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Can creative role models prime creativity in soccer players?

Philip Furley*, Daniel Memmert

German Sport University Cologne, Germany

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ABSTRACT

Objectives: The goal of the present study was to test if priming soccer players with certain players that are known for extraordinary creativity can lead to enhanced creativity in a computer-based decision-making task.
Design: Between-subject experimental designs were implemented.
Method: Using a sequential priming procedure amateur soccer players were primed with either creative (Lionel Messi; Thiago Alcántara) or uncreative soccer players (Per Mertesacker; John Terry) and subsequently performed a soccer decision-making task. The priming stimuli were changed from Experiment 1 ($N = 60$) to Experiment 2 ($N = 60$), and the priming procedure was changed in Experiment 3 ($N = 60$).
Results: All three experiments revealed large ($d = 0.91$ in Experiment 1 and $d = 1.75$ in Experiment 2) to moderate effects (Experiment 3; $d = 0.59$) of priming on creative decision making in soccer.
Conclusion: Domain-specific creative thinking can be influenced by priming amateur soccer players with soccer stars that are known to differ in terms of creativity. Both the practical implications of the findings for soccer and the methodological implications for future priming research in sport are critically discussed.

Creativity is important in many performance domains (Runco, 2007; Memmert, 2011, 2017) and can broadly be defined as the generation of ideas or problem solutions that are novel but still appropriate (Amabile, 1983; Sternberg & Lubart, 1999). Creativity has been suggested to include the cognitive components of fluency, flexibility, and originality (Guilford, 1967). Fluency refers to the ability to generate many responses; flexibility is the ability to switch between categories of responses; and originality is the ability to generate relatively seldom responses. Traditionally, creativity has been considered a personality trait (e.g. Eysenck, 1993), meaning that individual differences in creativity are assumed to be relatively stable traits over time and are determined by a combination of genetic and environmental factors at early developmental stages (Simonton, 1991). However, and of particular importance to the present study, a growing body of research has shown that creativity can be substantially influenced by contextual circumstances. For example, a person's current mood as an instance of a contextual circumstance has been shown to affect creativity (e.g. Isen, Daubman, & Nowicki, 1987; Murray, Sujan, Hirt, & Sujan, 1990; e.g. Isen, 2000 for a review). Further, incentives (e.g. extrinsic rewards) for the task being performed substantially impact on an individual's creativity (Amabile, 1996, for a review). A certain motivational state (e.g. striving to achieve a desired goal as opposed to trying to avoid mistakes) is another situational factor that has been shown to influence creative behavior (Friedman & Förster, 2000, 2001, 2002). Even a brief glimpse of the color green (a color that has been associated with creative inspiration) prior to a creativity task was shown to enhance creativity (Lichtenfeld, Elliot, Maier, & Pekrun, 2012). Taken together, all these studies indicate that the notion of creativity as a fixed personality trait is too narrow, and creativity is more appropriately conceptualized as a dynamic interactive capacity resulting from contextual and personality variables.

Further studies in the field of sport (Santos, Memmert, Sampaio, & Leite, 2016) have also shown that contextual factors (e.g. enriched environments; Memmert, 2015) or motivational states (Memmert, Hüttermann, & Orliczek, 2013) have the potential to enhance creativity. Creative athletes are assumed to gain performance benefits in interactive, open skill sports via their ability to be unpredictable and thereby constantly come up with new ways of outsmarting their opponents. In this regard, Argentinian soccer star Lionel Messi has been described as one of the most incredible, unique, and creative soccer players to have ever played the game. He has inspired officials, players, and fans all over the world. Millions of his jerseys are sold to fans every year and uncountable anecdotal instances come to mind of young players idolizing Messi and pretending to be Messi during soccer practice. In this vein, it is important to understand if envisioning the abilities of an idolized player or even merely being exposed to a player like Messi might actually have the potential to influence a players' creativity.

Pertinent to the present research, several studies using a sequential priming paradigm have demonstrated that prior exposure to primes can

* Corresponding author. German Sport University, Cologne, Institute of Training and Computer Science in Sport, Am Sportpark Müngersdorf 6, 50933 Köln, Germany.
E-mail address: p.furley@dshs-koeln.de (P. Furley).

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influence creativity (Cai, Mednick, Harrison, Kanady, & Mednick, 2009; Dijksterhuis & van Knippenberg, 1998; Förster, Friedman, Butterbach, & Sassenberg, 2005; Lichtenfeld et al., 2012; Sassenberg & Moskowitz, 2005). Research using this sequential priming paradigm, has, for example, demonstrated that priming the cognitive concept of a unique, deviant person (e.g. a "punk") increased creativity in comparison to priming the concept of an analytical person (e.g. an engineer; Förster et al., 2005). Bargh (2014) describes priming as part of the process by which sensation is turned into perception. Within this process, external environmental stimulation comes in contact with internal mental representation while the external information is massively reduced, simplified, and imbued with categorical meaning (Bruner, 1957; Neisser, 1967). In this respect, an environmental event (i.e. the prime) stimulates sensory receptors that in turn lead to the activation of a mental representation. This representation may then remain activated subsequently and exert a passive effect on the individual during the time it is activated. In this regard, priming can be considered the natural method of how the human mind keeps in touch with the environment.

The mechanism of how (social) priming is assumed to exert behavioral effects on an individual is by preactivating cognitive concepts that are associated with behavioral tendencies and processing modes (Bargh, Chen, & Burrows, 1996; Dijksterhuis & van Knippenberg, 1998; Dijksterhuis, 2014; Förster et al., 2005). This theorizing is supported by a large body of evidence indicating shared representations between perception and behavioral responses (Knuf, Aschersleben, & Prinz, 2001; Prinz, 1997). For the purpose of the present research, this means that the activation of the trait "creative" activates a number of response tendencies associated with the trait (e.g. 'thinking outside the box', generating numerous behavioral options, switching conceptual categories of problem solutions, etc.). Hence, there is a solid theoretical and empirical basis for assuming that envisioning the abilities of Lionel Messi could indeed induce priming effects that possibly trigger a player's creativity. We conducted three experiments to test whether priming athletes with certain soccer stars that are known for specific extraordinary skills in a certain domain (creativity) can lead to enhanced creativity in that same domain.

