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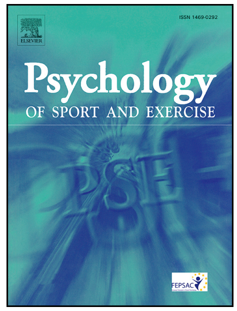

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Abstract

Objectives: This review provides an integrative argument for the use of observation as an intervention to manipulate individual collective efficacy beliefs in sports teams.

Design: An exploration of the conceptual and empirical evidence underpinning observation-based interventions for increasing collective efficacy.

Method: A presentation of reflections on the following. First, we reflect on existing techniques used to increase self- and collective efficacy beliefs. Second, we consider collective efficacy in the context of observational learning and the various modeling techniques employed in the sports and motor performance literature. Third, we highlight relevant literature from neuroscience, outlining the analogous neural pathways evident for social cognition (i.e., collective efficacy) and observation.

Results: This review presents a case for the use of observation interventions to manipulate collective efficacy, drawing upon social psychological frameworks of human behavior, the observation-based literature, and contemporary understanding of brain and behavior.

Conclusions: Observation-based interventions are suited for collective efficacy manipulation in sport. There is a need to advance understanding of this relationship in order to maximize improvements in collective efficacy across group contexts.

Key words: collective efficacy, manipulation, observation, modeling, intervention

Observation as a Method to Enhance Collective Efficacy: An Integrative Review

Collective efficacy, which refers to a team's belief in its ability to produce given levels of attainment, is important for team performance because it influences team members' individual efforts, use of available resources, persistence in the face of failure, and resistance to discouragement (Bandura, 1997). A large body of evidence exists to suggest collective efficacy has a positive effect upon group performance across many domains of group function (see Stajkovic, Lee, & Nyberg, 2009, for a meta-analysis). Despite the wealth of literature that has described collective efficacy (i.e., its antecedents and effects), less attention has been paid to methods used to change or manipulate this construct. Existing techniques, such as imagery, exhibit equivocal findings when used to manipulate collective efficacy beliefs (Shearer, Mellalieu, Shearer, & Roderique-Davies, 2009). Consequently, in order to develop a comprehensive method for increasing collective efficacy the specific antecedents of this construct should be considered. In this respect, observation of a group task/action can provide an individual with mastery and vicarious experiences, suggesting it may be effective for increasing collective efficacy beliefs.

The aim of this review is to present a case for the use of observation interventions to manipulate collective efficacy, drawing upon social psychological frameworks of human behavior, the observation-based literature, and contemporary understanding of brain and behavior. Following an overview of collective efficacy as a construct in the context of Bandura's (1986) social cognitive theory (SCT), and as an extension of self-efficacy, we discuss research focusing on existing interventions used to enhance efficacy beliefs in the sport-based literature. Observational learning, an important component of Bandura's SCT, is then introduced, with specific emphasis on modeling types and styles, and their link to collective efficacy. Next, we consider the contemporary social neuroscience literature that examines action observation and human social cognition, discussing evidence for the shared neural mechanisms that support the use of observation as an intervention for collective efficacy. Finally, we consider why observation of team action is an ideal intervention for collective efficacy enhancement, and provide recommendations to further understanding of the relationship between observation and collective efficacy.

The Theoretical Background to Efficacy and its Manipulation in Sport

Bandura (1977) introduced social learning theory to advance understanding of human learning and behavior, placing emphasis on the important roles played by vicarious, symbolic, and self-regulatory processes. Social learning theory was subsequently adapted to provide greater focus on human cognition in the context of social learning, which became known as SCT (cf. Bandura, 1986). SCT provides a framework for understanding human functioning, suggesting that human achievement depends on a reciprocal triad between personal, behavioral, and environmental influences. According to SCT, self-referent thoughts mediate between knowledge and action, determining a person's behavior, thought patterns, and emotional reactions for a given situation. Of these thoughts, none is more central than individuals' judgments of their capabilities, namely self-efficacy beliefs (cf. Bandura, 1989; Pajares, 1996). Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3) reflecting the confidence an individual has in his or her ability to perform a specific task.

