that, across all leagues, the average results (i.e., goal differences or points) of the games behind closed doors do not differ, while in other studies that compared leagues, they only differ slightly from the pre-COVID games (see e.g., the studies by Benz & Lopez, 2021; Bilalić et al., 2021; McCarrick et al., 2021; Wunderlich et al., 2021, which identify overall a - often small - reduction of the home wins, but the home advantage still exists in games played

behind closed doors, e.g. McCarrick et al. (2021) found a small reduction of won home games from 43% to 41%), but there are changes in the number of yellow cards awarded. “We find that the absence of a partisan home crowd has no effect on the final match score line, but it does result in a reduction of one-third of a yellow card for away teams relative to home teams.” (Bryson et al., 2021, p. 4). With respect to refereeing decisions, a similar pattern of results has also been reported, for example by McCarrick, Bilalić, Neave, and Wolfson (2021), who investigated the COVID-19-related changes and their effect on a number of measures for 15 European leagues. These measures included the outcome, as well as the dominance of a team (measured by the number of corners, shots, and shots on target) and the refereeing decisions (fouls, yellow and red cards). Bilalić, Gula, and Vaci (2021) used parts of the same archival data (12 European leagues), supplemented by a few other (control) variables, and tested successfully a so-called joint Home Advantage Mediated (HAM) model, which includes direct and indirect paths, using a joint Bayesian mixed effects model. Here, the dominance of a team – now called team performance – and refereeing decisions are used as mediating predictors for the games’ outcome (points and goals, see also McCarrick et al., 2021, who called this team performance).

Similar to many other studies investigating spectator influences and various home advantage outcomes (e.g., goals, points, see above), the variance between the several leagues is considerable. On the one hand, there was an increase in the home advantage observed in Italy and Portugal, while on the other hand, a considerable decrease was found in Greece or the Premier League in Germany (see Tilp & Thaller, 2020), but not the second and third divisions in Germany (see Fischer & Haucap, 2021).

Home advantage in COVID-19 times and games behind closed doors has also been investigated in other sports, however, not as exhaustively as soccer, and still presenting a lot of variance. This variation between different sports does not allow the conclusion that a large

crowd is mainly responsible for the home advantage. For the COVID-19 season 19/20, Higgs and Stavness (2021) found a reduction of home wins in the NHL and the NBA, which were finished in a bubble, excluding spectators and limiting all games to the same location, but no change in the NFL and the World Series Baseball league. For the following season 20/21, in which some games were played without and some with spectators (often limited in size), Szabo (2022) found a reduction in the home wins in the NFL (American Football), and in the NBA (basketball), but not in the NHL (hockey). Fazackerley et al. (2022) investigated individual performance statistics of players 2020 in the professional Australian National Rugby League (NRL) and did not find any substantial differences in effort-based (e.g., running distance) or skill-based performance measures (e.g., decoys) for the same players in games with and without a large crowd no crowds. They concluded that “the findings suggest that NRL players’ performance appears unlikely to be affected by the presence or absence of a crowd.” (Fazackerley et al., 2022, p. 1).

In Pre-COVID-19 times with games in which the presence of spectators is allowed an additional emphasis (with respect to the number of spectators) in the explanation of home advantage is the capacity utilization of a stadium (spectator density; cf. e.g., Agnew & Carron, 1994). It is often argued that a higher spectator density (actual number of spectators present divided by the number of seats) is responsible for the home advantage, e.g., because it is more likely to create an intense, uproarious atmosphere which leads to a special home advantage. Nevertheless, the empirical evidence does not support this hypothesis: Strauss and Bierschwale (2008) found a correlation of spectator density and matches won of almost $r=0$ for the German handball league. Pollard (1986) and Pollard and Armatas (2017) also did not find a correlation between home advantage and spectator density.

Overall, there is little to no correlation between the number of spectators or spectator density and home advantage. The theory of social support – according to which more

spectators provide more social support and therefore may positively affect the home team's performance – cannot be supported by the results at present, even if ongoing evaluations regarding COVID-19 pandemic-related spectator-less conditions are still emerging, which may warrant a reassessment. If one follows the *social impact theory* by Latané (1981), a linear relationship between crowd density or number of spectators and home advantage is not expected according to his “psychosocial law of the marginal impact”: he argued that the influence of each additional spectator decreases. The usual studies on number and density, however, use linear correlations, so that for conceptual reasons (Latané, 1981) as well as for statistical reasons, no relevant association can be expected.

In light of these findings, it could be argued that social support is not expressed in terms of number or density, but only in terms of concrete supportive or opposing behavior, and that this must be investigated consistently. If, however, we do not look at anecdotes and self-reports like Polybius (see above), but at the studies that examine the influence of specific spectator behavior (cheering, jeering, aggressive behavior) on athletic performance or behavior in a competitive situation, we find that the number of studies is negligible for cheering (Epting et al., 2011; Salminen, 1993; Strauss, 2002b), jeering (Epting et al., 2011; Greer, 1983) and aggressive behavior (Thirer & Rampey, 1979). On the other hand, although the number of fouls is influenced by spectator behavior, among other things, performance is not. This was demonstrated by Greer (1983): In a study with American basketball teams, he examined the influence of spectator protest (“spectator booing”) on the number of fouls, turnovers and baskets. When booing occurred for at least 15 seconds in a game, the five minutes following were called the “booing interval”. Booing usually was a reaction to refereeing decisions against the home team or the actions of the away team. It was found that neither home nor visiting teams benefited significantly from the booing with regard to shot success and turnovers, but there were changes in the number of fouls: more fouls were called

against the visiting teams than the home teams. Meanwhile, the number of fouls decreased for the home teams in the “booing interval”. Yet again, this study (as well as the basketball study by Epting et al., 2011) did not show an effect of booing on sporting performance.

Following the methodological idea of Greer (1983), Strauss (2002b) conducted a study examining the effect of cheering on American Football performance by analyzing the sporting performance of a team in several games and the behavior of parts of the audience. He found no evidence that supportive spectator behavior such as cheering during the time before the action has an influence on subsequent performances. Salminen (1993) also found no effects caused by spectator behaviors in various sports. These few studies that examine the specific behavior of viewers may show either no or little or at best highly specific influences (see Epting et al., 2011).

So far, the question of the *direct* influence of spectators on sporting performance has been considered. Since in all team sports referees are in control of the event, it is also conceivable that the spectators influence the referee, which in turn would have an impact on the development and outcome of the game. The question of this *indirect* social influence of spectators on athletes mediated by distorted refereeing decisions is examined particularly in the context of “noise from spectators and refereeing decisions” (e.g., MacMahon & Strauss, 2014). It is assumed, for example, that referees receive cues (e.g., increased noise) from the audience, especially in ambiguous situations, that indicate a foul. The subsequent decisions would then favor the home team.

