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Abstract

Grounded in the Cognitive Evaluation Theory, a mini-theory of Self-Determination Theory, this experimental field study sought to examine the impact of competence support of both coaches and athlete leaders on athletes' competence satisfaction, intrinsic motivation, and subjective as well as objective performance. Male basketball players (N = 120) were allocated to groups of five players. These groups were then randomly assigned to a control group or to one of three experimental conditions. In these experimental conditions either the coach, the athlete leader, or both provided motivational feedback to their team. The provision of motivational feedback by either the coach or the athlete leader was sufficient to increase athletes' competence satisfaction, intrinsic motivation, and objective performance (i.e., enhanced execution time without a decrease in scoring percentage) relative to the control group. Interestingly, when both the coach and athlete leader provided competence support, a surplus effect was observed on objective performance compared with when only the coach provided competence support. Furthermore, Structural Equation Modeling revealed that players' competence satisfaction mediated the relationship between the provided competence support and players' intrinsic motivation, while a direct effect was observed on objective performance. In conclusion, the study findings indicate that also athlete leaders can adopt a motivating role and that by doing so their impact is as strong as the impact of the coach. Both coaches and athlete leaders can thus boost athletes' objective performance and foster competence satisfaction, with the latter resulting in increased intrinsic motivation.

Key words: Cognitive Evaluation Theory, Self-Determination Approach, competence satisfaction, peer leader, team captain, shared leadership.

The Power of Competence Support in Sport Teams: The Impact of Coaches and Athlete Leaders on Athletes' Intrinsic Motivation and Performance.

As the Olympic motto "*Citius, Altius, Fortius"* (i.e, Latin for "*Faster, Higher, Stronger*") indicates, many athletes are eager to push their limits. This hunger for continuous improvement is evidenced by the fact that athletes spend hundreds of hours in their sport club to optimize every detail of their play. Undoubtedly, a strong motivation is driving them. Research has indeed demonstrated that athletes' motivation yields various benefits such as psychological well-being (Martin-Albo et al. 2012; Mouratidis et al. 2010), persistence (Pelletier et al. 2001), deliberate practice (Vink et al. 2015), and performance (Gillet et al. 2010; Zuber et al. 2015), while buffering against dropout (Sarrazin et al. 2002). However, not all types of motivation have equal outcomes in the long run. What appears especially critical is that athletes engage in the activity for its own sake, that is, because they experience their sport as inherently enjoyable and interesting (i.e., intrinsic motivation; Ryan & Deci 2000; Ryan & Deci 2017; Vallerand 2004). In particular because intrinsic motivation fosters high-quality learning and lasting engagement, it is important to identify the factors and processes that engender versus undermine it (Ryan & Deci 2000). An essential question for coaches is thus how to maintain or even enhance athletes' intrinsic motivation.

Competence Support as a Means to Foster Intrinsic Motivation

Within the Cognitive Evaluation Theory (CET), a mini-theory of Self-Determination Theory (Ryan & Deci 2002; Ryan & Deci 2017; Vansteenkiste et al. 2010), it is maintained that athletes' intrinsic motivation is depended on the extent to which athletes perceive themselves to be competent. Together with autonomy and relatedness, competence is considered a critical psychological need, the satisfaction of which is conducive to increased interest in and enjoyment of the activity at hand. Indeed, if athletes feel effective in executing an assigned task, they will experience the task as more inherently satisfying and they are more

likely to re-engage in the task in the future (Mageau & Vallerand 2003; Mouratidis et al. 2008b).

Perhaps more than any other context, sport settings are replete with ongoing feedback, supporting or thwarting athletes' need for competence. Athletes derive direct performance feedback from either observing their performance themselves or they receive verbal feedback by their coach, teammates, parents, or fans. Despite the pivotal role of competence support in athletes' functioning, research on the impact of competence support by coaches and teammates is sparse. Therefore, in the current study, we focus on how both coaches and leaders within the team (i.e., athlete leaders) can support athletes' sense of competence, and hence also their intrinsic motivation and performance.

We should note, though, that competence support is a broad construct that encompasses different facets. These facets include the provision of positive informational and motivational feedback and encouragement, the provision of optimal challenges, the offer of help and guidance during task execution, and the creation of a structured environment by providing clear guidelines and expectations (Curran et al. 2013; Vansteenkiste et al. 2012). In the present study, a structured environment was created by using a predefined basketball task and by providing clear guidelines and expectations how to execute the task. The facet of competence support that we manipulated involved the extent to which leaders provide motivational feedback.

The Power of Positive Motivational Feedback

More than 30 years ago, Vallerand and Reid (1984; 1988) already highlighted the importance of verbal feedback in different laboratory studies. More specifically, male and female undergraduate students performed a motor balance task and received either positive or negative feedback from the experimental leader (e.g., "It looks like you have a natural ability to balance and it shows in your performance" or "This is an easy task but your improvement

is quite slow. Try to perform as well as you can", respectively). Findings revealed higher levels of intrinsic motivation after positive than after negative feedback, with perceived competence mediating the effect. Unfortunately, the authors did not test the effect on performance, which many coaches in competitive sports settings still consider the most critical outcome.