Efficacy beliefs are formed through a process of selection/self-reflection, interpretation, and integrated self-persuasion (Pajares, 1997). Bandura (1986, 1997) suggested four specific antecedents of self-efficacy beliefs: enactive mastery experiences; vicarious experience; verbal persuasion; and physiological/affective states, with mastery and vicarious experiences the two strongest sources (cf. Law & Hall, 2009). Bandura (1997) proposed that enactive mastery experiences are the most influential source of efficacy information as they provide direct evidence of whether one can perform at the level required to achieve success, something which has received support in sports settings (e.g., Chase, Feltz, & Lirgg, 2003). Indeed, when repeated, perceived success will lead to increased efficacy expectations and perceived failure will lead to decreased efficacy expectations (Bond, Biddle, & Ntoumanis, 2001). The effects of these experiences on efficacy perceptions depend on factors such as pre-existing knowledge structures, the difficulty of the task being mastered, and the effort expended during the mastery experience (Bandura, 1988). Vicarious experiences refer to experiences that are generated through modeling the behaviors of others. The influence of these experiences are determined by factors such as the similarity of the observed and intended performances, the extent to which the attributes of a model are similar to that of the observer, and the competence/skill level of the model being observed (George, Feltz, & Chase, 1992).

Self-efficacy judgments have been shown to have a positive relationship with individual performance across several domains of human functioning (e.g., business: Stajkovic & Luthans, 1998). However, humans often work together towards collective objectives within groups or teams and hold collective efficacy beliefs regarding the team's functional abilities for specific tasks (Bandura, 1982, 1997). Collective efficacy has been conceptualized and subsequently measured in different ways, with two definitions prominent in the sports-based literature (Myers & Feltz, 2007). The first definition by Bandura describes collective efficacy as "a group's shared belief in its conjoint capability to organize and execute the courses of action required to produce given levels of attainment" (1997, p. 477). The second definition by Zacarro, Blair, Peterson, and Zazanis labels collective efficacy as "a sense of collective competence shared among individuals when allocating, coordinating, and integrating their resources in a successful concerted response to specific situational demands" (1995, p. 309). Although similar, subtle differences exist between the two. For example, Bandura's definition considers the specific goals defined by the team (i.e., "given level of attainment") whereas the definition used by Zacarro and colleagues refers to success in general (i.e., "successful concerted response"). Since collective efficacy is an abstract construct (meaning neither definition can be truly correct or incorrect) we must consider which definition leads to the development of instruments that most accurately predict group behaviors within a given domain (cf. Maddux, 1999). As team sports performance is underpinned by the achievement of specific goals (e.g., shots on target in soccer) rather than success in general, Bandura's definition will be adopted for this review article. This definition clearly states the presence of a "shared belief" and is more specific about what a team is trying to attain (i.e., goals), potentially explaining its widespread use in the sport-based literature.

The development of collective efficacy is linked closely with that of self-efficacy, the difference being the unit of agency to which they concern. Self-efficacy exists at an individual level (cf. Bandura, 1997), whereas collective efficacy has been conceptualized and analyzed both at an individual (Heuzé, Sarrazin, Masiero, Raimbault, & Thomas, 2006) and group level (Gibson, 1999). Although collective efficacy is a group's shared belief, Bandura (1997) advocated that each team member's belief in the team's overall capabilities should be considered, and these individual measures aggregated to the team level. Therefore, both individual and group level approaches are suitable for use with the study of collective efficacy, with the choice of level contingent on the situation involved (i.e., suited to the specific context). Aggregated collective efficacy details a group's overall beliefs, but does not consider individual differences within the group (Shearer, Holmes, & Mellalieu, 2009). Given that collective efficacy is ultimately measured through individual cognitions, it seems appropriate to adopt an individual-level approach to the manipulation, measurement, and analysis of collective efficacy perceptions. This approach recognizes the unique characteristics of each team member and does not assume that one global method will work for all team members (i.e., interventions should be individualized).

The close link between self- and collective efficacy has been established empirically, with studies demonstrating a moderate positive relationship between the two (Watson, Chemers, & Preiser, 2001). As collective efficacy is in part determined by self-efficacy, the two concepts are proposed to share the same antecedents. However, antecedents specific to collective efficacy have also been suggested. For example, Carron and Eys (2012) have suggested leadership, cohesion, and group size. More recently, Fransen et al. (2012) proposed factors such as positive supportive communication, and negative emotional reactions of the players to be predictive of collective efficacy beliefs, highlighting greater potential complexity of the construct when compared to self-efficacy.