The classic experiments of Nevill, Balmer, and Williams (1999, 2002) show that judges take into account the information from the spectators (here: noise) in their decision-making process. Soccer referees, coaches and players were shown soccer matches with and without sound. The participants attributed more fouls to the visiting team (in comparison to the away team) when they watched the recordings with sound. The decisions made when

watching the situations with sound also mirrored the actual referee's decision in the game. Unkelbach and Memmert (2010) were able to replicate this experiment, however, using a significantly improved methodology. In the first – experimental – part of their investigation, Unkelbach and Memmert (2010) found that referees awarded more yellow cards under the influence of noise. Additionally, they conducted an archival analysis, which confirmed that away teams were awarded significantly more yellow cards than home teams. This difference correlates significantly with spectator density, indicating that spectators act as an additional source of information for referees. They also found that the difference in the yellow cards given to home and away teams correlated significantly with the difference in goals (their measure of home advantage) but explained only a small proportion of the variance (approx. 1%), suggesting that referees can explain at best only a small part of the home advantage.

This difference in the number of fouls may indeed affect the match outcome. Lehman and Reifman (1987) report in an older archival study that top players in the Los Angeles Lakers (a team in the North American professional basketball league NBA) were awarded fewer fouls in home games than in away games in 1984 and 1985. This corresponds to the observation by Nevill, Newell, and Gale (1996) that about two thirds of penalties in soccer are awarded to the home team (see also Boyko et al., 2007). Additionally, two thirds of the yellow/red cards are given to the away team, which in turn can lead to a home advantage, among other things because of the numbers advantage this creates when players are dismissed (red card; Pollard & Armatas, 2017). Interestingly, when analyzing games in the European Rugby Cup, Dawson, Massey, and Downward (2020) found that the number of yellow cards awarded to away teams increased after implementing the Television Match Official (TMO). The authors speculated that before the TMO, the on-field referees tried to avoid favoring the home team, whereas this consideration was then absent for the TMO.

Nonetheless, the interpretation of the entirety of empirical data regarding the allocation of fouls and cards remains vague. It is unclear what the driving mechanisms are behind the results found by e.g. Bryson et al. (2021), McCarrick et al. (2021) or Bilalic et al. (2021) regarding yellow or red cards in games behind closed doors. One explanation is the lack of stimuli from the spectators, but the correlation could also be attributed to athletes and their change in tactics or behavior due to the lack of noise (see e.g., the recent experiment on passing times and accuracy in soccer by Otte et al., 2020, or the arguments made by Benz & Lopez, 2021). On the one hand, the referee could be influenced by the spectators, on the other hand, the “away athletes” could also appear to be more aggressive and the referee’s decision would thus be a necessary and logical, undistorted consequence to ensure game control and management (Raab et al., 2020). So far, in our opinion, no attempt has been made to consider the conflicting demands of possible audience influence on player behavior and the referee’s decision outside correlational archival studies (like e.g., Bilalić et al., 2021). A field-experimental study or longitudinal design to separate the effects in this process is needed.

It should be noted that although distorted refereeing decisions can occur in numerous decision-making situations, often studied in controlled experiments (for an overview, see MacMahon & Strauss, 2014; Raab et al., 2019), no significant impact of such specific decisions on home advantage has been found. An archival study that statistically investigated the question of whether an existing referee bias (here the so-called “injury bias” in soccer) actually leads to greater home advantage – measured in points or goals – was conducted by Riedl et al. (2015). It is a well-established finding, first shown by Sutter and Kocher (2004), that referees in the German Premier League award more extra time after the 90th minute if the home team is behind by one goal, as opposed to if the home team is up by one goal. Riedl et al. (2015) were able to confirm this, indicating that, on average, the injury time was 18 seconds longer. Beyond this effect, Riedl and colleagues were the first to statistically test

whether this also translated into more goals or points and thus would result in a home advantage. This was not the case. The study shows that the existence of the referee bias does not explain the home advantage. It is therefore doubtful that referees contribute significantly to home advantage (e.g., because the effects are too small or occur only rarely).

All in all, for now, it can be said that there is little empirical support that the home advantage results from social support through spectators and is directly or indirectly mediated by referees. On the contrary, the theory of social support can be countered by the theory of social pressure exerted by spectators in some situations (Strauss, 2002b; Wallace et al., 2005).

The research and empirical evidence of “choking under pressure” is particularly relevant, both theoretically and methodologically, in the area of motor learning (see e.g., in addition to numerous other studies, Marchant et al., 2014). As a consequence, multiple sport-psychological intervention techniques have been developed that prevent choking (for a systematic review, see Gröpel & Mesagno, 2019). Sian Beilock has presented numerous influential publications on “choking under pressure” and the correlation with neural activities (see e.g., the popular science book “Choke”; Beilock, 2011). At this point, we will only refer to some of the investigations concerning this wide field of research. A critical in-depth discussion of different theoretical choking approaches has been provided by Gray (2020).

Baumeister (1984) defines choking under pressure as a deterioration in performance under pressure, although the person is essentially motivated to perform optimally.

Factors that can exert pressure on a person (“pressure variables”) are, for example, competition and its conditions, the presence of spectators, the size of the reward, the expectation of negative consequences. Positive and negative public expectations are also considered “pressure variables” (Baumeister et al., 1985; Baumeister & Steinhilber, 1984).

The seminal study on “choking under pressure”, however, was carried out by Baumeister and Steinhilber (1984). They claim that the anticipation of success in situations in

which the athlete could achieve a new, desired social identity can lead to performance decrements. They argue that the prospect of becoming a master, for example, increases self-awareness. This means that an internal focus on one's own body and behavior is adopted. Numerous experimental studies on coordination- and condition-based tasks have shown that this internal focus tends to decrease performance compared to an external focus (e.g., greater muscular tension, more oxygen consumption, etc.; cf. e.g., Chua et al., 2021; Wulf, 2013).

To provide evidence that increased self-awareness during important matches leads to a decrease in performance, Baumeister and Steinhilber (1984) used the results of the World Series finals from 1924 to 1982 (baseball) and the finals and semi-finals of the NBA from 1967 to 1982 (basketball). In both leagues, the winner is determined according to a "best of seven" tournament, i.e., the winner of the final or semi-final must have won four matches. Baumeister and Steinhilber (1984) argued that the home disadvantage should occur particularly in the seventh or last game, when pressure is at its highest. Games 1 to 4 in the basketball and games 1 and 2 in the baseball analysis were chosen as benchmarks for comparison. As expected, in games 1 to 4, a home advantage was found and linked to the fact that the outcome did not hinge on these games. However, the last three games (games 5, 6 or 7) were won more often by the away team, as predicted.