Moreover, the ecological validity of these laboratory experiments is too limited to translate these findings to the context of competitive team sports. For example, if the task is sport-specific rather than a general balance task, participants could be more eager to perform better. Moreover, receiving feedback from a leader who is familiar might yield different effects than receiving feedback from an unknown experimenter. Furthermore, the sporting context is characterized by abundant feedback, not being limited to direct performance feedback (as often used in the laboratory experiments). Hence, the question remains whether the provision of positive motivational feedback can lead to a further increase in competence satisfaction and intrinsic motivation.

A limited number of studies on competence support in a sports context provided preliminary evidence on the potential role of positive feedback in this setting. To illustrate, positive feedback was found to be positively related to athletes' competence satisfaction among female softball players (Amorose & Nolan-Sellers 2016) and to athletes' intrinsic motivation among high school and college athletes (Amorose & Horn 2000; Horn 1985). Longitudinal studies substantiated the observed cross-sectional relation between competence satisfaction and intrinsic motivation in samples of youth athletes, both at a lower competitive level (Jõesaar et al. 2011) and the elite level (Losier & Vallerand 1994). Going beyond this correlational work, De Muynck et al. (2017) recently conducted an experimental field study, thereby showing that the provision of positive, relative to negative, feedback increased tennis

players' intrinsic motivation, an effect that could be accounted for by improved competence satisfaction.

Although experimental studies on the impact of competence support in the CET-tradition are rare, inspiration can be found in closely related research areas, such as the self-efficacy literature. Self-efficacy can be defined as "the beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura 1997). When players experience such situation-specific self-confidence, they will feel competent to execute the activity. Several cross-sectional and longitudinal studies have demonstrated that self-efficacy is associated with players' exerted effort and their performance (e.g., Bandura 1997; Feltz & Lirgg 1998; Heazlewood & Burke 2011; Moritz et al. 2000; Pajares 2006; Weiss et al. 1989). Experimental studies in this area revealed that players' self-efficacy can be enhanced through the provision of positive feedback (Bandura & Cervone 1983; Escarti & Guzman 1999; Hutchinson et al. 2008; Weinberg et al. 1981). Such findings provide additional evidence that competence support will yield similar effects on competence satisfaction.

Coach and Athlete Leader as Sources of Competence Support

Although most leadership research in sport has solely focused on the coach, this is not the only source of competence support in the team. Recent work has revealed that also leaders within the team (i.e., athlete leaders) can positively impact their teammates (for a review, see Cotterill & Fransen, 2016). To our knowledge, only two experimental studies have been conducted that specifically focused on the impact of athlete leaders' competence support (Fransen et al. 2015a; Fransen et al. 2017b). Their findings revealed that when the athlete leader provided positive feedback, his teammates reported feeling more competent, were more intrinsically motivated, identified stronger with their team, showed more team confidence, and ultimately also performed better.

Although these experiments highlighted the important role of the athlete leaders, some limitations regarding the ecological validity restrain the direct transferability to the actual sporting context. First, the athlete leader was a research confederate, unknown to the other players, and relatively older and more skilled. Second, new teams were composed before the experiment consisting of players who did not know each other in advance. As such, this experimental situation does not accurately reflect the sporting context in which players know each other very well and the athlete leader has earned his leadership status through interactions with his team.

Present Research

The aim of the present study is to examine the impact of competence support of both coaches and athlete leaders on athletes' competence satisfaction, intrinsic motivation, and performance. Given the paucity of experimental work in the sport context grounded in CET, we will adopt an experimental design. This is of critical importance because any observed relation between perceived positive feedback and intrinsic motivation in correlational studies can possibly be accounted for by a third covarying variable, such as performance. To verify whether it is actually the provision of competence support that induces a change in intrinsic motivation, an experimental design is required.

Although the internal validity of the previously mentioned experiments in the self-efficacy literature is high, the limited external validity potentially constrains the transfer of the findings to an authentic, competitive sport context. Therefore, the present study goes beyond past work in this area as it took place in a field setting instead of the laboratory (Bandura & Cervone 1983; Hutchinson et al. 2008). Furthermore, we sampled competitive athletes instead of university students (e.g., Bandura & Cervone 1983; Hutchinson et al. 2008; McAuley et al. 1999), we used an interactive task that includes sport-specific skills and cooperation between team members instead of individual task (e.g., Bandura & Cervone 1983; Escarti & Guzman

1999; Hutchinson et al. 2008), and we provided ongoing feedback during the exercise instead of limited performance feedback after the performance as sport settings are replete with continuous feedback (e.g., Bandura & Cervone 1983; Escarti & Guzman 1999; McAuley et al. 1999).

Apart from these methodological improvements, which speak to the external validity of the study, content-wise we went beyond past work by studying the role of two ecological valid and different sources of competence support, namely the coach and the athlete leader (e.g., Bandura & Cervone 1983; Escarti & Guzman 1999; Hutchinson et al. 2008; McAuley et al. 1999). Finally, we also tracked athletes' objective performance by recording their performance times and keeping their scores. Albeit the most desirable outcome in a sports setting, the impact on objective performance has only rarely been investigated.