When forming efficacy perceptions an individual will take into account both his or her own performance within the team, and the performance of his or her teammates (cf. Bandura, 1997). For own performance an individual will gather efficacy information directly from execution of action. However, when an athlete develops efficacy beliefs concerning teammates' performances they will do so through vicarious experiences. Specifically, the athlete will observe his or her teammates' actions and interpret the level of success (i.e., action understanding) and emotions (via empathy) associated with their performance. Empathy has been examined extensively across multiple disciplines including social psychology (Davis, 1994), and more recently cognitive neuroscience (Masten, Morelli, & Eisenberger, 2011). Due to its complex nature, researchers have used the construct in different ways, with the term "empathy" adopted to label eight conceptually distinct phenomena (Batson, 2009). Of the concepts outlined by Batson, the first, "knowing another person's internal state" provides a broad definition of empathy appropriate for collective efficacy development. Simulation theory (Gordon, 1986; Heal, 1986) suggests we understand the internal state of others by projecting ourselves into their situation and imagining the thoughts and feelings associated (Batson). For example, in soccer, when an individual team member watches his or her teammates' performing a corner kick routine he or she imagines him or herself being part of the routine to gauge the team's collective efficacy perceptions.

A number of intervention techniques have been developed to strengthen self-efficacy beliefs based on performance accomplishments and vicarious experiences (see Short & Ross-Stewart, 2009 for a full review). To improve self-efficacy using performance accomplishment information, performance should be structured so that success is achieved and interpreted as a result of one's own efforts (Short & Ross-Stewart). For intervention purposes, instructional strategies such as progressions, performance aids, and physical guidance can be used to achieve success and increase self-efficacy for the athletes involved (Feltz, Short, & Sullivan, 2008). Interventions based upon vicarious experience can be useful when individuals have little previous performance experience as they allow for the formation of beliefs (i.e., collective efficacy) about actions, behaviors, and environments that are yet to be encountered. The social comparison aspect of vicarious experience has resulted in a literature base of peer modeling interventions, which involve the observation of others' actions, to strengthen self-efficacy beliefs (Clark & Ste-Marie, 2002). For example, Clark and Ste-Marie demonstrated that viewing peer coping models (i.e., individuals displaying progression from unskilled to skilled performance) and peer mastery models (i.e., individuals displaying skilled execution of a skill) improved self-efficacy and performance for a diving skill.

In relation to interventions used to enhance collective efficacy, previous studies have employed goal-setting (Gibson, 2001) and verbal self-guidance techniques (Brown, 2003) both in organizational and educational contexts. However, since these initial investigations, neither method has been examined as a technique to enhance collective efficacy. A potential reason being that both goal-setting and verbal self-guidance fail to help teams process the selection, integration, interpretation, and recollection of the sources of collective efficacy information. Given that collective efficacy perceptions have several antecedents, intervention strategies should seek to provide individuals with multiple sources of efficacy information to maximize efficacy beliefs. One example is motivational general-mastery imagery (MG-M), which requires the individual to image being mentally tough and confident in all circumstances (Shearer, Thomson, Mellalieu, & Shearer, 2007). MG-M has the capacity to provide an individual with both mastery (i.e., imagining themselves performing successfully) and vicarious experience (i.e., imagining peers performing successfully), both salient factors that affect a team's collective efficacy. MG-M has been acknowledged as an effective method for the manipulation of both self-efficacy (Short et al., 2002; Munroe-Chandler, Hall, & Fishburne, 2008) and collective efficacy beliefs in sport (Shearer, Mellalieu, Thomson, & Shearer, 2008; Shearer, Mellalieu, et al., 2009). For example, Shearer et al. (2008) provided partial support for MG-M type imagery interventions to enhance collective efficacy in elite sports teams. Using a multiple baseline across groups design with elite wheelchair basketball players, Shearer and colleagues (2008) reported equivocal collective efficacy responses to a 4-week imagery intervention. Specifically, of three experimental groups, average collective efficacy scores increased for the first group, became more consistent for the second, and remained unchanged for the third. Despite agreement on the sources used to develop collective efficacy beliefs, previous studies have yet to consistently manipulate this construct when adopting different intervention strategies. The following section will discuss the theoretical and empirical support for the use of observation-based methods as an alternative collective efficacy intervention.