According to Baumeister and Steinhilber (1984), the probability of negative performance changes in decisive matches increases for the home team relative to the increased self-awareness. In the following decades an intense controversy developed. Baumeister and Steinhilber (1984) were criticized in particular for the suggestion that increased self-awareness hinders performance. Heaton and Sigall (1989) reinterpreted Baumeister and Steinhilber's (1984) results, stating that it is not the possible attainment of a positive identity that triggers the home disadvantage, but the athletes' fear of attaining a negative identity or the fear of failure.

Schlenker et al. (1995) repeated the analysis of Baumeister and Steinhilber (1984), with one difference: the period of analysis now extended to 1993. For this period, it was now difficult to prove a home disadvantage in decisive games. From this they deduced the inadequacy of the statement by Baumeister and Steinhilber (1984). A controversial discussion developed about the correct interpretation. However, it must be stated that when more games are included in the analysis, the effect found by Baumeister and Steinhilber (1984) in basketball levels out or disappears. This was reported by Tauer et al. (2009) in a comprehensive analysis of 50 years of NBA play-offs, where a choking effect was no longer found (but was still found in baseball).

Following the debate in the 1990s, Butler and Baumeister (1998) published a study in which they once again provided evidence for the negative influence of supportive spectators, this time on performance in difficult tasks. In their first experiment, the subjects were asked to solve mental arithmetic tasks either in front of a friend (condition 1) or in front of a stranger (condition 2). The people watching were not visible to the participants and could not make their presence known. It turned out that the worst performances occurred in front of a friendly audience. Butler and Baumeister (1998) were also able to show in two additional experiments that a supposedly supportive audience led to a decrease in performance when working on difficult tasks. This effect did not occur with easy tasks. An interesting side note from the experiments by Butler and Baumeister (1998) is that the actors in front of this audience felt more comfortable and less stressed and preferred to work under this condition. They did not notice their personal performance scores decrease.

Law et al. (2003) also showed in an experiment with table tennis players, who had to learn a table tennis shot, that a supportive audience that increases internal focus (see above, e.g., Chua et al., 2021), has a deteriorating effect if the shot has been learned explicitly.

Wallace et al. (2005) transferred the arguments taken from the Butler and Baumeister (1998) experiments to the real-world situation in a home- and away-related competitive scenario with a supportive audience. They found that choking can occur more frequently for home teams in mostly skill-based tasks (like penalties in soccer, or free throws in basketball). The performances in effort-related tasks (e.g., running time of players) should benefit from the home supportive situation. This argument is very similar to the conclusion that Strauss (2002a) already presented in his narrative review about social facilitation effects of observers (mere present or coactive) on motor tasks (see above).

There is some empirical support for the Wallace et al. (2005) transfer from Butler and Baumeister (1998). For example, Dohmen (2008) found in an archival study with data from the German Premier soccer league (1963-2004) that the away team was more successful in scoring a penalty (73.59%) than the home teams (75.83%). In a recent detailed analysis of NBA basketball games, Böheim et al. (2019) showed that a large crowd is associated with lower free throw efficiency for players on the home team (but only in the first half). Some of the results therefore suggest a decrease in performance, in contrast to theories of social support. McEwan (2019) investigated 100 years of NHL (hockey) archives and found that away teams in comparison to home teams have an advantage for winning the playoff series if it comes to an overtime situation. McEwan and Hofmann (2021) argue in an overview that choking is not an overall phenomenon that can easily be found in archival data, but the effect exists for specific situations.

One of these specific situations is dart throwing, which can be classified as a coordination/skilled-based task. For the successful execution of a throw, concentration and focus are necessary. Outside the home advantage-related research, Greve et al. (2022) investigated the effects of an actively present audience, of no spectators, and of a simulated audience (due to the COVID-19 pandemic) on the performances of top-class dart throwers in

all archived high-level competitions from 2018 to 2021. The real presence of spectators was the condition with the worst performances in comparison with the two others.

What about comparing skill- and effort-based tasks? Heinrich et al. (2021) analyzed all archived competition outcomes of world-class biathletes before COVID-19 and during COVID-19 (without an audience), and showed that the skiing times (the conditioning-based part of their overall performances) were better in front of an active large audience, and that the shooting performances (the coordination-based part) improved during COVID-19, when crowds were not present. This pattern of results confirms the assumption of Strauss (2002a) and Wallace et al. (2005). However, the pattern only holds for male biathletes, but not for females, where the observed pattern was the opposite (skiing times did not improve, shooting performance did) and counter to previous assumptions.

Looking at some of the results of the “choking under pressure”-research following Baumeister and Steinhilber’s (1984) approach on decisive and crucial games, it can also be argued that a larger number of spectators than usual tends to have a (small) performance-decreasing effect on the home team and would lead to more home losses. Strauss and Höfer (2001) argued that a larger number of spectators or higher spectator density than usual could be associated with greater importance of the game. The number of spectators, audience density, corresponding spectator behavior or other measures would thus function as an indicator for the importance of a performance, which would lead to greater social pressure for the home team. They found a small tendency of an increase of home losses in the German Premier soccer league (1963-1998) with a greater number of spectators than usual (using the numbers from the previous season as the teams’ standard level. Interestingly, Fischer and Haucap (2021) made a similar argument – but in the opposite direction – to explain the decrease of home wins for some German soccer teams in the three professional leagues during the COVID-19 season (2019/20) in closed-door games. They found that teams that usually

enjoy a very large home audience suffer the most, with a drop in the number of home field wins in games behind closed doors. For teams with a traditionally smaller or moderate crowd size (measured pre-COVID restrictions), there was no relevant decrease in the home advantage. Discussing the findings by Strauss and Höfer (2001) and Fischer and Haucap (2021) together, one can speculate that relevant deviations from the previously experienced standard level of spectators (the “usual”) could lead to more social pressure, hence, the likelihood of choking under pressure increases. Summarizing this, some of the described results suggest a decrease in performance, in contrast to the theories of social support.

Overall, there has been – and still is – a lack of robust empirical evidence that spectators are directly (or even indirectly via e.g., referees) strongly involved in the home advantage (beyond what we have here introduced in the beginning of this chapter as – directly evident influence).

Of course, future studies can change and challenge the lack of empirical evidence. Indeed, ongoing COVID-19 pandemic changes, with limited spectator attendance, and a comparison to “normal” and subsequent increases of spectators, with fewer or no restrictions, and with improved methodologies within the area (like e.g., specific statistical multilevel approaches), the understanding of audience effects may improve. Some archival studies investigating the home advantage situation during COVID-19 games behind closed doors claimed to find a (strong) direct (or in a few cases also indirect) spectator effect, while others suggest the opposite. These contrasting positions are not surprising due to the large random effects and variance in home advantage outcomes. In addition, it is not only the number of spectators that changed dramatically during the pandemic, but also other aspects like hygiene protocols, match rules, match preparation times etc. For an overall assessment and conclusion on the impact of spectators on the home advantage, it is also necessary to consider not only archival and correlational COVID-19 studies, but also, and moreover, the whole literature,

theories and methodological (from correlational to experimental) approaches and thousands of studies, starting with Schwarz and Barsky (1977).