To examine the unique and additive motivational role of athlete leaders and coaches, three different feedback conditions will be created, two of which involve a single source and one a double source of feedback. That is, in the single source conditions, either the coach or the athlete leader will be given concrete information on how to provide positive feedback and will then be instructed to provide such motivational feedback afterwards. In the double source condition, both the athlete leader and the coach will be instructed to provide positive feedback. By contrasting both single sources of feedback relative to each other and the control group, we will be able to gain insight in (1) the differential impact of coaches and athlete leaders and (2) whether a single source suffices to generate an intrinsically motivating and performance-enhancing effect. By contrasting the double-source feedback conditions with the single-source feedback conditions, we can address the question whether 'more is better' or whether, instead, there is a ceiling effect in the provided positive feedback such that additional sources of competence-enhancing feedback do not yield any supplementary effect.

We have explicitly chosen for the provision of motivational feedback instead of technical feedback (i.e., specific advice to optimize the technique of a particular skill) for several reasons. First, such feedback is often used in sport practice by both coaches and athletes. Second, younger athletes are often not skilled enough to provide high-quality technical feedback, while motivational feedback is much more frequent. Third, the performance advantages related to technical improvement only manifest in the long run (Ericsson et al. 2007), while motivational feedback may yield in an instant effect on the effort of team members, resulting in a faster execution time (Fransen et al. 2017b). This faster execution is an important performance indicator as it leads to a quicker rebound and increased scoring opportunities. The motivational feedback was provided ongoingly, that is, during activity engagement either the coach, athlete leader or both encouraged the athletes and highlighted positive features of their performance on numerous occasions.

Grounded in CET (Ryan & Deci 2017; Vansteenkiste et al. 2010) research, we expected that the provision of motivational feedback (e.g., “Great shot!”; “Keep up the speed, you can do this!”) would result in increased competence satisfaction, which would, in turn predict an increase in intrinsic motivation (Fransen et al. 2017b; Mouratidis et al. 2008a; Mouratidis et al. 2008b). That is, improved competence satisfaction would account for (i.e., mediate) the increase in athletes’ intrinsic motivation. As for the performance outcomes, we adopted a differentiated approach, thereby including a subjective indicator (i.e., satisfaction with one’s own performance and with the team’s performance) as well two objective indicators; a more quantitative aspect of performance (i.e., speed as reflected by the time to execute the activity) and a more qualitative aspect of performance (i.e., accuracy as reflected by the scoring percentage). In line with previous studies (Fransen et al. 2017b), we expect that the provided motivational feedback of either the coach and/or the athlete leader will result in a faster execution of the task due to increased effort. Yet, it remains to be seen whether

motivational feedback would also increase athletes' accuracy (i.e., scoring percentage), the more qualitative aspect of performance. Although the pitfall of increasing speed is that accuracy gets lost, we expected that players would maintain their initial accuracy levels (i.e., scoring percentage) under motivational feedback conditions in spite of their increased speed. Herein, we examined the effect of motivational feedback on the combined score of objective performance, as well as on both indicators separately.

Finally, while CET clearly predicts an enhancement in intrinsic motivation due to improved competence satisfaction, the question whether enhanced competence satisfaction would also generalize to improved performance remains to be investigated. Indeed, one possibility is that motivational feedback yields an immediate performance-enhancing effect, especially on quantitative indicators. That is, under competence-supportive conditions athletes get energized to execute the task faster, an effect that directly stems from the received positive feedback itself. Further, because competence satisfaction is assessed via a questionnaire after task execution, it is well possible that actual objective performance drives changes in competence satisfaction and intrinsic motivation instead of competence predicting an increase in performance. The following four formal hypotheses were put forward and tested:

H1: By providing motivational feedback, *coaches* will nurture athletes' sense of competence (H1a) and foster their intrinsic motivation (H1b), compared with the control group. With respect to performance, we expect a positive impact on subjective performance (H1c) and objective performance (i.e., faster execution time, while maintaining the scoring percentage) (H1d).

H2: By providing motivational feedback, *athlete leaders* will nurture athletes' sense of competence (H2a) and foster their intrinsic motivation (H2b), compared with the control group. With respect to performance, we expect a positive impact on

subjective performance (H2c) and objective performance (i.e., faster execution time, while maintaining the scoring percentage) (H2d).

H3: When both coach and athlete leader provide competence support together, a surplus effect will be created compared with the effect of coach and athlete leader separately, both for competence satisfaction (H3a), intrinsic motivation (H3b), subjective performance (H3c) and objective performance (i.e., faster execution time, while maintaining the scoring percentage) (H3d).

H4: In line with the premises of the Cognitive Evaluation Theory (Vansteenkiste et al. 2010), players' competence satisfaction will explain (i.e., mediate) the relationship between the provided competence support and players' intrinsic motivation (H4a). With respect to performance, we were open to the possibility that motivational feedback would yield a direct performance-enhancing effect, which then impacts on athlete's competence levels (H4b) instead of improved competence satisfaction and intrinsic motivation accounting for the performance-enhancing effect of motivational feedback.

Methods

Procedure

The presidents of 25 Flemish basketball clubs were contacted to participate in the experiment. The ten clubs that agreed to participate (yielding a response rate of 40%) were asked to submit the team roster of the participating team(s). Two weeks before the experiment took place the players received a first questionnaire, complemented by an ethical consent form. These questionnaires were completed either via an online survey or via paper and pencil. In the latter case players completed the questionnaires after a training session, while a research assistant was present.