1. The present research

The media frequently reports on the influence that elite athletes can have on younger players (e.g. https://www.psychologytoday.com/blog/coaching-and-parenting-young-athletes/201504/are-athletes-good-role-models, retrieved on March, 17, 2017). While research confirms that athletes often do function as role models, especially for boys (Biskup & Pfister, 1999), the only studies indicating effects of athletes as role models have been conducted on consumer behavior (Bush, Martin, & Bush, 2004; Martin & Bush, 2000). We are not aware of any research that has investigated how athlete role models might affect behavior or decision making while performing sports. To address this shortcoming in the literature the present research investigated if social priming can be considered one mechanism of how role models in soccer might affect other amateur soccer players. The sequential priming paradigm by Dijksterhuis and van Knippenberg (1998) can be considered a promising starting point in this endeavor as it has been highly influential in psychological theorizing (Bargh, 2014) and is the most widely used paradigm in priming research (Bargh & Chartrand, 2000).

Recent research has provided evidence for the necessity of taking moderating variables into account when conducting priming research (see Cesario, 2014; Dijksterhuis, 2014; Klatzky & Creswell, 2014). These moderating variables include both individual difference variables (e.g. cultural or experiential background) and experimental variables (e.g. task characteristics). Social priming effects have been shown to be substantially moderated by the extent to which the participant group attributes certain characteristics to the social primes (Cesario, Plaks, Hagiwara, Navarrete, & Higgins, 2010; see also; Dijksterhuis, Aarts, Bargh, & van Knippenberg, 2000). From this follows that participants would not be influenced in their creative behavior if they did not perceive the player they are being primed with as creative. Further, research shows that primes will only affect behavior in particular contexts (Cesario et al., 2010) and it has been demonstrated that social priming will only affect participants if the concept that is being primed 'fits' the experimental context. For example, priming aggressive behavior is not likely to result in overt aggressive behavior in a friendly, peaceful context (Cesario et al., 2010), but priming soccer-specific creativity in the context of a soccer decision making task might result in more creative decision making. Moreover, social primes have been shown to be more influential when the person being primed (e.g. a soccer player) and the social prime (e.g. a celebrity soccer player acting as a role model) are similar or belong to the same group (Loersch, Aarts, Payne, & Jefferis, 2008).

Taking these moderating variables into account, three separate experiments using different social primes in Experiment 1 and 2 (Lionel Messi vs. Per Mertesacker and Thiago Alcántara vs. John Terry, respectively) and a different priming procedure in the Experiment 3 were conducted. In all three experiments the social prime, the task, and the participants were all from the domain of soccer. Further, the primes were pretested to differ in terms of attributed creativity. More specifically, the experiments tested if priming soccer players with creative role models would lead to different levels of domain-specific creative thinking (i.e. thinking outside the box [flexibility], creating more [fluency] and unusual solutions [originality]; Memmert et al., 2013).

2. Experiment 1 and 2

2.1. Method

Participants. Sixty male soccer players with an average of 18 years (SD = 3.7) of amateur soccer experience as a player took part in Experiment 1 (M_{age} = 24.8, SD = 2.7). On average the sample reported watching 5.2 h of soccer per week (SD = 3.6). Sixty different male soccer players with an average of 16.66 years (SD = 4.0) of amateur soccer experience as a player took part in the Experiment 2 (M_{age} = 23.0, SD = 2.6). On average the sample reported watching 4.35 h of soccer per week (SD = 1.9). Written informed consent was obtained from every participant before commencing the experiment. Sample size was calculated prior to the study to have sufficient power (Schweizer & Furley, 2016) to detect medium-to-large effects (d = 0.8, based on Experiment 2 of Förster et al., 2005) on an established creativity measure (Memmert et al., 2013) in a one-tailed independent t-test (Faul, Erdfelder, Lang, & Buchner, 2007).

Experimental manipulation (between-participants). A preliminary study was conducted to verify which soccer players differed in terms of creativity (N = 46 college students with a sports science major). First, two experienced soccer coaches (having acquired a high UEFA coaching license) selected a list of ten players, then the 46 college students with a sport science major rated these players on a four items list: 'How creative is this player?', 'How deviant from the norm do you consider this player?', 'How unique is this player?', and 'How risk-taking are the decisions of this player?' All items were anchored at 1 (Not at all) and 9 (Very much). These items were derived from the procedure of Experiment 2 in Förster et al. (2005). For Experiment 1 we selected the player with the highest rating on the mean of all four items (α = 0.76) Lionel Messi ($M_{creative}$ = 7.63, SD = 1.9; $M_{deviant}$ = 7.85, SD = 1.9; M_{unique} = 8.37, SD = 1.0; $M_{risk\text{-}taking}$ = 7.22, SD = 1.9) and the lowest mean ratings Per Mertesacker ($M_{creative}$ = 2.52, SD = 1.4; $M_{deviant}$ = 2.96, SD = 1.8; M_{unique} = 3.04, SD = 1.0; $M_{risk\text{-}taking}$ = 2.61, SD = 1.7). For Experiment 2 we selected the two players with the second highest mean ratings of our preliminary investigation: Thiago Alcántara ($M_{creative}$ = 7.33, SD = 1.4; $M_{deviant}$ = 6.90, SD = 1.5; M_{unique} = 6.90, SD = 1.6; $M_{risk\text{-}taking}$ = 6.96, SD = 1.5) and the second lowest mean ratings John Terry ($M_{creative}$ = 3.24, SD = 1.9;