Taking the current evidence, spectators are not considered to be the main causal factor for the home advantage, as is the case in the models of Courneya and Carron (1992) and Carron et al. (2005). They should not be considered as the main underlying force for home advantage, but rather as a situational condition that is cognitively evaluated by athletes. It therefore seems appropriate to investigate the effects of a potential social influence through spectators on the athletes themselves, on their information processing and even the tactical behavior of the coaches (Staufenbiel et al., 2015) or the learning processes for home and away games (Staufenbiel et al., 2018).

Final remarks

Whether merely present or actively behaving, spectators have an impact on sporting performance – if certain conditions are met. The social influence of spectators seems to depend more on the cognitive assessment of the situation by the actors, as suggested e.g., by the biopsychosocial theory of Blascovich and colleagues (1999; or Wallace et al., 2005) rather than on direct external influence and related factors (such as number, density, specific behavior). This concept illustrates the importance of investigating the information processing of athletes and coaches. These evaluations can be investigated using experimental research designs in both social facilitation and home-advantage research.

The psychological (and physiological) correlates such as athletes' (or also coaches') expectations (e.g., self-efficacy, self-fulfilling prophecy, learning processes etc., cf. Allen & Jones, 2014; Bray et al., 2002; Staufenbiel et al., 2015, 2018) and thus their ability to efficiently process information likely play a key role in the reasons for home advantage, and this is where ongoing investigations should focus.

Literature

- Agnew, G. A., & Carron, A. V. (1994). Crowd effects and the home advantage. *International Journal of Sport Psychology*, 25(1), 53–62.
- Aiello, J. R., Nicosia, G., & Thompson, D. (1979). Physiological, social, and behavioral consequences of crowding on children and adolescents. *Child Development*, 50(1), 195–202.
- Allen, M. S., & Jones, M. V. (2014). The “Home Advantage” in Athletic Competitions. *Current Directions in Psychological Science*, 23(1), 48–54.
- Allport, F. H. (1920). The influence of the group upon association and thought. *Journal of Experimental Psychology*, 3(3), 159–182. <https://doi.org/10.1037/h0067891>
- Allport, F. H. (1924). Response to social stimulation in the group. In *Social Psychology* (1st ed., pp. 260–291). Erlbaum.
- Anderson, M., Wolfson, S., Neave, N., & Moss, M. (2012). Perspectives on the home advantage: A comparison of football players, fans and referees. *Psychology of Sport and Exercise*, 13(3), 311–316. <https://doi.org/10.1016/j.psychsport.2011.11.012>
- Baron, R. S. (1986). Distraction-conflict theory: Progress and problems. *Advances in Experimental Social Psychology*, 19(C), 1–40. [https://doi.org/10.1016/S0065-2601\(08\)60211-7](https://doi.org/10.1016/S0065-2601(08)60211-7)
- Baumeister, R. F. (1984). Choking under pressure: Self-consciousness and paradoxical effects of incentives on skillful performance. *Journal of Personality and Social Psychology*, 46(3), 610–620. <https://doi.org/10.1037/0022-3514.46.3.610>
- Baumeister, R. F., Hamilton, J. C., & Tice, D. M. (1985). Public Versus Private Expectancy of Success. Confidence Booster or Performance Pressure? *Journal of Personality and Social Psychology*, 48(6), 1447–1457. <https://doi.org/10.1037/0022-3514.48.6.1447>

- Baumeister, R. F., & Steinhilber, A. (1984). Paradoxical effects of supportive audiences on performance under pressure: The home field disadvantage in sports championships. *Journal of Personality and Social Psychology*, 47(1), 85–93.
<https://doi.org/10.1037/0022-3514.47.1.85>
- Beilock, S. (2011). *Choke*. Free Press.
- Benz, L. S., & Lopez, M. J. (2021). Estimating the change in soccer's home advantage during the Covid-19 pandemic using bivariate Poisson regression. *AStA Advances in Statistical Analysis*. <https://doi.org/10.1007/s10182-021-00413-9>
- Bilalić, M., Gula, B., & Vaci, N. (2021). Home advantage mediated (HAM) by referee bias and team performance during covid. *Scientific Reports*, 11(1), 21558.
<https://doi.org/10.1038/s41598-021-00784-8>
- Blascovich, J., & McCall, C. (2013). Social influence in virtual environments. In K. E. Dill (Ed.), *Oxford library of psychology. The Oxford handbook of media psychology* (pp. 305–315). Oxford University Press.
- Blascovich, J., Mendes, W. B., Hunter, S. B., & Salomon, K. (1999). Social 'Facilitation' as Challenge and Threat. *Journal of Personality and Social Psychology*, 77(1), 68–77.
<https://doi.org/10.1037/0022-3514.77.1.68>
- Blascovich, J., & Tomaka, J. (1996). The Biopsychosocial Model of Arousal Regulation. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 28, pp. 1–52). Academic Press, Inc.
- Boggs, D. H., & Simon, J. R. (1968). Differential Effect of Noise on Tasks of Varying Complexity. *Journal of Applied Psychology*, 52(2), 148–153.
<https://doi.org/10.1037/h0025496>
- Böheim, R., Grübl, D., & Lackner, M. (2019). Choking under pressure – Evidence of the

- causal effect of audience size on performance. *Journal of Economic Behavior and Organization*, 168, 76–93. <https://doi.org/10.1016/j.jebo.2019.10.001>
- Bond, C. F., & Titus, L. J. (1983). Social facilitation: A meta-analysis of 241 studies. *Psychological Bulletin*, 94(2), 265–292. <https://doi.org/10.1037/0033-2909.94.2.265>
- Boyko, R. H., Boyko, A. R., & Boyko, M. G. (2007). Referee bias contributes to home advantage in English Premiership football. *Journal of Sports Sciences*, 25(11), 1185–1194. <https://doi.org/10.1080/02640410601038576>
- Bray, S. R., Jones, M. V., & Owen, S. (2002). The influence of competition location on athletes' psychological states. *Journal of Sport Behavior*, 25(3), 231–242.
- Brown, A. J., & Harkins, S. G. (2020). Social Facilitation and Social Loafing: Opposite Sides of the Same Coin. In S. J. Karau (Ed.), *Individual Motivation within Groups* (pp. 297–330). Academic Press.
- Bryson, A., Dolton, P., Reade, J. J., Schreyer, D., & Singleton, C. (2021). Causal effects of an absent crowd on performances and refereeing decisions during Covid-19. *Economics Letters*, 198, 109664. <https://doi.org/10.1016/j.econlet.2020.109664>
- Burnham, W. H. (1905). The Hygiene of Home Study. *The Pedagogical Seminary*, 12(2), 213–230. <https://doi.org/10.1080/08919402.1905.10532755>
- Burnham, W. H. (1910). The Group as a Stimulus to Mental Activity. *Science*, 31(803), 761–767.
- Butler, J. L., & Baumeister, R. F. (1998). The trouble with friendly faces: Skilled performance with a supportive audience. *Journal of Personality and Social Psychology*, 75(5), 1213–1230.
- Carron, A. V., Loughhead, T. M., & Bray, S. R. (2005). The home advantage in sport competitions: Courneya and Carron's (1992) conceptual framework a decade later.