On the day of the experiment, a research assistant attended a training session of the participating team. After introducing himself, the research assistant divided the participants in experimental groups of five players, consisting of one leader, who was perceived as very good leader by the other four players (based on a preceding survey). A research confederate acted as the coach of the team. Each experiment (including four participants) lasted about 45 minutes. Immediately after the experiment, a debriefing took place in which participants were informed about the conducted manipulations and the aim of the experiment. In addition, after the full data collection was completed, participants were informed about the performance ranking of all participating teams, as well as about the scientific findings and implications of the study. The study design was approved by the ethical committee of the first author's university. Participation was voluntary and players could withdraw their participation at any time. Furthermore, full confidentiality was guaranteed and no rewards were provided for participation.

Participants

In total, 120 male basketball players participated in our experiment. The players were on average 14.9 years old (*SD* = 1.2) and had 6.1 years of basketball experience (*SD* = 2.9). Participants were divided into 24 groups of five players. As mentioned before, to increase the ecological validity, each experimental group consisted of five players of the same team in contrast to previous research (Fransen et al. 2015a; Fransen et al. 2017b).

Experimental Design

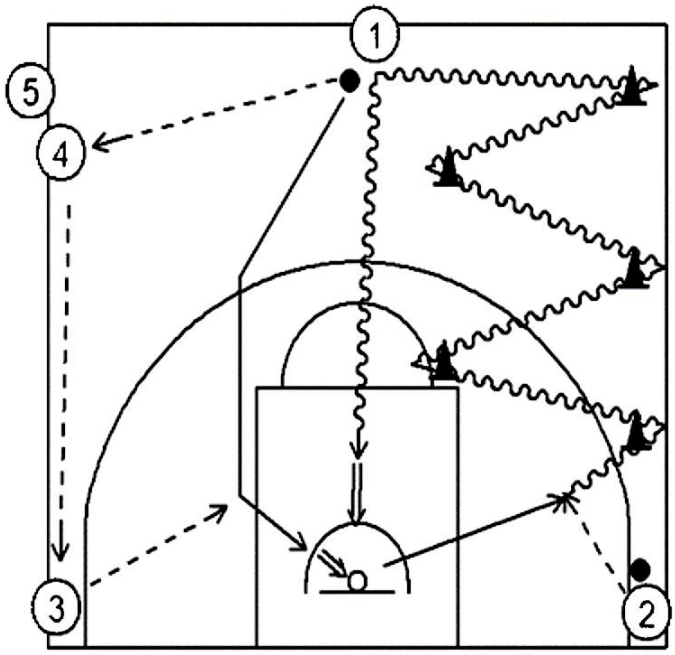
Procedure. Two weeks before the experiment started, players were asked to rate each of their teammates' leadership on a scale, ranging from 1 (*very bad leader*) to 7 (*very good leader*). The results of this questionnaire determined the grouping of the experimental teams. More specifically, the player who was perceived as best leader of the team (i.e., highest *indegree centrality*) became the captain of an experimental group, together with four players

who had previously rated his leadership qualities very high. In teams with 10 or more players, a second experimental team was composed including the second best leader and four players who perceived him as a very good leader. As such, we experimentally composed teams that included one leader and four followers. To allow comparison across the different teams, we ensured that each experimental team consisted of five players. Hence it was possible that some players of the basketball team could not participate in the experiment and just continued their regular training session.

The players of the experimental teams received an identical basketball shirt to foster players' identification with their team. Each team subsequently completed two similar test sessions, including the same basketball task: the first session represented a baseline assessment and the second session represented the actual experimental manipulation. To guarantee that participants would exert their maximum effort in both sessions, they were informed that the scores of both test sessions would be aggregated to obtain an overall team score. As a cover story, we told the athletes that their team performance would be compared with norm tables that include the average performance of teams, taking into account their age and their competition level.

The task. Each test session consisted of a highly interactive basketball task, presented in Figure 1. The athlete leader (i.e., Player 1) started the exercise by passing the ball to Player 4, who passed the ball forward to Player 3. After receiving the ball back from Player 3, Player 1 tried to score with a lay-up. Immediately thereafter, he received a new ball from Player 2, dribbled along the cones, and tried to score with a free-throw. As soon as the ball hit the board, Player 2 (who rebounded the lay-up and had in the meanwhile moved to the starting point) started the exercise. Player 3 rebounded the free-throw and took the place of Player 2. Player 4 moved to the position of Player 3.

Figure 1. The set-up of the highly-interactive basketball test, used in the present experiment.



After explaining the exercise, the coach (i.e., the research confederate) instructed the players to practice the exercise once (i.e., each player one round). The coach corrected any mistakes and provided additional information when necessary to minimize the learning effect between the first and second test session.

In each test session, the team completed the exercise 50 times, meaning that each player completed 10 rounds, including 20 scoring opportunities in total (i.e., one lay-up and one free-throw in each round). The research assistant kept track of the scores and informed the players how many rounds they still had to complete.

Manipulation

In the second test session, we manipulated the behavior of either the coach or the athlete leader, and more specifically the extent to which they supported other members' competence. We adopted a 4 x 2 design, with time as within-subjects variable (i.e., two different test sessions) and four experimental conditions that varied in the provided competence support as between-subjects variable.