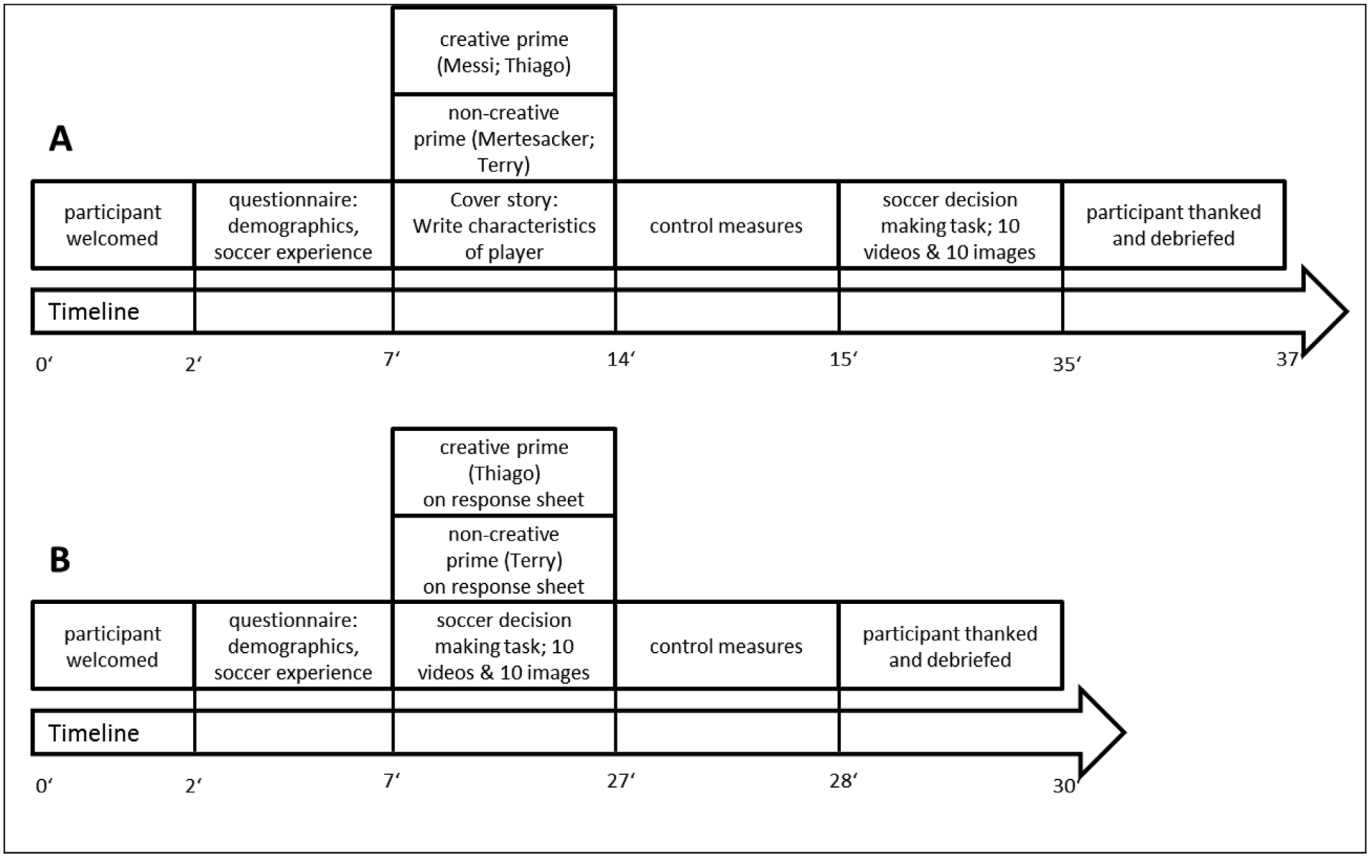

Fig. 1. Experimental timeline of Experiments 1 and 2 (A) and Experiment 3 (B).
Note. The numbers below the timeline represent minutes.

$M_{deviant}$ = 3.48, SD = 2.0; M_{unique} = 3.33, SD = 1.8; $M_{risk\text{-}taking}$ = 3.02, SD = 1.9). Paired-samples t-tests revealed large, statistically significant (all $t > 11.56$) mean differences between all ratings of Lionel Messi and Per Mertesacker and statistically significant (all $t > 8.92$) mean differences between all ratings of Thiago Alcántara and John Terry.

For the experimental between-groups manipulation, participants were randomly assigned to either the creative player (Lionel Messi) group or the non-creative player (Per Mertesacker) group in Experiment 1. Experiment 2 used the same random allocation procedure with the exception that Thiago Alcántara was the creative player prime and John Terry was the non-creative player prime.

2.2. Procedure

The study was carried out in accordance with the Helsinki Declaration, and written informed consent was obtained from each participant before the start of the experiment. Fig. 1 outlines the timeline of the experimental procedure. Every participant was tested individually in a quiet laboratory. Upon arrival, participants were randomly assigned to either the Lionel Messi (creative prime) or the Per Mertesacker (non-creative prime) condition in Experiment 1 and the Thiago Alcántara (creative prime) and John Terry (non-creative prime) condition in Experiment 2. Then the participants completed a questionnaire collecting demographic data, which gathered information related to their soccer experience (how long have you played soccer for; what was the highest level you have played soccer at; how many hours of soccer do you watch per week; which position do you typically play). Subsequently, participants were asked if they were willing to assist for an upcoming study (that was not part of the decision making study) for which their input was needed in regards to how certain soccer players are typically perceived. In line with recommendations on avoiding demand effects in priming studies (Bargh & Chartrand, 2000), the cover story was intended to disguise the real purpose of the experiment and in fact was implemented to induce the experimental priming manipulation (see Förster et al., 2005 for a similar procedure). Specifically, participants were asked to write down what characterizes Lionel Messi (Thiago Alcántara in Experiment 2) or Per Mertesacker (John Terry in Experiment 2) with the following instructions: "Imagine a journalist asks you to describe the typical on-court behavior of the player and what typical situations come to mind that best describe his skills and on-court behavior. Write down your responses as detailed as possible in the next 5 min. Please be as specific as possible and vividly describe everything relevant that comes to your mind".

After this task, participants were thanked for their help and informed that they would now start the actual experimental decision making task, which attempted to find out if soccer players' decision making improved in a video condition (more kinematic information) as compared to a still picture condition. Therefore, half of the participants of both the Lionel Messi (Thiago Alcántara) and Per Mertesacker (John Terry) group viewed 10 videos and 10 stills presented in random order, while for the other half this was reversed and the 10 videos were presented as still situations and the 10 stills as videos. As no differences were evident between static and dynamic scenes we collapsed data analysis over both categories in the following analyses (Furley & Memmet, 2015).