Observational learning: Modeling as an Intervention to Manipulate Social Processes

As emphasized in SCT, the advanced capability for vicarious learning is a distinctive human quality that enables an individual to expand his or her knowledge, skills, and beliefs through empathizing with the emotions/actions conveyed by a model (i.e., observed behavior of others: Bandura, 1989). This framework suggests that virtually all phenomena achieved through direct experience (e.g., efficacy beliefs) can occur vicariously by observing people's behaviors and the resulting consequences. Bandura (1989) suggests that individuals experience diverse modeling influences with modeled actions serving as instructors, motivators, inhibitors, disinhibitors, social facilitators, and emotional arousers. According to SCT, acquisition of social behaviors primarily exists in social-contexts, and the majority of what is learned is gained through observational learning. This suggests humans develop individual and social actions (i.e., team-related behavior) through the modeling of others' behaviors, which in-turn influences a person's collective efficacy beliefs. For example, if an individual/team becomes more capable of performing an action through observing other teammates'/teams' performances, efficacy beliefs would also be expected to increase.

Bandura (1986) proposed four procedural components of modeling. The first - the attentional process - determines the modeling influences people observe and the information extracted from them. In the context of collective efficacy, individual beliefs are formed by perception of others' actions. Therefore, during team performance an individual will attend to teammates' behaviors and apparent emotions to inform his or her collective efficacy beliefs. For example, in basketball an individual will pay attention to teammates' behaviors he or she deems influential towards successful performance when developing collective efficacy perceptions about the team as a whole (e.g., effective passing/goal shooting). The second component governing observational learning is the retention process, which involves the transformation and restructuring of information obtained from modeled events. When observing teammates' behaviors an individual's collective efficacy perceptions are only influenced by the events he or she remembers (i.e., memorable actions of fellow team members). During the third component of modeling - the behavioral production process - the resultant conceptions from the modeled behavior are turned into action. When an individual views his or her teammates' behaviors, collective efficacy is affected by the modeled events, and subsequently performance is influenced as a result of both the observed behaviors and the change in collective efficacy perceptions. The fourth component governing the modeling process involves the role of motivational processes in the performance of observationally-learned behaviors. Individuals are more likely to exhibit modeled behavior if it results in desired outcomes. Consequently, if collective efficacy increases as a result of observed events, and performance improves as a result of both enhanced collective efficacy and reproduction of the observed behaviors, an individual is likely to be highly motivated to repeat these actions within a given team's performances.

Observational learning is often described as a process of watching others to assist in the learning of varied skills (Schmidt & Wrisberg, 2008) with vicarious influence significant because observers can acquire lasting attitudes, emotional reactions, perceptions, and behavioral tendencies towards persons, places, and actions associated with the model's emotional experience. SCT distinguishes between acquisition and performance because people do not perform everything that is learned. In the case of efficacy beliefs, observation of others can provide an individual with vicarious experiences, important for the development of efficacy perceptions. While research has demonstrated that observing the actions of others is useful when attempting to learn a new skill (Clark & Ste-Marie, 2002), the potency of the model is related to the similarities between the model and the observer, this being greatest when the observer is viewing him or herself (Bandura, 1986, 1997). To date, two modes of self-as-a-model interventions have been used: self-observation and self-modeling (Clark & Ste-Marie, 2007). Self-observation methods involve an individual viewing him or herself performing an action/skill at their current level (Clark, Ste-Marie, & Martini, 2006). In contrast, self-modeling has two subclasses: positive self-review modeling involves observing footage of best performances and editing out errors, and feed-forward modeling involves observing footage that depicts a skill that is not yet acquired or an existing skill in a context that is yet to be addressed (Dowrick, 1999). Self-as-a-model techniques have received considerable attention as interventions for various human motor performance activities, including academic setting (see Hitchcock, Dowrick, & Prater, 2003, for a full review), swimming (Martini, Rymal, & Ste-Marie, 2011), gymnastics (Baudry, Leroy, Seifert, & Chollet, 2006), and volleyball (Zetou, Kourtesis, Getsiou, Michalopoulou, & Kioumourtzoglou, 2008).