The first test session involved a baseline measurement, in which the coach acted in a neutral manner; except for the formal instructions on how to perform the exercise, he gave no competence-supportive feedback. Also, no specific instructions were given to the athlete leader of the team. During the second test session, the participating teams were randomly distributed to one of four conditions (i.e., six teams per condition); (1) the coach condition (in which the coach supported team members' competence); (2) the athlete leader condition (in which the coach asked the athlete leader to support team members' competence); (3) the combined condition (in which the coach supported team members' competence himself and asked the athlete leader to do so); and (4) the control condition (in which the coach neither provided competence support himself, nor asked the athlete leader to do so). Each of the conditions was executed according to a detailed, standardized script, which can be found in the Appendix.

In line with earlier research (Fransen et al. 2017b; Mouratidis et al. 2008a), the coach (i.e., our confederate) supported team members' need for competence by providing positive feedback and by encouraging them, both at the individual level and at the team level (e.g., "Great play, team. Keep it up and we will certainly end high on the contest ranking!"). In each round (i.e., while one player performed the exercise), the coach provided once individual feedback to the performing player (e.g., "Well done, great shot!") and once feedback to the entire team (e.g., "Great play, team!").

In the athlete leader condition and the combined condition, the coach instructed the athlete leader between the two test sessions. More specifically, the coach informed the athlete leader that he was seen as best leader by his teammates and asked him for help to take the performance of the team to a higher level. The athlete leader was given concrete examples of how to provide competence feedback. To allow comparison with the competence support provided by the coach, the athlete leader was instructed to provide motivational feedback

during every round to the player who executed the exercise as well as to the team in general. If the athlete leader did not adopt this frequency, the coach reminded the athlete leader of his task during the experiment. The full scripts that were adopted in this experiment are presented in the Appendix.

Measures

Participants completed the same two-page questionnaire after both the first and second session.

Manipulation check

Competence valuation. We attempted to create a situation in which players were motivated to perform well. To verify whether our attempt was successful, participants rated how valuable they found it do well on the task after the first test session. The scale, based on the work of Mouratidis et al. (2008b), included two items, namely: "It is important for me that I perform well on this task" and "It is important for our team that we perform well on this task." These items were rated on a scale ranging from 1 (*completely disagree*) to 7 (*completely agree*) and were positively correlated ($r = .69$, $p < .001$).

Leader status of the athlete leader. To examine whether the confederate was perceived as athlete leader of the team, participants answered the following question "To what extent do you perceive each of your teammates to be the leader of your team?" on a scale, ranging from 1 (*very bad leader*) to 7 (*very good leader*). We then compared the perceived leader status of the appointed leader with the status of the other players.

Perceived competence support. To determine the effectiveness of the competence manipulation, we relied on the indicators of a competence-supportive environment (Mouratidis et al. 2008a; Standage et al. 2005). More specifically, participants rated the following question on a scale, ranging from 1 (*not at all*) to 7 (*very much*): "Please indicate for each of your teammates and coach to what extent, during the past basketball test, they

helped you to improve, encouraged you, and gave you the feeling that you were competent in performing the basketball test." In addition, the experiment leader tracked the objective frequency of provided motivational feedback by the athlete leader.

Motivational processes

Competence satisfaction. Participants' competence satisfaction was measured by two items, suggested by Chen et al. (2015). An example item is: 'During the previous basketball test, I felt competent in what I did.' Both items were scored on a 7-point Likert scale, ranging from 1 (*completely disagree*) to 7 (*completely agree*).

Intrinsic motivation. To assess participants' intrinsic motivation, we used the four-item intrinsic motivation subscale suggested by Mouratidis et al. (2008b), as an adaptation of the Sport Motivation Scale (Pelletier et al. 1995). All items were scored on a 7-point Likert scale, ranging from 1 (*completely disagree*) to 7 (*completely agree*). An example item is: "I did my best during the previous basketball test because it was fun." The internal consistency of the present four-item scale was excellent, as demonstrated by a Cronbach's alpha of .80 and .89 after the first and second session, respectively.

Performance. We included both subjective and objective performance measures. For the subjective performance ratings, we asked the participants to rate the following items (both for themselves as well as for their team) on a 7-point Likert scale, ranging from 1 (*completely disagree*) to 7 (*completely agree*): "I/My team can complete the task fast" and "I/My team can perform the task accurately (i.e., scoring many shots)."

As objective performance measures at the individual level, we assessed (1) the number of lay-ups and free-throws the participant scored in one test session (i.e., varying between 0 and 20 during one test session); and (2) the time that the participant needed to complete the exercise (i.e., for each player his individual times on the 10 rounds were added). Based on these measures we constructed an overall performance measure, namely the time an

individual needed to complete his 10 rounds, complemented by five seconds for each missed lay-up or free-throw. To the participants, this overall measure of team performance was framed as the decisive measure to compare the performance of their team with the performance of the other teams.

Results

The means and standard deviations of all the included variables, as well as their correlations are presented in Table 1.

Manipulation Check

Competence valuation. On average, players rated their competence valuation as 5.11 (*SD* = 1.34) on a scale from 1 to 7. In line with our intentions, participants thus considered the task as important and were motivated to perform well. Furthermore, a one-way ANOVA revealed no significant differences between the different conditions ($F(3,116) = .29$; $p = .84$; $\eta^2 = .01$).