- Journal of Sports Sciences*, 23(4), 395–407.
<https://doi.org/10.1080/02640410400021542>
- Chua, L.-K., Jimenez-Diaz, J., Lewthwaite, R., Kim, T., & Wulf, G. (2021). Superiority of external attentional focus for motor performance and learning: Systematic reviews and meta-analyses. *Psychological Bulletin*, 147(6), 618–645.
<https://doi.org/10.1037/bul0000335>
- Cialdini, R. B. (2001). *Influence: Science and Practice* (4th ed.). Harper Collins.
- Cottrell, N. B., Wack, D. L., Sekerak, G. J., & Rittle, R. H. (1968). Social facilitation of dominant responses by the presence of an audience and the mere presence of others. *Journal of Personality and Social Psychology*, 9(3), 245–250.
<https://doi.org/10.1037/h0025902>
- Courneya, K. S., & Carron, A. V. (1992). The Home Advantage in Sport Competitions: A Literature Review. *Journal of Sport & Exercise Psychology*, 14(1), 13–27.
- Cox, F. N. (1966). Some effects of test anxiety and presence or absence of other persons on boys' performance on a repetitive motor task. *Journal of Experimental Child Psychology*, 3(1), 100–112. [https://doi.org/10.1016/0022-0965\(66\)90065-8](https://doi.org/10.1016/0022-0965(66)90065-8)
- Danziger, K. (2000). Making social psychology experimental: A conceptual history, 1920–1970. *Journal of the History of the Behavioral Sciences*, 36(4), 329–347.
[https://doi.org/10.1002/1520-6696\(200023\)36:4](https://doi.org/10.1002/1520-6696(200023)36:4)
- Dashiell, J. F. (1935). Experimental studies of the influence of social situations on the behavior of individual human adults. In E. Murchinson (Ed.), *A Handbook of Social Psychology* (pp. 1097–1158). Clark University Press.
- Dawson, P., Massey, P., & Downward, P. (2020). Television match officials, referees, and home advantage: Evidence from the European Rugby Cup. *Sport Management Review*,

- 23(3), 443–454. <https://doi.org/10.1016/j.smr.2019.04.002>
- Dohmen, T. J. (2008). Do professionals choke under pressure? *Journal of Economic Behavior & Organization*, 65(3), 636–653. <https://doi.org/10.1016/j.jebo.2005.12.004>
- Edwards, A. M., Dutton-Challis, L., Cottrell, D., Guy, J. H., & Hettinga, F. J. (2018). Impact of active and passive social facilitation on self-paced endurance and sprint exercise: Encouragement augments performance and motivation to exercise. *BMJ Open Sport & Exercise Medicine*, 4(1), e000368. <https://doi.org/10.1136/bmjsem-2018-000368>
- Epting, L. K., Riggs, K. N., Knowles, J. D., & Hanky, J. J. (2011). Cheers vs. Jeers: Effects of audience feedback on individual athletic performance. *North American Journal of Psychology*, 13(2), 299–312.
- Fazackerley, L. A., Gorman, A. D., Minett, G. M., Caia, J., & Kelly, V. G. (2022). The influence of absent crowds on National Rugby League match player statistics and running metrics. *Psychology of Sport & Exercise*, 60, 102163. <https://doi.org/10.1016/j.psychsport.2022.102163>
- Feltz, D. L., Forlenza, S. T., Winn, B., & Kerr, N. L. (2014). Cyber Buddy is Better than No Buddy: A Test of the Köhler Motivation Effect in Exergames. *Games for Health Journal*, 3(2), 98–105. <https://doi.org/10.1089/g4h.2013.0088>
- Feltz, D. L., Kerr, N. L., & Irwin, B. C. (2011). Buddy up: The Köhler effect applied to health games. *Journal of Sport and Exercise Psychology*, 33(4), 506–526. <https://doi.org/10.1123/jsep.33.4.506>
- Fischer, K., & Haucap, J. (2021). Does Crowd Support Drive the Home Advantage in Professional Football? Evidence from German Ghost Games during the COVID-19 Pandemic. *Journal of Sports Economics*, 22(8), 982–1008. <https://doi.org/10.1177/15270025211026552>

- Flake, J. K., Pek, J., & Hehman, E. (2017). Construct Validation in Social and Personality Research. *Social Psychological and Personality Science*, 8(4), 370–378.
<https://doi.org/10.1177/1948550617693063>
- Fothergill, M., Wolfson, S., & Little, L. (2014). A qualitative analysis of perceptions of venue: Do professional soccer players and managers concur with the conceptual home advantage framework? *International Journal of Sport and Exercise Psychology*, 12(4), 316–332. <https://doi.org/10.1080/1612197X.2014.932826>
- Gómez-Ruano, M. A., Pollard, R., & Lago-Peñas, C. (2021). *Home Advantage in Sport: Causes and the Effect on Performance*. Routledge.
- Gray, R. (2020). Attentional Theories of Choking Under Pressure Revisited. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology* (pp. 595–610). John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781119568124.ch28>
- Greer, D. L. (1983). Spectator booing and the home advantage: A study of social influence in the basketball arena. *Social Psychology Quarterly*, 46(3), 252–261.
- Greve, J., van Meurs, E., & Strauss, B. (2022). “...and the crowd goes wild!” – Performance in elite darts players, the presence of crowds and the simulation of a crowd during the COVID-19 pandemic. *Journal of Sport & Exercise Psychology*, 44, S81.
- Gröpel, P., & Mesagno, C. (2019). Choking interventions in sports: A systematic review. *International Review of Sport and Exercise Psychology*, 12(1), 176–201.
<https://doi.org/10.1080/1750984X.2017.1408134>
- Guerin, B. (1993). *Social Facilitation*. Cambridge University Press.
- Guttman, A. (1986). *Sports Spectators* (1st ed.). Columbia University Press.
- Harb-Wu, K., & Krumer, A. (2019). Choking under pressure in front of a supportive audience: Evidence from professional biathlon. *Journal of Economic Behavior and Organization*,