Subsequent to the experimental priming manipulation, participants were asked to complete 4 control measures derived from Förster et al. (2005) of current mood ('How do you feel right now?') on a Likert scale ranging from 1 (Very Bad) to 9 (Very Good); expectations regarding task subsequent task performance ('How well do you think you will perform on the soccer-specific decision making task?'), anchored at 1 (Very Poorly) and 9 (Very Well); expected liking of the task ('How much

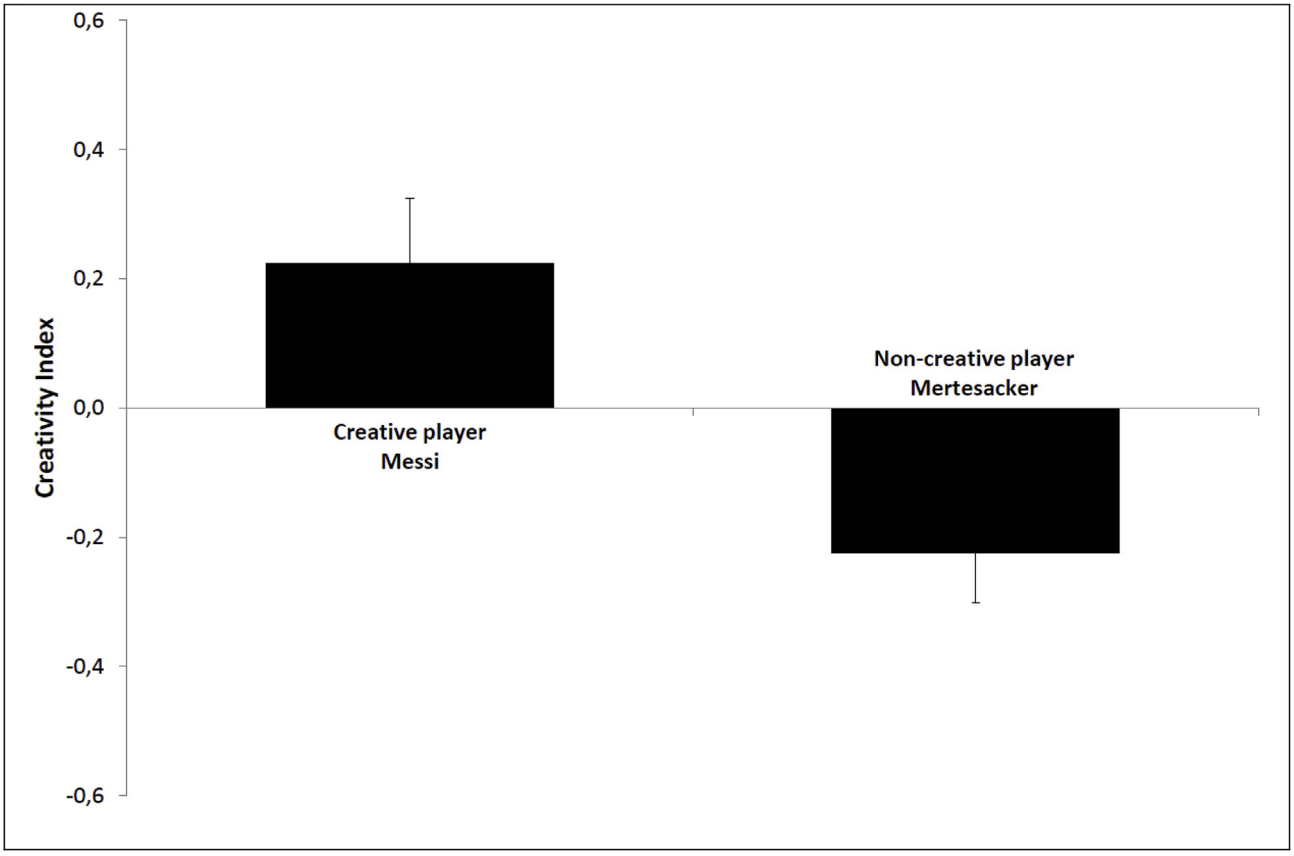

Fig. 2. Mean creativity scores in Experiment 1 as a function of soccer player priming. Error bars represent standard errors of the mean.

are you looking forward to the soccer-specific decision making task?') on a scale from 1 (Not at All) to 9 (Very Much); and general motivation ('How motivated are you to complete the soccer-specific decision making task?'), anchored at 1 (Not at All) and 9 (Very Much).

The transition time between the end of the priming procedure and the start of the decision making task was approximately 1 min. Upon completion of these control measures, the experimenter administered the soccer-specific decision making task (see Memmert et al., 2013 for full details). Initially, participants were familiarized with the procedure of the decision making task with several instruction screens outlining the task demands. The test consisted of 20 different offensive soccer scenes that allowed for a number of possible solutions and were taken from games from the first and second German league of the 2010/2011 season. The videos were approximately 10 s long. The video scenes were presented on a personal computer monitor (screen size: 15 in., diagonal; distance = 45 cm, visual angle of the display: 27° vertical × 34° horizontal). The 20 soccer scenes (10 images and 10 videos) were presented in random order using E-Prime Professional 2.0. After every soccer scene participants had to write down all the tactical decision making options that came to their mind on a response sheet. Participants had 45 s time (the time was indicated by a countdown after every stimulus presentation on the screen) to generate as many adequate tactical solutions as possible. Subsequent to completing the testing procedure (approximately 20 min) participants were informed about the purpose of the experiment.

2.3. Data analysis

Soccer-specific creativity was assessed by using the three criteria of fluency, flexibility, and originality (see Guilford, 1967; Runco, 2007). Fluency was assessed by the number of adequate tactical solutions produced by a participant for every scene and divided by the total number of stimuli to arrive at a fluency score for every participant. Flexibility measured the participant's divergent thinking ability. All solutions given by the participants were sorted into seven different categories based on Memmert et al. (2013: shot on goal, feint followed by a pass, dribble, short pass, lob, cross, and miscellaneous). One point was given for each category selected by a subject and summed for the respective stimulus, before being divided by the total number of stimuli to arrive at a flexibility score for every participant. Two independent raters (soccer experts with high-level coaching certifications who were fully blind to experimental groups and the purpose of the study) judged the originality of the solutions for each scene (An example for an original solution would be if a soccer player stated that they would feint a pass to a certain player on the left and instead play a "no-look pass" to another player). The soccer experts were not familiar with any other variables about the participants. The available range for the originality assessments was 1 (not original at all) to 5 (very original).