Leader status of the athlete leader. Before the second test session, we assessed whether the appointed athlete leader (based on the questionnaire before the experiment) was still perceived as best leader in the team. Results revealed that in 22 of the 24 teams (92%), the appointed athlete leader was still perceived as best leader in the team. Of the two remaining teams, only one team participated in the athlete leader condition (the other one in the control condition) and the difference between the appointed leader and the best athlete leader was only .25 scale points on a 7-point scale (5.25 versus 5.50). We can thus conclude that our intention to appoint the best athlete leader was successful.

Perceived competence support. Table 2 presents the means and standard deviations of the perceived competence support of both coach and athlete leader after both test sessions, across the four conditions. In addition, Table 2 reveals the results of the 4 x 2 repeated measures ANOVA's with time as within-subjects repeated measure and the four conditions as between-subjects factors.

Table 1

Means, standard deviations, and correlations between all the included variables.

	M	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Perceived competence support of the coach at T1	4.56	1.38													
2. Perceived competence support of the athlete leader at T1	4.99	1.45	.35***												
3. Competence satisfaction at T1	4.93	.86	-.03	-.26*											
4. Intrinsic motivation at T1	5.26	.91	.09	.08	.38***										
5. Subjective individual performance at T1	4.85	.93	.13	-.10	.40***	.28**									
6. Objective individual performance (time) at T1	164.56	15.32	.02	-.03	-.07	-.10	-.11								
7. Objective individual performance (scores) at T1	13.69	2.04	.02	-.09	.19*	.16	.50***	-.13							
8. Perceived competence support of the coach at T2	5.12	1.72	.34***	.12	.14	.22*	.21*	-.21*	.11						
9. Perceived competence support of the athlete leader at T2	6.01	.85	.06	.21*	.13	.30**	.15	-.03	-.09	.25*					
10. Competence satisfaction at T2	5.27	.81	.01	-.21*	.60***	.26**	.33***	-.06	.10	.15	.12				
11. Intrinsic motivation at T2	5.52	.96	-.06	.01	.37***	.78***	.27**	-.12	.12	.31***	.32***	.48***			
12. Subjective individual performance at T2	5.35	.83	-.03	-.12	.45***	.21*	.42***	-.09	.16	.12	.17	.58***	.34***		
13. Objective individual performance (time) at T2	154.42	17.89	-.03	-.04	.05	-.10	-.01	.80***	-.04	-.37***	-.13	-.01	-.17	-.02	
14. Objective individual performance (scores) at T2	13.84	2.48	.01	.00	.12	.06	.17	-.04	.35***	-.17	.03	.21*	.04	.32***	.15

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 2

Results of the 4 x 2 Repeated Measures ANOVA's for the Manipulation Checks, with Time as the Within-Subject Factor and the Experimental Condition as the Between-Subject Factor Together with the Results of the Post-hoc Analyses of the Interaction Effects.

	M at Time 1 (*SD*)	*M* at Time 2 (*SD*)	Time		Time x Condition		Post-hoc tests (Time x Condition)					
							Coach condition		*Athlete leader condition*		*Combined condition*	
			F	η_p^2	F	η_p^2	F	η_p^2	F	η_p^2	F	η_p^2
1. <u>Perceived</u> competence support of the coach			7.69**	.07	4.85**	.12						
A. Coach condition	4.70 (1.38)	5.63 (1.74)										
B. Athlete leader condition	3.78 (1.19)	4.70 (1.54)					.00	.00				
C. Combined condition	4.93 (1.23)	5.50 (1.76)					.50	.009	.53	.01		
D. Control condition	5.08 (1.26)	4.46 (1.63)					13.60***	.21	15.14***	.23	5.73*	.10
2. <u>Perceived</u> competence support of the athlete leader			45.85***	.33	2.93*	.09						
A. Coach condition	5.25 (1.36)	5.79 (.83)										
B. Athlete leader condition	4.88 (1.57)	6.21 (.66)					3.63	.07				
C. Combined condition	4.96 (1.60)	6.54 (.66)					5.09*	.10	.28	.006		
D. Control condition	4.88 (1.33)	5.50 (.88)					.05	.001	3.34	.07	4.81*	.10
3. <u>Externally rated</u> competence support of the athlete leader			46.18***	.70	7.26**	.52						
A. Coach condition	6.17 (9.83)	12.83 (19.36)										
B. Athlete leader condition	8.67 (11.24)	39.33 (19.44)					15.45**	.61				
C. Combined condition	6.00 (6.36)	43.50 (22.50)					10.87**	.52	.50	.05		
D. Control condition	5.00 (4.34)	11.50 (16.81)					.001	.00	10.47**	.51	9.07*	.48

*$p < .05$; **$p < .01$; ***$p < .001$.

Note. Time 1 represents the measurement after the first test session; Time 2 represents the measurement after the second test session. The post hoc analyses represent the interaction effect of a 2 x 2 repeated measures ANOVA for each pair of experimental conditions. The partial eta squared is used as effect size for Repeated Measures ANOVA's.

Competence support by the coach. Repeated measures ANOVA revealed a significant interaction effect across the four conditions. In line with our intended manipulation, post hoc tests revealed that the competence support provided by the coach was perceived to be more strongly increased in the coach and in the combined condition than in the control condition. However, we also found a significant interaction effect between the athlete leader condition and the control condition. This interaction indicated that the coach was perceived to be more competence-supportive, even though the coach did not provide any motivational feedback and acted the same way in the second, when compared to the first, test session. The increase in competence support by the coach in this condition was not only perceived by the athlete leader himself, but also by the other players.