- 166, 246–262. <https://doi.org/10.1016/j.jebo.2019.09.001>
- Heaton, A. W., & Sigall, H. (1989). The ‘Championship Choke’ Revisited: The Role of Fear of Acquiring a Negative Identity¹. *Journal of Applied Social Psychology*, 19(12), 1019–1033. <https://doi.org/10.1111/j.1559-1816.1989.tb01236.x>
- Heinrich, A., Müller, F., Stoll, O., & Cañal-Bruland, R. (2021). Selection bias in social facilitation theory? Audience effects on elite biathletes’ performance are gender-specific. *Psychology of Sport and Exercise*, 55, 101943. <https://doi.org/10.1016/j.psychsport.2021.101943>
- Heuer, A. (2020). *From identification of random contributions to determination of the optimum forecast of a soccer match*. <https://doi.org/10.48550/arXiv.2003.09352>
- Higgs, N., & Stavness, I. (2021). Bayesian analysis of home advantage in north american professional sports before and during COVID-19. *Scientific Reports*, 11(1) doi:10.1038/s41598-021-93533-w
- Hull, C. L. (1943). *Principles of behavior* (1st ed.). Appleton-Century-Crofts.
- Jamieson, J. P. (2010). The Home Field Advantage in Athletics: A Meta-Analysis. *Journal of Applied Social Psychology*, 40(7), 1819–1848.
- Jones, M. B. (2013). The home advantage in individual sports: An augmented review. *Psychology of Sport and Exercise*, 14(3), 397–404. <https://doi.org/10.1016/J.PSYCHSPORT.2013.01.002>
- Jones, M. B. (2018). Differences in home advantage between sports. *Psychology of Sport & Exercise*, 34, 61-69. <https://doi.org/10.1016/j.psychsport.2017.07.012>
- Kelman, H. C. (1958). Compliance, identification, and internalisation three porcesses of attitude change. *Journal of Conflict Resolution*, 2(1), 51–60.
- Kozar, B. (1973). The Effects of a Supportive and Nonsupportive Audience upon Learning a

- Gross Motor Skill. *International Journal of Sport Psychology*, 4(1), 11–30.
- Laird, D. A. (1923). Changes in Motor Control and Individual Variation under the Influence of ‘Razzing.’ *Journal of Experimental Psychology*, 6(3), 236–246.
<https://doi.org/10.1037/h0072891>
- Landers, D. (1975). Observational learning of a motor skill: Temporal spacing of demonstrations and audience presence. *Journal of Motor Behavior*, 7(4), 281–287.
<https://doi.org/10.1080/00222895.1975.10735047>
- Landers, D., & McCullagh, P. D. (1976). Social facilitation of motor performance. *Exercise and Sport Sciences Reviews*, 4(1), 125–162. <https://doi.org/10.1249/00003677-197600040-00006>
- Latané, B. (1981). The psychology of social impact. *American Psychologist*, 36(4), 343–356.
<https://doi.org/10.1037/0003-066X.36.4.343>
- Lau, A., Schwarz, J., & Stoll, O. (2019). Influence of social facilitation on learning development using aWii Balanceboard (TM). *German Journal of Exercise and Sport Research*, 49(1), 97–102.
- Law, J., Masters, R., Bray, S. R., Eves, F., & Bardswell, I. (2003). Motor Performance as a Function of Audience Affability and Metaknowledge. *Journal of Sport and Exercise Psychology*, 25(4), 484–500. <https://doi.org/10.1123/jsep.25.4.484>
- Lehman, D. R., & Reifman, A. (1987). Spectator influence on basketball officiating. *Journal of Social Psychology*, 127(6), 673–675.
- Leite, W., & Pollard, R. (2018). International comparison of differences in home advantage between level 1 and level 2 of domestic football leagues. *German Journal of Exercise and Sport Research*, 48(2), 271–277. <https://doi.org/10.1007/s12662-018-0507-2>
- MacMahon, C., & Strauss, B. (2014). The psychology of decision making in sports officials.

- In A. G. Papaioanno & D. Hackfort (Eds.), *Routledge Companion to Sport and Exercise Psychology* (1st ed., pp. 223–235). Routledge.
- Manstead, A. S. R., & Semin, G. R. (1980). Social facilitation effects: Mere enhancement of dominant responses? *British Journal of Social and Clinical Psychology*, 19(2), 119–135. <https://doi.org/10.1111/j.2044-8260.1980.tb00937.x>
- Marchant, D., Maher, R., & Wang, J. (2014). Perspectives on choking in sport. In A. G. Papaioanno & D. Hackfort (Eds.), *Routledge Companion to Sport and Exercise Psychology* (pp. 446–459). Routledge.
- Martens, R. (1969a). Effect on performance of learning a complex motor task in the presence of spectators. *Research Quarterly of the American Association for Health, Physical Education and Recreation*, 40(2), 317–323. <https://doi.org/10.1080/10671188.1969.10614830>
- Martens, R. (1969b). Palmar sweating and the presence of an audience. *Journal of Experimental Social Psychology*, 5(3), 371–374. [https://doi.org/10.1016/0022-1031\(69\)90061-4](https://doi.org/10.1016/0022-1031(69)90061-4)
- Martens, R. (1969c). Effect of an Audience on Learning and Performance of a Complex Motor Skill. *Journal of Personality and Social Psychology*, 12(3), 252–260. <https://doi.org/10.1037/h0027710>
- Martens, R., & Landers, D. (1969). Coaction effects on a muscular endurance task. *Research Quarterly of the American Association for Health, Physical Education and Recreation*, 40(4), 733–737. <https://doi.org/10.1080/10671188.1969.10614911>
- Martin, J. J. (2020). What Triplett Didn't Find and What Lewin Never Said First. *Kinesiology Review*, 9(2), 89–91. <https://doi.org/10.1123/kr.2020-0006>
- Maxwell, J. P., Masters, R., & Poulton, J. M. (2008). Self-consciousness, perceived evaluation