In addition to influencing performance and learning, video-based observation interventions, which involve viewing one's self (self-modeling) or others (peer-modeling) performing an action, have received considerable attention as a means to enhance a number of psychological factors. Both SCT and self-efficacy theory (Bandura, 1986, 1997) indicate individual efficacy beliefs can be influenced through self-modeling techniques. Modeling has the capacity to influence efficacy beliefs by providing the observer with instructional information, and showing that a task can be learned and completed successfully (Feltz, Short, & Sullivan, 2008). Indeed, numerous studies have shown increased self-efficacy as a result of self-modeling interventions in sport (cf. Short & Ross-Stewart, 2009). For example, Feltz, Short, and Singleton (2008) reported greater self-efficacy levels for collegiate hockey players who viewed a positive self-modeling intervention in comparison to those allocated to a control group. In consideration of different self-as-a-model intervention types Clark and Ste-Marie (2007) compared self-efficacy responses to self-modeling, self-observation, and control (physical training alone) conditions over the course of a one-week experiment using adolescent swimmers. Self-efficacy increased for all three conditions post-intervention with higher group means reported for the two self-as-a-model intervention groups in comparison to the control group, further supporting the use of observation-based methods to increase efficacy perceptions in athletes.

The ability of self-as-a-model interventions to influence performance and self-efficacy supports the use of group-based modeling interventions to manipulate collective efficacy perceptions. As collective efficacy is closely linked with self-efficacy (cf. Bandura, 1997), and highly correlated with task performance (Stajkovic et al., 2009), techniques designed to influence self-efficacy and task performance offer the potential to be tailored to manipulate collective efficacy perceptions. Specifically, observing one's own team perform a group task/action includes both self- and other-modeling and can be used to influence collective efficacy through mastery and vicarious experiences. Our recent two-study investigation (Bruton, Mellalieu, & Shearer, 2014) was the first of its kind to examine the effectiveness of group-based observation interventions to increase collective efficacy in sports teams. Study one compared the effect of positive, neutral, and negative film footage of team performance for a lab-based obstacle course task on collective efficacy beliefs. Collective efficacy increased for individuals who viewed positive footage of his or her team performing, and decreased for those who viewed negative footage of team performance. Study two examined the effect of familiarity (familiar vs. unfamiliar) with the content of a positive observation intervention on change in collective efficacy beliefs. Collective efficacy increased for individuals viewing familiar and unfamiliar footage, however changes were greatest when viewing positive performance of one's own team. The findings from this investigation suggest that group-based observation interventions increase collective efficacy through the provision of mastery (i.e., positive performance of one's own team) and vicarious experiences (i.e., positive performance of an unknown team from a different sport), and should therefore be employed by sports teams across all levels (i.e., recreational/elite).

Neuroscientific Basis for Observation as a Means to Manipulate Collective Efficacy

Like many concepts and constructs studied in sport psychology, collective efficacy has lacked an explanation for the potential neurobiological mechanisms underpinning both its function and action (cf. Shearer, Holmes, et al., 2009). Over a decade ago, Keil, Holmes, Bennett, Davids, and Smith (2000) suggested the need to integrate several lines of research when investigating psychological processes, combining brain activity measurement with traditional behavioral methods in a bid to fully understand psychological constructs important to sports performance (i.e., collective efficacy). More recently, Cross, Acquah, and Ramsey (2013) suggested an overreliance on neuroscience would be misplaced, but still encouraged the use of neurobiological methods to compliment traditional approaches in the field of psychology. In this section we outline evidence from existing literature in cognitive neuroscience to provide further support for the role of observation as an intervention for developing collective efficacy beliefs. Specifically, we link the neural circuitry of the mirror neuron system (MNS), cortical midline structures (CMS), and limbic system to the development of collective efficacy perceptions.

Mirror neurons are a special class of neuron first discovered by single cell recordings in the parieto-frontal areas of macaque monkeys (di Pellegrino, Fadiga, Fogassi, Gallese, & Rizzolatti, 1992). These neurons were found to be activated both when a monkey executes a specific motor action and when it watches the same action being performed (Rizzolatti, Fadiga, Gallese, & Fogassi, 1996). Mirror neurons have received sizeable interest within neuroscience literature, with recent studies proposing the existence of an MNS in humans similar to that found in monkeys (see Rizzolatti & Fogassi, 2014, for an overview). There is considerable evidence to suggest that motor areas recruited in humans during action observation overlap with areas where mirror neurons have been reported in monkeys (e.g., Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; Iacoboni et al., 2005). Of the studies investigating mirror neurons in humans, the majority have used neuroimaging techniques such as fMRI (for a meta-analysis see Molenberghs, Cunnington, & Mattingley, 2012), providing indirect evidence for the existence of this neuron type (Keysers & Gazzola, 2010). However, Mukamel, Ekstrom, Kaplan, Iacoboni, and Fried (2010) have investigated the single-neuron responses to execution and observation of actions, and found that humans have neurons that behave in an identical manner to mirror neurons in monkeys, discharging when they view and perform a specific action. They also demonstrated that these neurons exist in additional cortical areas to those proposed by the majority of mirror neuron investigations (i.e., premotor and inferior parietal cortex).