Competence support by the athlete leader. We measured the competence support by the athlete leader both objectively (in the amount of feedback provided by the athlete leader, which is externally rated by an observer and thus a measure at the team level) and subjectively (through the perceptions of the other players). The results were very similar for both measures and revealed a significant interaction effect across the four conditions. Post hoc analyses further confirmed our manipulation by demonstrating that the increase in *externally rated* competence support by the athlete leader was significantly higher in the athlete leader and combined condition, compared with both the coach and the control condition. Moreover, the *perceived* competence support of the athlete leader was significantly higher in the combined condition than in the coach and control condition. Also for the athlete leader condition, a trend towards significance could be observed if this condition was compared with the coach condition ($p = .06$) and the control condition ($p = .07$). Our manipulation was confirmed by both the objective ratings and the subjective perceptions. All the single interaction effects are presented in Table 2.

Leaders' Impact on Motivational Processes

Competence Satisfaction. Apart from the large time-effect, indicating an increase in competence satisfaction across conditions, our findings revealed a significant interaction effect between time and condition, as presented in Table 3. Post hoc tests revealed that participants in all three competence-supportive conditions experienced more competence satisfaction than participants in the control condition did. These findings confirm H1a and H2a. No interaction effect between the three competence-supportive conditions emerged; the impact of the athlete leader was thus similar to the impact of the coach. In contrast with H3a, no surplus effect emerged when both the coach and the athlete leader provided motivational feedback concurrently.[1]

Intrinsic Motivation. Similar to competence satisfaction, the results in Table 3 revealed a significant time effect, indicating that participants' intrinsic motivation increased across conditions. Furthermore, a significant interaction effect emerged between time and condition. Post hoc tests revealed that participants in the coach condition and in the athlete leader condition experienced significantly stronger intrinsic motivation compared to the control condition, which confirms H1b and H2b. Also for intrinsic motivation, the impact of the coach was not larger than the impact of the athlete leader. In contrast with H3b but similar to the effect observed for competence, no surplus effect emerged in the double or combined compared to the single source conditions.

[1] To examine whether our manipulation impacted competence specifically or instead produced a positive effect on all three needs (i.e., competence, autonomy, relatedness) identified in Self-Determination Theory, we assessed participants' satisfaction and frustration in the three needs by a 12-item measure, suggested by Chen et al. (2015). The results revealed no interaction effect for competence frustration across the different conditions, which confirms that our manipulation only impacted the competence satisfaction of the participants and not their competence frustration. Likewise, no effects were found for participants' autonomy and relatedness satisfaction and frustration between the different conditions, which further confirms the unique impact of our manipulation on competence satisfaction.

Leaders' Impact on Performance

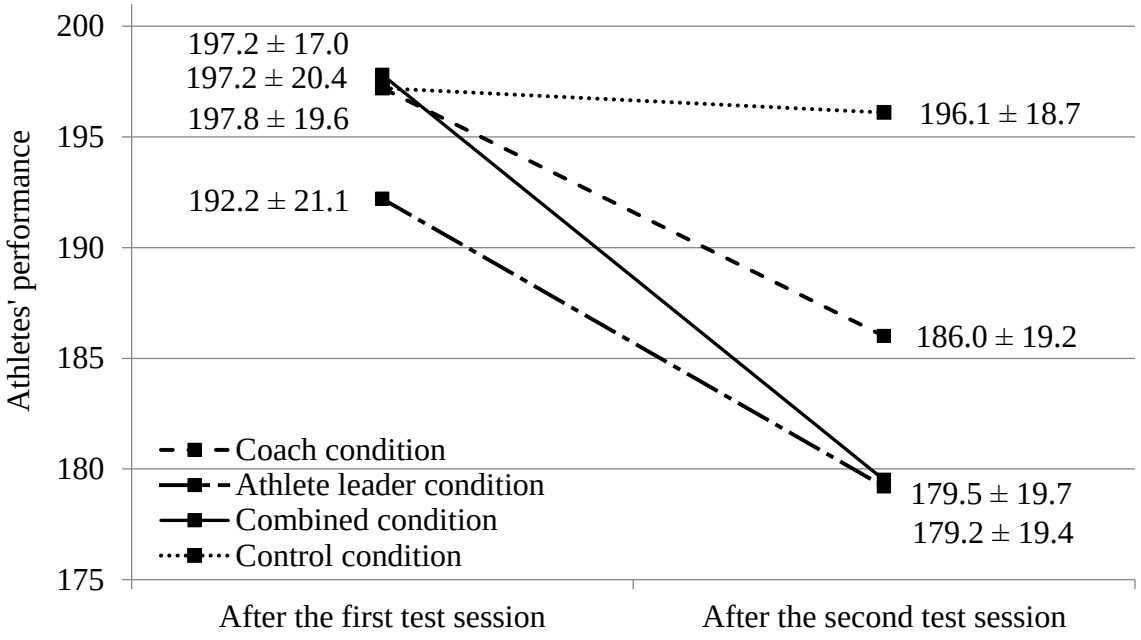
Subjective performance. Our findings, presented in Table 3, revealed a significant main effect for time, for both subjective individual and team performance. In other words, regardless of the experimental condition participants felt that their own performance and the performance of their team improved throughout the experiment[2], presumably reflecting a learning effect; by doing the exercise multiple times, participants get better, and thus also feel more competent in doing the task. For the subjective individual performance, no significant interaction effect emerged across the different conditions. It should be noted, though, that in line with H2c, the improvement shows a tendency to be larger in the athlete leader condition than in the control condition, although not being significant ($p = .08$). For athletes' perceptions on their team's performance, we do find a significant interaction effect[3]. The post hoc tests further clarified that participants in the three competence-supportive conditions felt that their team improved significantly more than participants in the control condition did.