All analyses were conducted with IBM SPSS version 24. The inter-judge reliability coefficient was above the critical limit of 0.80 (intraclass correlation coefficient). The individual ratings of the stimuli were used to compute a mean originality score for each participant (the ratings from both raters were averaged for every stimulus and then summed up before being divided by the total number of responses). Besides analyzing the three components of divergent thinking, we further computed a creativity value by averaging the z-transformed fluency, flexibility, and originality values as has been typically done in previous creativity research (e.g. Memmert et al., 2013). The effect of creativity priming was analyzed with an overall MANOVA followed up with a series of independent t-tests (all one-tailed). The significance level was set at $p < .05$. Cohen's d is reported as effect size with 95% confidence intervals.

2.4. Results

Preliminary analyses Experiment 1 and 2. No differences in mood, expectations, liking, and motivation were evident subsequent to the experimental manipulation and prior to the decision making task between the two creative (Lionel Messi and Thiago Alcántara) and non-creative (Per Mertesacker and John Terry) experimental groups. Further, the experimental groups did not differ in their accumulated soccer experience, the highest level they had played soccer at, the amount of soccer they watched on TV, and the distribution of playing positions (defense, mid-field, striker) (all $p > .05$, two-tailed).

Creativity Lionel Messi vs. Per Mertesacker. The descriptive results of the averaged z-transformed creativity values (fluency, flexibility, and originality) are displayed in Fig. 2. An independent *t*-test revealed a significant difference ($t[58] = 3.512$, $p < .001$, one-tailed, $d = 0.91$ [0.37. 1.44]) on the overall creativity index, showing more creative decision making in the Lionel Messi group as compared to the Per Mertesacker group.

1 × 2 (Messi vs. Per Mertesacker) MANOVA on the 3 creativity values using Pillai's trace revealed a significant main effect ($V = 0.215$; $F(3, 56) = 5.109$, $p < .005$, $\eta^2 = 0.215$) confirming the significant differences between the groups on the creativity index. Follow up independent t-tests only revealed significant differences for fluency ($M_{Messi} = 3.140$; $SD = 0.728$; $M_{Mertesacker} = 2.833$; $SD = 0.680$; $t[58] = 1.685$, $p < .05$, one-tailed, $d = 0.43$ [-0.08. 0.94]) and flexibility ($M_{Messi} = 2.642$; $SD = 0.423$; $M_{Mertesacker} = 2.330$; $SD = 0.465$; $t[58] = 2.713$, $p < .005$, one-tailed, $d = 0.70$ [0.18. 1.22]), while no significant differences emerged for originality ($M_{Messi} = 2.987$; $SD = 0.171$; $M_{Mertesacker} = 2.946$; $SD = 0.158$; $t[58] = 0.966$, $p = .17$, one-tailed, $d = 0.25$ [-0.26. 0.78]).

Creativity Thiago Alcántara vs. John Terry. The descriptive results of the averaged z-transformed creativity values (fluency, flexibility, and originality) are displayed in Fig. 3. An independent *t*-test revealed a significant difference ($t[58] = 6.768$, $p < .001$, one-tailed, $d = 1.75$ [1.10. 2.29]) on the overall creativity index, showing more creative decision making in the Thiago group as compared to the Terry group.

1 × 2 (Thiago Alcántara vs. John Terry) MANOVA on the 3 creativity values using Pillai's trace revealed a significant main effect ($V = 0.494$; $F(3, 56) = 18.254$, $p < .001$, $\eta^2 = 0.494$) confirming the significant differences between the groups on the creativity index. Follow up independent t-tests only revealed significant differences for fluency ($M_{Thiago} = 3.745$; $SD = 0.681$; $M_{Terry} = 2.802$; $SD = 0.540$; $t[58] = 5.944$, $p < .001$, one-tailed, $d = 1.53$ [0.95. 2.10]) and flexibility ($M_{Thiago} = 2.873$; $SD = 0.395$; $M_{Terry} = 2.253$; $SD = 0.256$; $t[58] = 7.213$, $p < .001$, one-tailed, $d = 1.86$ [1.25. 2.46]), while no significant differences emerged for originality ($M_{Thiago} = 2.897$; $SD = 0.138$; $M_{Terry} = 2.871$; $SD = 0.160$; $t[58] = 0.689$, $p = .25$, one-tailed, $d = 0.17$ [-0.34. 0.68]).

2.5. Discussion

The results of Experiment 1 and 2 support the hypothesis that domain-specific creative thinking can be primed in soccer players. Initially describing a highly creative soccer player (Lionel Messi or Thiago Alcántara) in comparison to describing a non-creative soccer player (Per Mertesacker or John Terry) resulted in a large effect ($d_{Exp1} = 0.91$; $d_{Exp2} = 1.75$) on a soccer-specific creativity index. Individual t-tests on the components of the creativity index only revealed significant differences for fluency (how many responses participants generated) and flexibility (how often participants switched response categories), while originality (how seldom the responses were according to the norm) was not significant.