Specific to human movement, several neuroimaging studies have now shown increased mirror neuron activity during observation of simple motor tasks such as hand grasping (for a meta-analysis see Grezes & Decety, 2001). In addition, studies have reported that an individual experiences heightened activity within areas where the MNS is presumed to be located during observation of more complex actions when they exist within his or her motor repertoire (Calvo-Merino, Glaser, Grèzes, Passingham, & Haggard, 2005, 2006). Although consensus has yet to be reached on a specific function for the MNS it has been proposed as the neurophysiological mechanism that underpins observational learning (Cattaneo & Rizzolatti, 2009). There is also agreement that this system is involved with many aspects of human social cognition (Pacherie & Dokic, 2006). The MNS is suggested to play an important role in action prediction/anticipation, action intention understanding, imitation, empathy, ‘mind’-reading, and language development (cf. Rizzolatti, 2005, Rizzolatti & Fogassi, 2014), and allows an individual to understand others’ actions from the inside, providing him or her with a first-person account of the other person’s motor goals and intentions (Rizzolatti & Sinigaglia, 2010). With reference to efficacy development, action anticipation, which encompasses an individual observing and subsequently predicting the behaviors of others, is of particular interest. When developing collective efficacy beliefs an athlete will take into account the specific actions/behaviors of his or her own team and make a judgment (i.e., prediction) about whether said actions/behaviors can cumulatively lead to a successful outcome within a given domain (i.e., team performance). As outlined by Bandura's (1986) SCT, an individual develops the majority of his or her social behaviors and beliefs through observing others. Given that collective efficacy refers to individual beliefs about the confidence of a social group, it is apparent that efficacy development will involve both the observation of one's teammates and comparative teams within the same domain. Therefore, the apparent role of mirror neurons within observational learning suggests that this neuron type will be heavily involved with the development of collective efficacy perceptions.

While the MNS accounts for action prediction and motor intention, collective efficacy perceptions also require individuals to empathize with the thoughts and emotions of group members (e.g., what is the mood in the dressing room?). Cortical midline structures (CMS) account for additional aspects of social cognition to those supposedly accounted for by the MNS (e.g., the processing of social relationships: Iacoboni et al., 2004; Schilbach et al., 2006). This links the CMS to 'theory of mind' and the ability of an individual to attribute independent mental states of self/others in order to explain behavior (Fletcher et al., 1995); an important building block of social behaviors such as collective efficacy (Iacoboni et al., 2005). Uddin, Iacoboni, Lange, and Keenan (2007) suggest that an interaction between frontoparietal mirror neuron areas and CMS accounts for both social understanding and functioning and may therefore be involved with the processing of socially communicated phenomena, such as collective efficacy. A number of studies propose that empathizing with conspecifics' emotions activates similar brain areas that include, but extend beyond the MNS to limbic areas (which hold a close association with emotion) via the insula (e.g., Carr et al., 2003; Pfeifer, Iacoboni, Mazziotta, & Dapretto, 2008). Consequently, when an individual considers perceptions of his or her group's collective efficacy, it is likely that he or she empathizes with the content of the observed behaviors (e.g., a positive reaction to a score) by engaging this neural system. This neuroscience evidence links closely with Bandura's (1986) SCT and the process of observational learning, which suggests that an individual will take into account both emotions and behaviors when observing his or her teammates.

Collectively, the neuroscience evidence suggests that it is appropriate to consider the neural circuitry of the MNS, CMS, and limbic system in the context of collective efficacy where judgments are made about shared beliefs through behavioral empathy with teammates (Shearer, Holmes, et al., 2009). Comparable neural activity that exists for social cognitions (e.g., collective efficacy) and both observation and execution of action indicates the potential involvement of observation in the development of social phenomena such as collective efficacy. When developing collective efficacy beliefs during team performance, an individual's perceptions are based on the actions, behaviors, and emotions of both him or herself and his or her fellow team members. Consequently, the observation of team performance can hypothetically influence an individual's collective efficacy perceptions via the neural mechanisms that link this process to both actual execution and social cognition. For example, when a soccer player views his or her team performing a set-play successfully and scoring a goal, the individual will observe and empathize with his or her teammates' actions, behaviors, and apparent emotions, innervating the MNS, CMS, and limbic system, which may then allow the individual to make a judgment about his or her collective efficacy beliefs. This subsequently provides a neural level mechanism of how mastery and vicarious experiences lead to changes in collective efficacy beliefs.