- and performance of a continuous motor task. *International Journal of Sport Psychology*, 39(3), 179–191.
- Mayer, A. (1904). Über Einzel- und Gesamtleistung des Schulkindes. In *Sammlungen von Abhandlungen zur Psychologischen Pädagogik I, Band 4. Heft*.
- McCarrick, D., Bilalic, M., Neave, N., & Wolfson, S. (2021). Home advantage during the COVID-19 pandemic: Analyses of European football leagues. *Psychology of Sport & Exercise*, 56, 102013. <https://doi.org/10.1016/j.psychsport.2021.102013>
- McEwan, D. (2019). A home advantage? Examining 100 years of team success in National Hockey League playoff overtime games. *Psychology of Sport & Exercise*, 43, 195–199. <https://doi.org/10.1016/j.psychsport.2019.02.010>
- McEwan, D., & Hofmann, M. D. (2021). Does a Home Disadvantage Ever Exist? In M. A. Gómez-Ruano, R. Pollard, & C. Lago-Peñas (Eds.), *Home Advantage in Sport* (1st ed., pp. 131–143). Routledge. <https://doi.org/10.4324/9781003081456-15>
- Meumann, E. (1904). *Haus- und Schularbeit*. Barth.
- Miyamoto, M. (1979). Social Facilitation in Finger Maze Learning. *Japanese Psychological Research*, 21(2), 94–98. <https://doi.org/10.4992/psycholres1954.21.94>
- Moede, W. (1920). *Experimentelle Massenpsychologie: Beiträge zur Experimental psychologie der Gruppe*. Hirzel.
- Moore, H. (1917). Laboratory Tests of Anger, Fear and Sex Interest. *The American Journal of Psychology*, 28(3), 396. <https://doi.org/10.2307/1413610>
- Moore, J. C., & Brylinsky, J. A. (1993). Spectator Effect on Team Performance in College Basketball. *Journal of Sport Behavior*, 16(2), 77–84.
- Murray, E., Neumann, D. L., Moffitt, R. L., & Thomas, P. R. (2016). The effects of the presence of others during a rowing exercise in a virtual reality environment.

- Psychology of Sport and Exercise*, 22, 328–336.
<https://doi.org/10.1016/j.psychsport.2015.09.007>
- Murray, J. F. (1982). Construction of a stabilometer capable of indicating the variability of non-level performance. *Perceptual and Motor Skills*, 55, 1211–1215.
<https://doi.org/10.2466/pms.1982.55.3f.1211>
- Nevill, A. M., Balmer, N., & Williams, M. (1999). Crowd influence on decisions in association football. *Lancet*, 353(9162), 1416. [https://doi.org/10.1016/S0140-6736\(99\)01299-4](https://doi.org/10.1016/S0140-6736(99)01299-4)
- Nevill, A. M., Balmer, N., & Williams, M. (2002). The influence of crowd noise and experience upon refereeing decisions in football. *Psychology of Sport and Exercise*, 3(4), 261–272. [https://doi.org/10.1016/S1469-0292\(01\)00033-4](https://doi.org/10.1016/S1469-0292(01)00033-4)
- Nevill, A. M., Newell, S. M., & Gale, S. (1996). Factors associated with home advantage in english and scottish soccer matches. *Journal of Sports Sciences*, 14(2), 181–186.
<https://doi.org/10.1080/02640419608727700>
- Otte, F. W., Millar, S.-K., & Klatt, S. (2020). What do you hear? The effect of stadium noise on football players' passing performances. *European Journal of Sport Science*, 1–10.
<https://doi.org/10.1080/17461391.2020.1809714>
- Palacios-Huerta, I. (2004). Structural changes during a century of the world's most popular sport. *Statistical Methods and Applications*, 13(2), 241–258.
<https://doi.org/10.1007/s10260-004-0093-3>
- Peeters, T., & van Ours, J. (2020). Seasonal Home Advantage in English Professional Football; 1973-2018. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3603228>
- Pollard, R. (1986). Home advantage in soccer: A retrospective analysis. *Journal of Sports Sciences*, 4(3), 237–248. <https://doi.org/10.1080/02640418608732122>

- Pollard, R., & Armatas, V. (2017). Factors affecting home advantage in football World Cup qualification. *International Journal of Performance Analysis in Sport*, 17(1–2), 121–135. <https://doi.org/10.1080/24748668.2017.1304031>
- Pollard, R., & Gómez, M. A. (2014a). Comparison of home advantage in men's and women's football leagues in Europe. *European Journal of Sport Science*, 14(Sup. 1), 77–83. <https://doi.org/10.1080/17461391.2011.651490>
- Pollard, R., & Gómez, M. A. (2014b). Components of home advantage in 157 national soccer leagues worldwide. *International Journal of Sport and Exercise Psychology*, 12(3), 218–233. <https://doi.org/10.1080/1612197X.2014.888245>
- Pollard, R., & Pollard, G. (2005). Long-term trends in home advantage in professional team sports in North America and England (1876-2003). *Journal of Sports Sciences*, 23(4), 337–350. <https://doi.org/10.1080/02640410400021559>
- Pollard, R., Prieto, J., & Gómez, M. Á. (2017). Global differences in home advantage by country, sport and sex. *International Journal of Performance Analysis in Sport*, 17(4), 586–599. <https://doi.org/10.1080/24748668.2017.1372164>
- Raab, M., Avugos, S., Bar-Eli, M., & MacMahon, C. (2020). The referee's challenge: A threshold process model for decision making in sport games. *International Review of Sport and Exercise Psychology*, 1–21. <https://doi.org/10.1080/1750984X.2020.1783696>
- Raab, M., Bar-Eli, M., Plessner, H., & Araújo, D. (2019). The past, present and future of research on judgment and decision making in sport. *Psychology of Sport & Exercise*, 42, 25–32. <https://doi.org/10.1016/j.psychsport.2018.10.004>
- Rajecki, D. W., Ickes, W., Corcoran, C., & Lerner, K. (1977). Social facilitation of human performance: Mere presence effects. *Journal of Social Psychology*, 102(2), 297–310.

<https://doi.org/10.1080/00224545.1977.9713277>

- Riedl, D., Staufenbiel, K., Strauss, B., & Heuer, A. (2014). *The Global Home Advantage in Soccer: Status, developments and causes*. Available since February 17, 2022, at PsyArXiv, DOI: 10.31234/osf.io/zauijy
- Riedl, D., Strauss, B., Heuer, A., & Rubner, O. (2015). Finale furioso: Referee-biased injury times and their effects on home advantage in football. *Journal of Sports Sciences*, 33(4), 327–336. <https://doi.org/10.1080/02640414.2014.944558>
- Salminen, S. (1993). The Effect of the Audience on the Home Advantage. *Perceptual and Motor Skills*, 76(3_suppl), 1123–1128. <https://doi.org/10.2466/pms.1993.76.3c.1123>
- Sanders, G. S., Baron, R. S., & Moore, D. L. (1978). Distraction and social comparison as mediators of social facilitation effects. *Journal of Experimental Social Psychology*, 14(3), 291–303. [https://doi.org/10.1016/0022-1031\(78\)90017-3](https://doi.org/10.1016/0022-1031(78)90017-3)
- Sanna, L. J. (1992). Self-Efficacy Theory: Implications for Social Facilitation and Social Loafing. *Journal of Personality and Social Psychology*, 62(5), 774–786. <https://doi.org/10.1037/0022-3514.62.5.774>
- Schlenker, B. R., Phillips, S. T., Boniecki, K. A., & Schlenker, D. R. (1995). Where Is the Home Choke? *Journal of Personality and Social Psychology*, 68(4), 649–652. <https://doi.org/10.1037/0022-3514.68.4.649>
- Schwartz, B., & Barsky, S. F. (1977). The home advantage. *Social Forces*, 55(3), 641–661.
- Sheridan, A., Marchant, D. C., Williams, E. L., Jones, H. S., Hewitt, P. A., & Sparks, A. (2019). Persence of Spotters Improves Bench Press Performance: A Deception Study. *Journal of Strength and Conditioning Research*, 33(7), 1755–1761.
- Snyder, A. L., Anderson-Hanley, C., & Arciero, P. J. (2012). Virtual and Live Social Facilitation While Exergaming: Competitiveness moderates exercise intensity. *Journal*