Replicating the effect of Experiment 1 in Experiment 2 with two

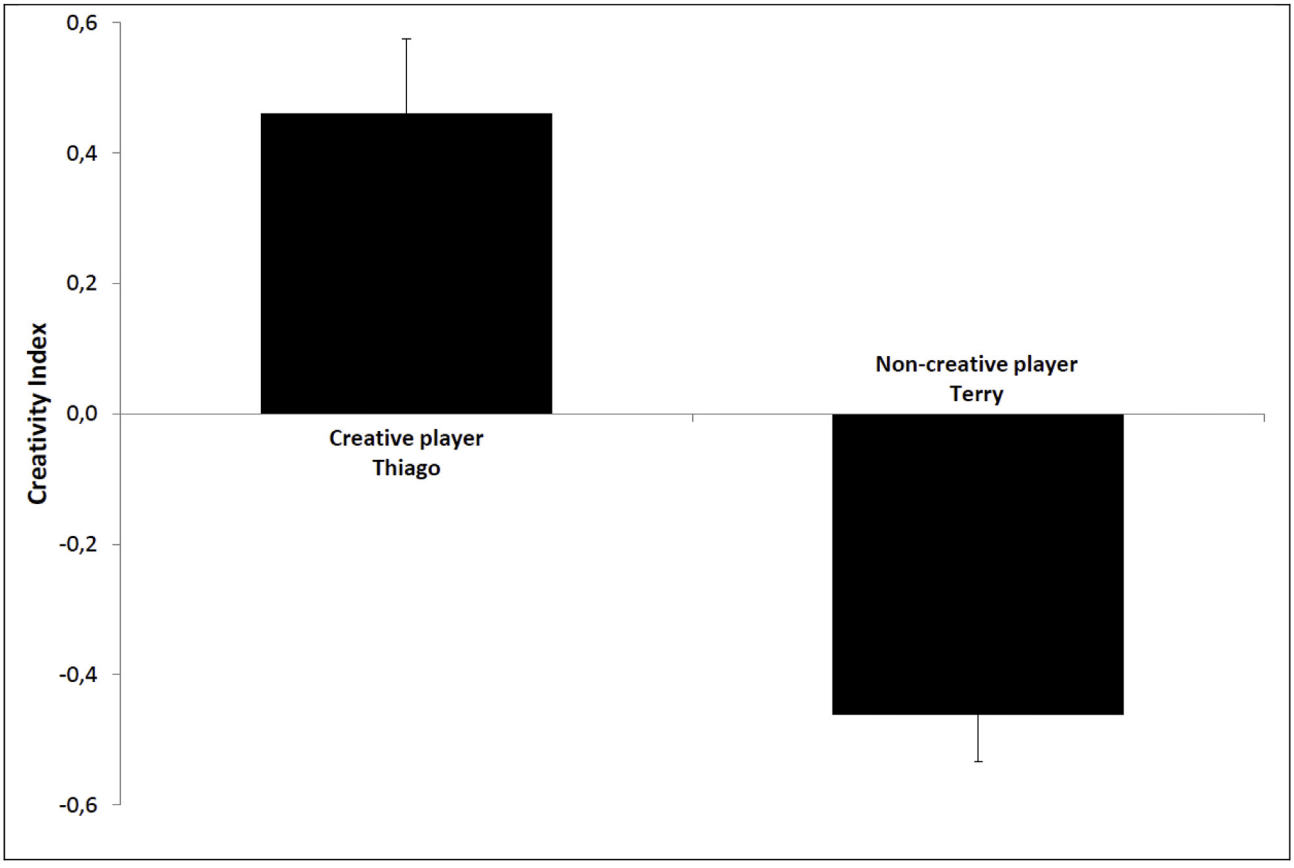

Fig. 3. Mean creativity scores in Experiment 2 as a function of soccer player priming. Error bars represent standard errors of the mean.

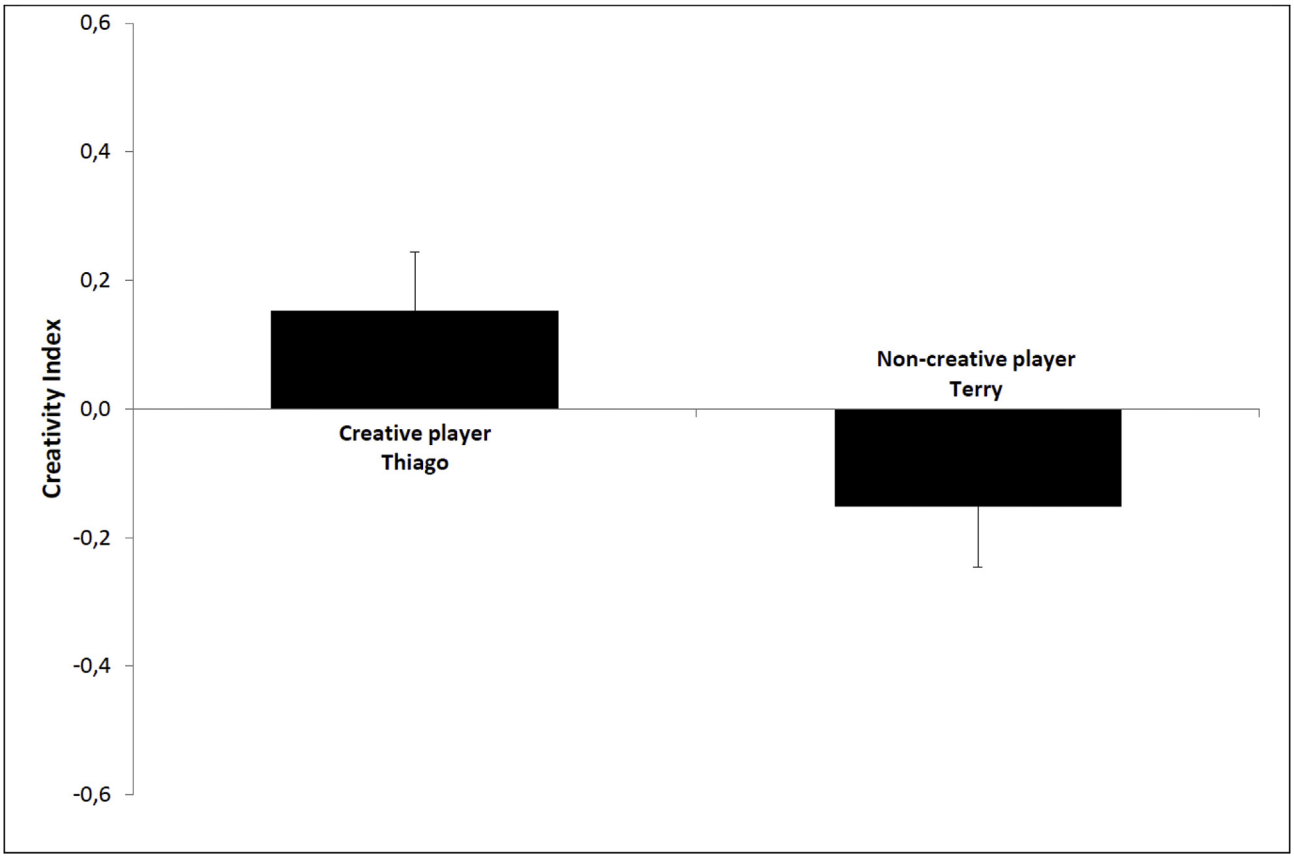

Fig. 4. Mean creativity scores in Experiment 3 as a function of soccer player priming. Error bars represent standard errors of the mean.

different soccer player primes points to the generalizability and robustness of the findings and is in line with recent calls in psychology (e.g. Fiedler, 2011; Munafò et al., 2017; OSC, 2015) stressing the necessity to replicate original findings with different stimuli. In this respect, both experiments suggest that salient characteristics (i.e. creativity) of primed individuals seem to be able to preactivate creative processing modes amongst observers that are in line with the primed characteristics and thereby potentially influence their decision making process.