Practical Implications and Future Research Directions for Observation as a Collective Efficacy Intervention

Based on the evidence presented in this review we tentatively offer two potential practical recommendations regarding the use of observation-based techniques to manipulate collective efficacy. First, we have discussed literature supporting the use of observation-based interventions to increase several variables associated with successful group/team performance (e.g., self-efficacy, collective efficacy). Indeed, in our own recent study we increased the collective efficacy of team sports players immediately when they viewed an observation intervention containing positive video footage (Bruton et al., 2014). This implies that providing athletes (individual/team) with positive footage of previous performances (training and competition) prior to competition can increase efficacy beliefs, potentially benefitting performance. Second, in this review we have highlighted that neural activity for action observation is closest to that of actual action execution when an individual views a familiar action (Calvo-Merino et al., 2005, 2006). Indeed, Bandura (1986, 1997) contends that modeling interventions will have the greatest influence on efficacy beliefs when the model-observer similarity is maximized. Our own investigation provided evidence that observation interventions displaying positive footage cause the largest increase in collective efficacy when an individual is familiar with the footage being observed (Bruton et al.). In order to maximize collective efficacy, and therefore team performance, teams should be provided with interventions comprising positive performance footage specific to both the team and setting (e.g., footage of their own team performing in competitive settings).

In light of the conceptual basis and initial evidence provided in this review, we conclude with a number of recommendations regarding the investigation of observation interventions intended to increase collective efficacy in groups/teams. First, there is a need to further examine the effectiveness of group-based observation interventions in modifying individual collective efficacy perceptions. The findings of our initial study into observation and collective efficacy in sports teams indicated that observation interventions can be used to influence collective efficacy (Bruton et al., 2014). However, to develop understanding of using observation interventions for this purpose, their effectiveness with different sports teams needs consideration (e.g., soccer, field hockey, rugby union). Due to the lack of literature regarding observation and collective efficacy, there is a need to determine whether existing findings remain consistent across different team sports. Specifically, the contribution of the ‘content’ and ‘familiarity’ of observation interventions towards collective efficacy for different sports teams require further investigation. This will advance understanding of observation intervention application across different sports whilst comprehensively examining the usefulness of this intervention type to increase collective efficacy with all groups/teams.

Second, although our recent investigation has established observation interventions provide an immediate increase in collective efficacy perceptions, the application of such techniques across longer time periods is not understood. In ‘real world’ settings it is likely that observation interventions will be used repeatedly to increase collective efficacy. For example, in a sporting context a coach will want his or her team to have high levels of collective efficacy throughout the season. Repeated exposure to observation interventions might ‘blunt’ an individual’s collective efficacy response due to boredom or provision of similar efficacy information (i.e., displaying performance accomplishments of equal worth). Therefore, there is a need to understand this dose-response relationship better.

Third, observation should be compared with existing interventions utilized in group dynamics such as traditional team building techniques (Voight & Callaghan, 2001) and other prevalent collective efficacy interventions (e.g., imagery) to determine the most effective strategy for increasing collective efficacy. From a socio-cognitive and neuroscience perspective, motor imagery, as a reflection of past experiences, is conceptually linked with collective efficacy due to its shared neural mechanisms with action execution (Jeannerod, 2001; Gallese, Keysers, & Rizzolatti, 2004). However, the effectiveness of imagery as a collective efficacy intervention is dependent upon the recipient's ability to image. Imagery ability can be defined as "an individual's capability to form vivid, controllable images and retain them for sufficient time to effect the desired imagery rehearsal" (Morris, Spittle, & Watt, 2005, p. 37).

