**Losing the Twelfth Man: Will empty stadiums eliminate home advantage in football,
and could placebo crowds rectify this?**

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The Twelfth Man

The crowd in football is often referred to as the twelfth man due to the impact it can have on the match outcome, particularly for the home team. The psychological influence of the crowd can affect both the home and away teams, as well as the referee. Home advantage in football is apparent across most leagues (Pollard and Gómez, 2009, Inan, 2020), partly due to crowd support (Inan, 2020). Teams prefer to attack towards the most vocal section of the stadium during the second half of games, such as Manchester United towards the Stretford End, with anecdotal references of players and managers stating that their fans can help “suck the ball into the net”. The return of European league football during the COVID-19 pandemic leaves teams facing the prospect of playing the remaining games of the 2019-2020 season behind closed doors and without their twelfth man. Home advantage is equalised over an entire season through games being played home and away, but leagues are returning in the latter stages of competition meaning this may not end up entirely balanced which could have important implications for clubs.

Home Advantage: Psychobiological effects from the crowd

Placebo and nocebo effects are neurobiological responses resulting in improved or worsened performance which stem from an inert treatment and/or cues to improved or worsened performance (Davis et al., 2020). Verbal suggestions and explicit expectations from the crowd, and implicit experience of the players and referee, unite to form a unique social environment which activates neurobiological pathways. It could therefore be suggested that crowd support contributes to home advantage via varying placebo and nocebo effects which impact upon the home team (mainly placebo effects), the away team (mainly nocebo effects) and the referee (mainly nocebo effects) via conditioned responses.

The largest proportion of the crowd are supporters of the home team, and therefore likely to generate more noise in the stadium. In moments of difficulty, like conceding a goal, the crowd will try to lift their team's spirits. In good moments, like scoring a goal, the home crowd can provide further positive stimulus thanks to the increased noise and support. Conversely, jeering the opposition is done to elicit the opposite, namely nocebo effects. For example, if the home team concedes a penalty, the crowd will do their best to put increased stress on the opposing penalty-taker in the hope of causing him to miss. Finally, the crowd will also exert pressure on the referee to provide decisions more favourable to the home team. Evidence suggests that the crowd can influence the referee's decision-making to benefit the home team (Nevill et al., 2002) which in turn contributes to home advantage (Unkelbach and Memmert, 2010). Thus, the influence of the crowd can work in a variety of ways all tending towards a benefit for the home team, a benefit that will be lost when football is played in an empty stadium.

Should we employ placebo crowds?

Home advantage is crucial for all teams, including those aiming for the title or European qualification, but can be particularly important for teams struggling for points while fighting relegation (Jacklin, 2005). Some teams might have fancied their chances due to key games being played at home. Now, the loss of crowds not only deprives the home team of their placebo effects, but there will also no longer be potential nocebo effects for the opposition. In fact, this might even elicit placebo effects for the visiting team (Figure 1). It is also possible that both teams will suffer a loss of intensity without any crowd, while the referee might be alleviated of certain pressures from the home crowd. But how should these issues be dealt with, if at all?

Figure 1. Home support can elicit positive neurobiological responses for the home team (placebo effects), and negative (nocebo) responses for the away team and referee (Panel A). An empty stadium may reverse this scenario (Panel B), as the home team may now experience a negative sensation due to the lack of normal crowd support, while the away team may interpret this as positive. The referee will also likely experience a positive experience due to less pressure, although the effect is unlikely to be explicitly positive. Implementing some sort of fake fan and noise system might help to alleviate some of these changes through preconditioned neurobiological responses, leaving all three parties somewhat neutral (Panel C).

The return of football behind closed doors poses some intriguing questions including whether fake fan cut-outs and fake fan noise should be installed in stadiums to elicit preconditioned neurobiological placebo responses associated with the crowd. Continuous crowd noise might contribute to an overall increased intensity during games, but should the noise created within the stadium benefit the home team more, thereby maintaining the dimension of home advantage as much as possible? What happens when the away team scores? And what about the referee? It is unlikely that any crowd noise that is implemented will directly target the referee. Can we expect less biased refereeing performances due to a loss of social pressure? This would be considered positive albeit not by the home team. Although probably unconscious, data from Italy suggest referees change their behaviour in games played without spectators (Pettersson-Lidbom and Priks, 2010). Should footballing bodies allow clubs to make their own decisions or should they standardise any intervention? Whatever decision is taken, the loss of physical

crowds will likely contribute to match outcomes and research will no doubt determine how this period of football behind closed doors influences home advantage, match intensity and refereeing decisions.

Conclusions

The return of football will see games played in empty stadiums for the foreseeable future which will alter the social context spectators exert on the players and referee. Teams should be aware that this may affect their players and should consider implementing interventions (if possible) to elicit the preconditioned neurobiological responses associated with a crowded stadium.

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111 **Competing Interests**

112 None to declare.

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