Nevertheless, it is likely that the results from Experiment 1 and 2 would only be observable in the particular priming procedure used (see Fiedler, 2011 on biases due to the experimental procedure). Dijksterhuis and van Knippenberg (1998) showed that sequential priming effects are moderated by the "strength" of the priming manipulation. As explicitly writing down typical characteristics of celebrity soccer players can be considered a relatively strong experimental manipulation in terms of concept activation, we attempted to conceptually replicate Experiment 1 and 2 with a more subtle priming procedure in which participants were merely exposed to images and names of two respective players. By changing the priming manipulation, we further attempted to increase the external validity of the findings as amateur football players are more likely to be confronted with images and reports of celebrity football players in their everyday lives, as opposed to writing down characteristics of celebrity football players.

3. Experiment 3

For Experiment 3 we used the same two soccer players Thiago Alcántara and John Terry for the creativity priming. Only this time we used a different form of priming in which color images and names of the players (see Bargh & Chartrand, 2000) were printed on the response sheets. Further, the control measures (mood, expectations, liking, and motivation) were given to the participants after the soccer-specific decision making task (see Fig. 1). Otherwise everything was identical to Experiment 1 and 2.

3.1. Method

Participants. Sixty different soccer players (39 women) with an average of 14.96 years (SD = 3.6) of amateur soccer experience as a player took part in the study (M_{age} = 23.3, SD = 3.0). On average the sample reported to watch 3.57 h of soccer per week (SD = 3.1). Written informed consent was obtained from every participant before commencing the experiment. Sample size was chosen to be identical to Experiment 1 and 2.

Measure and Procedure. The measures and procedure were identical to Experiment 2, only that the experimental priming manipulation was different. Instead of having participants write up the characteristics of the respective players, participants received different response sheets in Experiment 3 that either had a color picture and the printed name of Thiago Alcántara or John Terry on the top of the page on which participants had to write down their decisions (see Bargh & Chartrand, 2000 for different priming methodologies). The rationale for this was to test if mere exposure to primes during the decision making task was sufficient to induce priming effects on creativity. Each response sheet contained boxes for four scenes of the decision making test in which participants were asked to write down their answers. Hence, participants had 5 response sheets for the entire test of 20 scenes and every response sheet displayed the image and the name of the respective soccer players. This time the control measures were given to the participants after the soccer-specific decision making task to control that the primes on the response sheets did not affect mood, expectations, liking, and motivation.

3.2. Results

Again no differences in mood, expectations, liking, and motivation were evident after the decision making task between the two experimental groups. Neither did the experimental groups differ in their accumulated soccer experience, the highest level they had played soccer at, the amount of soccer they watched on TV, and the distribution of playing positions (defense, mid-field, striker) (all $p > .05$, two-tailed).

The descriptive results of the averaged z-transformed creativity values (fluency, flexibility, and originality) are displayed in Fig. 4. An independent *t*-test revealed a significant difference ($t[58] = 2.283$, $p < .05$, one-tailed, $d = 0.59$ [0.07. 1.11]) on the overall creativity index, showing more creative decision making in the Thiago Alcántara group as compared to the John Terry group.

1 × 2 (Thiago vs. Terry) MANOVA on the 3 creativity values using Pillai's trace revealed a significant main effect ($V = 0.175$; $F(3, 56) = 3.959$, $p < .05$, $\eta^2 = 0.175$) confirming the significant differences between the groups on the creativity index. Follow up independent t-tests only revealed a significant difference for originality ($M_{Thiago} = 2.997$; $SD = 0.178$; $M_{Terry} = 2.910$; $SD = 0.128$; $t[58] = 2.190$, $p < .05$, one-tailed, $d = 0.56$ [0.04. 1.07]) while no significant differences emerged for fluency ($M_{Thiago} = 2.697$; $SD = 0.501$; $M_{Terry} = 2.663$; $SD = 0.466$; $t[58] = 0.267$, $p = .40$, one-tailed, $d = 0.07$ [-0.44. 0.58]) and flexibility ($M_{Thiago} = 2.172$; $SD = 0.357$; $M_{Terry} = 2.075$; $SD = 0.305$; $t[58] = 1.127$, $p = .13$, one-tailed, $d = 0.29$ [-0.22. 0.80]).

3.3. Discussion

The results of Experiment 3 support the hypothesis that domain-specific creative thinking can be influenced by priming in soccer. Merely exposing amateur soccer players to images and names of soccer players that differ in their domain-specific creativity while generating decision making options for soccer situations impacted on their creative decision making. In line with the findings from Dijksterhuis and van Knippenberg (1998) the effect of the priming procedure of Experiment 3 was smaller ($d = 0.59$ compared to $d = 0.91$ in Experiment1 and $d = 1.75$ in Experiment 2).

In contrast to Experiments 1 and 2 individual t-tests on the components of the creativity index only revealed a significant difference for originality in Experiment 3 and not for fluency and flexibility. While the general pattern of creativity measures in Experiment 3 was in line with our hypothesis, we do not have an explanation why the mere exposure priming only significantly affected originality and not fluency and flexibility as in Experiments 1 and 2.