Humans acquire all social behaviors through observational learning (Bandura, 1989), meaning the effectiveness of observation-based methods is dependent upon an innate capability (i.e., observational learning) rather than an ability to perform a specific psychological skill. Subsequently, observation interventions are more readily accessible for increasing collective efficacy in team sports athletes when compared to imagery. Observation interventions also provide a more accurate neural representation of action execution in comparison to imagery (Holmes & Calmels, 2008). Specifically, observation and execution are bottom-up processes (i.e., percept-driven) whereas imagery is a top-down process (i.e., knowledge-driven). This suggests that brain activation patterns are similar in terms of location and ordering for execution and observation, making it more functionally equivalent to actual execution than imagery (Holmes & Calmels). Given collective efficacy beliefs are based on capabilities to perform an action successfully, it is conceivable that interventions designed to access action-based information more accurately (i.e., with functional equivalence) have the capacity to cause the greatest increase in efficacy. It is recommended that future studies use a combination of psychometric and neuroimaging techniques to compare observation and imagery as collective efficacy interventions. This will further understanding of collective efficacy manipulation and provide potential neural level explanations for the mechanisms underpinning efficacy development.

Fourth, if observation is the most effective strategy for increasing collective efficacy, understanding which observation intervention type influences collective efficacy perceptions the most would be important. In the third section of this review we identify three types of self-as-a-model intervention used in modeling literature (self-observation, positive self-review, feedforward modeling). Of these only positive self-review has been examined as a collective efficacy intervention (Bruton et al., 2014). It is possible that different modeling types may provide an individual/team with different sources of efficacy information. For example, positive self-review interventions are designed to provide the observer with mastery experiences through displaying positive examples of previous performance, whereas self-observation interventions may provide less performance accomplishment information but evoke a sense of coping and resilience by including a team's/individual's responses to negative situations. Alternatively, the effects of the different interventions could be individualized (i.e., an individual may prefer a certain observation style) or suitable for a team at a given point (i.e., when their collective efficacy beliefs are high/low). For example, if a rugby union team's defense has been weak during the majority of their performances, a positive self-review intervention displaying attacking content may be unsuitable and potentially ineffective towards their collective efficacy perceptions.

Finally, a significant part of the conceptual basis for observation influencing collective efficacy is that similar neural activity exists for social cognitions (e.g., collective efficacy) and the observation and execution of action. Despite evidence for the link between the MNS, CMS, observation, and social cognition, to date, no research has investigated the neural processes involved with collective efficacy perceptions directly and therefore no direct explanation exists for the mechanisms that underpin both its function and action (Shearer, Holmes, et al., 2009). To fully understand psychological constructs such as collective efficacy we should integrate understanding of both brain and behavior (cf. Keil et al., 2000). The design used in our previous study (Bruton et al., 2014) was a pilot design for an investigation examining the neurological basis of individual collective efficacy perceptions.

The experimental methods used in our study (i.e., video-based interventions, computer-based measurement tools) are ideal for use with electroencephalography (EEG) and functional magnetic resonance imaging (fMRI), common methods employed to measure neural activity in past neuroscience research. Future studies need to compare an individual's brain activity whilst watching positive footage of his or her own group's performance with subsequent activity associated with unfamiliar group footage and neutral footage (cf. Calvo-Merino et al., 2006). This knowledge will further our understanding of the specific mechanisms involved with collective efficacy development, providing neuroscience evidence that can be used to tailor interventions to increase individual collective efficacy perceptions.

Summary

Considerable evidence exists supporting the importance of collective efficacy towards group/team performance across several domains including sport, business, and education (see Stajkovic et al., 2009 for a review). However, few interventions exist that have been used to manipulate an individual's collective efficacy beliefs. This review discussed the use of observation-based techniques as a means to manipulate individual perceptions of collective efficacy. Conceptually, Bandura's (1986) theories of social cognition and observational learning place emphasis on the importance of observation in the development of collective efficacy beliefs. Empirically, observation in the form of self-modeling enhances task performance and self-efficacy (Feltz, Short, & Singleton, 2008), two correlates of collective efficacy, with findings from our recent study supporting observation as a successful collective efficacy intervention technique (Bruton et al., 2014). Additionally, from a neuroscience perspective, when we observe others' actions and emotions, our brain activates as though we were experiencing those actions and emotions ourselves (Gatti et al., 2013). Similar activation of the MNS, CMS, and limbic system indicates that we empathize with others and provides an answer for 'theory of mind'. Practically, this suggests that individuals develop collective efficacy perceptions when observing teammates' behaviors and emotions, further supporting the use of observation as a suitable intervention to increase collective efficacy.

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- This review recommends observation as a collective efficacy (CE) intervention
- Bandura's theories outline the importance of observation in CE development
- Observation enhances task performance and self-efficacy, two correlates of CE
- Similar neural activity is reported for observation, execution and social cognition
- This neuroscience evidence provides further support for observation increasing CE