- of Sport and Exercise Psychology*, 34(2), 252–259.
- Spence, K. W. (1956). *Behavior Theory and Conditioning*. Yale University Press.
- Staufenbiel, K., Lobinger, B., & Strauss, B. (2015). Home advantage in soccer – A matter of expectations, goal setting and tactical decisions of coaches? *Journal of Sports Sciences*, 33(18), 1932–1941. <https://doi.org/10.1080/02640414.2015.1018929>
- Staufenbiel, K., Riedl, D., & Strauss, B. (2018). Learning to be advantaged: The development of home advantage in high-level youth soccer. *International Journal of Sport and Exercise Psychology*, 16(1), 36–50. <https://doi.org/10.1080/1612197X.2016.1142463>
- Strauss, B. (2002a). Social facilitation in motor tasks: A review of research and theory. *Psychology of Sport and Exercise*, 3(3), 237–256. [https://doi.org/10.1016/S1469-0292\(01\)00019-X](https://doi.org/10.1016/S1469-0292(01)00019-X)
- Strauss, B. (2002b). The impact of supportive spectator behavior on performance in team sports. *International Journal of Sport Psychology*, 33(4), 372–390.
- Strauss, B., & Bierschwale, J. (2008). Zuschauer und der Heimvorteil in der Handballbundesliga. *Zeitschrift Für Sportpsychologie*, 15(3), 96–101. <https://doi.org/10.1026/1612-5010.15.3.96>
- Strauss, B., & Höfer, E. (2001). Spectators and the home advantage in team sports. In A. Papaioannou, M. Goudas, & Y. Theodorakis (Eds.), *Proceedings of the 10th World Congress of Sport Psychology* (Vol. 4, pp. 210–212). Christodoulidi Publications.
- Strauss, B., & MacMahon, C. (2014). Audience influences on athlete performances. In A. G. Papaioanno & D. Hackfort (Eds.), *Routledge Companion to Sport and Exercise Psychology* (1st ed., pp. 213–222). Routledge.
- Stroebe, W. (2012). The Truth About Triplett (1898), But Nobody Seems to Care. *Perspectives on Psychological Science*, 7(1), 54–57.

<https://doi.org/10.1177/1745691611427306>

Sutter, M., & Kocher, M. G. (2004). Favoritism of agents—The case of referees' home bias.

Journal of Economic Psychology, 25(4), 461–469. [https://doi.org/10.1016/S0167-4870\(03\)00013-8](https://doi.org/10.1016/S0167-4870(03)00013-8)

Szabó, D. Z. (2022). The impact of differing audience sizes on referees and team performance from a North American perspective. *Psychology of Sport & Exercise*, 60, 102162.

<https://doi.org/10.1016/j.psychsport.2022.102162>

Tauer, J. M., Guenther, C. L., & Rozek, C. (2009). Is There a Home Choke in Decisive Playoff Basketball Games? *Journal of Applied Sport Psychology*, 21(2), 148–162.

Thirer, J., & Rampey, M. S. (1979). Effects of Abusive Spectators' Behavior on Performance of Home and Visiting Intercollegiate Basketball Teams. *Perceptual and Motor Skills*, 48(3_suppl), 1047–1053. <https://doi.org/10.2466/pms.1979.48.3c.1047>

Tilp, M., & Thaller, S. (2020). Covid-19 Has Turned Home Advantage Into Home Disadvantage in the German Soccer Bundesliga. *Frontiers in Sports and Active Living*, 2. <https://www.frontiersin.org/article/10.3389/fspor.2020.593499>

Triplett, N. (1898). The Dynamogenic Factors in Pacemaking and Competition. *The American Journal of Psychology*, 9(4), 507–533.

Unkelbach, C., & Memmert, D. (2010). Crowd noise as a cue in referee decisions contributes to the home advantage. *Journal of Sport and Exercise Psychology*, 32(4), 483–498. <https://doi.org/10.1123/jsep.32.4.483>

Uziel, L. (2007). Individual differences in the social facilitation effect: A review and meta-analysis. *Journal of Research in Personality*, 41(3), 579–601. <https://doi.org/10.1016/j.jrp.2006.06.008>

Van de Ven, N. (2011). Supporters Are Not Necessary for the Home Advantage: Evidence

- From Same-Stadium Derbies and Games Without an Audience. *Journal of Applied Social Psychology*, 41(12), 2785–2792. <https://doi.org/10.1111/j.1559-1816.2011.00865.x>
- van Meurs, E., Greve, J., & Strauss, B. (2021). *Moving in the presence of others—A systematic review and meta-analysis*. <https://doi.org/10.31234/osf.io/25wh7>
- Wallace, H. M., Baumeister, R. F., & Vohs, K. D. (2005). Audience support and choking under pressure: A home disadvantage? *Journal of Sports Sciences*, 23(4), 429–438. <https://doi.org/10.1080/02640410400021666>
- Wankel, L. M. (1977). Audience size and trait anxiety effects upon state anxiety and motor performance. *Research Quarterly of the American Alliance for Health, Physical Education and Recreation*, 48(1), 181–186. <https://doi.org/10.1080/10671315.1977.10762168>
- Worringham, C. J., & Messick, D. M. (1983). Social facilitation of running: An unobtrusive study. *Journal of Social Psychology*, 121(1), 23–29. <https://doi.org/10.1080/00224545.1983.9924462>
- Wulf, G. (2013). Attentional focus and motor learning: A review of 15 years. *International Review of Sport and Exercise Psychology*, 6(1), 77–104. <https://doi.org/10.1080/1750984X.2012.723728>
- Wunderlich, F., Weigelt, M., Rein, R., & Memmert, D. (2021). How does spectator presence affect football? Home advantage remains in European top-class football matches played without spectators during the COVID-19 pandemic. *PLOS ONE*, 16(3), e0248590. <https://doi.org/10.1371/journal.pone.0248590>
- Zajonc, R. B. (1965). Social facilitation. *Science*, 149, 142–146.
- Zajonc, R. B. (1969). *Animal social psychology: A reader of experimental studies*. Wiley.