4. General discussion

The goal of the present paper was to test if priming soccer players with creative soccer players can lead to enhanced creativity. In three experiments we found support for this hypothesis. In line with theoretical proposals (e.g. Bargh, 2014; Dijksterhuis, 2014), social primes (soccer players) that are known for their creative skills seem to be able to activate cognitive representations of creativity which in turn can activate associated mindsets, information processing modes, and response tendencies: in this case, thinking outside the box (originality), generating numerous behavioral options (fluency), switching conceptual categories of problem solutions (flexibility). In this respect, these initial findings of priming in the field of sport contribute to the literature that has successfully transferred priming paradigms to more naturalistic settings (Berger, Meredith, & Wheeler, 2008; Latham & Piccolo, 2012; Papies, Potjes, Keesman, Schwinghammer, & van Koningsbruggen, 2013).

In line with Bargh's (2014) claim that social priming is more likely to generalize to real-world stimuli and situations than more abstract forms of cognitive priming, and given the increased exposure to celebrity player pictures and reports via mobile devices and social media, we consider it possible that the reported laboratory findings might also transfer to the soccer field. However, we acknowledge that future research has to test this hypothesis in representative settings and answer the question if priming effects are strong enough and last long enough to influence behavior during a 90 min soccer match as the time scale of the present priming procedure might not transfer to the soccer field. Once priming has been shown to influence creativity on the soccer pitch, soccer coaches could use video simulations of creative players prior to decision making training or even matches to improve creative decision making. Although speculative at present, it seems feasible that even specific self-talk or certain cue words that contain creative primes have the potential to influence creativity in soccer. Concerning the transfer of priming effects found in the laboratory to the field, it might be useful to adopt a dynamical systems perspective (Krpan, 2017). Combining methods from dynamical systems theory with the sequential priming paradigm is likely to enhance understanding of the associative structure of the mind in representative performance environments. Hence, it is our hope that this first series of investigations stimulates further research on priming in sports.

Caution is warranted on too enthusiastic interpretations of these initial findings, especially as a series of recent investigations has cast doubt on priming studies with some researchers even completely questioning their existence. While many studies (e.g. Bargh et al., 1996; Dijksterhuis & van Knippenberg, 1998; Förster et al., 2005; Lichtenfeld et al., 2012) have found significant priming effects (see Cameron, Brown-Iannuzzi, & Payne, 2012; DeCoster & Claypool, 2004 for meta-analytic reviews), a recent series of studies has failed to replicate priming effects (Doyen, Klein, Pichon, & Cleeremans, 2012; Pashler, Coburn, & Harris, 2012; Pashler, Rohrer, & Harris, 2013). In this regard the field of priming has become the showcase paradigm within the so called crisis of confidence in experimental psychology (Carpenter, 2012; Kahneman, 2012; Yong, 2012). Unfortunately the debate on priming has been 'fairly black and white' amongst some scientists, with one side suggesting that priming is an omnipresent phenomenon that will be evident in a vast variety of situations, and the other side implying that priming effects are not reliable and might even be an instance of a false-positive effect in the literature. However, the history of psychological science suggests that it is often not an 'either or' question, but rather a question of 'under what circumstances' (see Cesario, 2014; Klatzky & Creswell, 2014, for a recent discussion on moderators of priming effects). Therefore, important moderators were taken into account when investigating priming effects in the present series of studies: i.e. the social primes (i.e. soccer players) substantially differed in attributed creativity; Further, the social prime, task, and participants were all from the domain of soccer.

Although we conceptually replicated creativity priming effects in soccer across three experiments,[1] the present series of studies is not without limitations. Most importantly, we did not implement a control condition or a baseline measure of creativity in any of the experiments and therefore do not know if the relative differences between the experimental groups was caused by creative primes enhancing creativity or non-creative primes decreasing creativity amongst participants. As the present research was the first research investigating priming on soccer specific creativity, we attempted to follow the original paradigms of Dijksterhuis and van Knippenberg (1998; see also Förster et al., 2005) as closely as possible. We carefully acted in accordance with the recommendations of Bargh and Chartrand (2000) on avoiding demand effects in priming studies by using a cover story. This required that the priming manipulation was at the beginning of the experiments

[1] The authors declare that the three reported experiments were the only experiments conducted on creativity priming in soccer and no studies landed in the file drawer. Stated differently, we found creativity priming effects in hundred percent of the studies we conducted on this hypothesis.

and not after a baseline creativity measure. We acknowledge that future research is needed to address remedies of the paradigm and advance knowledge on the potential of creativity priming on the respective playing fields. Some alternative explanations of the present results were eliminated by controlling that the experimental priming manipulation was not confounded with differences in mood, expectations, liking of the task, or motivation. Also, there is no reason to believe that the experimental priming groups differed in terms of creativity or decision making abilities prior to the experimental manipulations. Across all three experiments no significant differences were evident in accumulated soccer experience, the highest level they had played soccer at, the amount of soccer they watched on TV, and the distribution of playing positions (defense, mid-field, striker). In addition, the random allocation of participants to the experimental groups reduced the risk of other confounding variables that were not explicitly controlled for. Nevertheless, future research might want to conceptually replicate these first findings using a within-subject design and/or having baseline measures on the dependent variables (see Bargh & Chartrand, 2000 on methodological considerations in conducting these future studies).

The results of the present studies raise the question regarding the nature of the priming effects found. As the primes did not merely differ in terms of creativity, but also in playing position and potentially other variables (e.g. regulatory focus; see Memmert et al., 2013) it remains unclear what mental representations were activated by the primes and how this activation spread to influence soccer-specific creative decision making. Although we consider it interesting that priming soccer players has the potential to influence creative decision making, future research should look into the specificity of priming effects in different sport situations.

In conclusion, human creativity is influenced by a variety of trait, state, and contextual variables that interact in a complex manner when producing creativity in numerous situations, such as in the field of sport. The present findings suggest that prior exposure to certain primes could be an important contextual variable to consider in enhancing (or reducing) creativity in sports. Therefore, social priming seems a promising avenue to approach in future sport psychological research and application.

5. Research disclosure statements

The authors declare that 1) (a) the total number of excluded observations and (b) the reasons for making these exclusions have been reported in this manuscript; 2) that all independent variables or manipulations, whether successful or failed, have been reported in the manuscript; 3) that all dependent variables or measures that were analyzed for this article's target research question have been reported in the manuscript; 4) that how sample size was determined has been reported in this manuscript and that we did not collect further participants after first analyzing collected data.

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