Overall objective performance. To measure athletes' objective performance, we assessed athletes' speed (i.e., the time the athlete needed to perform the exercise 10 times), as well as athletes' accuracy (i.e., the lay-ups and free throws scored). The overall performance was then calculated as the time complemented by five additional seconds for each missed free throw or shot. The results revealed a significant interaction effect between time and condition, presented in Figure 2.

[2] When examining the two items at individual level separately, a main effect for time was found for participants' perceptions of both their speed and their accuracy.

[3] A separate examination of the two items at team level revealed that the interaction effect (time x condition) was found for perceptions of the team's speed ($F(3,116) = 5.88$; $p = .001$; $\eta_p^2 = .13$), but not for its accuracy.

Figure 2. Athletes' total performance (i.e., execution time + 5s * # missed shots) after the first and the second test sessions across the four experimental conditions.



Post hoc tests, presented in Table 3, revealed that the performance of participants in all three competence-supportive conditions improved significantly more than the performance of participants in the control condition. In addition, when both the coach and the athlete leader provided competence support, participants performed better than when only the coach provided competence support. To obtain more insight in whether this performance improvement in the competence-supportive conditions was mainly driven an improvement in athletes' speed or in their accuracy, we also conducted the analyses for speed and accuracy separately.

Speed. With regard to the execution time, apart from the large time-effect, indicating an increase in speed across conditions, we obtained a significant interaction effect between time and condition. Post hoc tests revealed that participants in all three competence-supportive conditions improved significantly more (i.e., needed less time) than participants in the control condition. In contrast with H3d, no interaction effect between the three competence-supportive conditions emerged.

Table 3

Results of the 4 x 2 Repeated Measures ANOVA's for the outcome variables, with time as the within-subject factor and the experimental condition as the between-subject factor together with the results of the post-hoc analyses of the interaction effects.

	M at Time 1 (*SD*)	*M* at Time 2 (*SD*)	Time		Time x Condition		Post-hoc tests (Time x Condition)					
							Coach condition		*Athlete leader condition*		*Combined condition*	
			F	η_p^2	F	η_p^2	F	η_p^2	F	η_p^2	F	η_p^2
1. Competence satisfaction			26.70^{***}	.19	2.82^{*}	.07						
A. Coach condition	4.93 (.88)	5.45 (.80)										
B. Athlete leader condition	4.82 (.92)	5.22 (.81)					.33	.01				
C. Combined condition	4.85 (.85)	5.30 (.85)					.13	.002	.07	.001		
D. Control condition	5.10 (.81)	5.12 (.77)					7.14^{**}	.11	4.00^{*}	.07	6.18^{*}	.10
2. Intrinsic motivation			22.8^{***}	.16	3.51^{*}	.08						
A. Coach condition	5.30 (.85)	5.77 (.85)										
B. Athlete leader condition	5.13 (1.09)	5.49 (1.00)					.49	.01				
C. Combined condition	5.30 (.84)	5.55 (.93)					1.81	.03	.47	.01		
D. Control condition	5.29 (.86)	5.28 (1.02)					9.76^{**}	.14	6.09^{*}	.10	2.81	.05
3. Subjective individual performance			32.95^{***}	.22	1.44	.04						
A. Coach condition	4.87 (1.02)	5.42 (.89)										
B. Athlete leader condition	4.57 (1.09)	5.33 (.76)					.74	.01				
C. Combined condition	5.07 (.81)	5.40 (.88)					.78	.01	2.79	.05		
D. Control condition	4.90 (.75)	5.23 (.81)					.90	.02	3.17	.06	.00	.00

4. Subjective team performance			46.07***	.28	5.17**	.12						
A. Coach condition	5.10 (.90)	5.85 (.82)										
B. Athlete leader condition	4.85 (.93)	5.52 (.86)					.14	.002				
C. Combined condition	5.12 (.83)	5.80 (.74)					.11	.002	.005	< .001		
D. Control condition	5.12 (.85)	5.12 (.69)					12.75**	.18	8.03**	.12	10.22**	.15
5. Total performance (time + 5s * # missed shots)			72.62***	.39	7.83***	.17						
A. Coach condition	197.2 (20.4)	186.0 (19.2)										
B. Athlete leader condition	192.2 (21.1)	179.2 (19.4)					.21	.004				
C. Combined condition	197.8 (19.6)	179.5 (19.7)					4.62*	.07	1.80	.03		
D. Control condition	197.2 (17.0)	196.1 (18.7)					9.55**	.14	9.01**	.13	24.55***	.30
6. Speed (time to complete the exercise)			131.75***	.53	11.12***	.22						
A. Coach condition	163.9 (15.4)	151.3 (19.2)										
B. Athlete leader condition	160.3 (15.6)	148.4 (13.1)					.04	.001				
C. Combined condition	167.3 (17.1)	152.7 (17.1)					.60	.01	1.59	.03		
D. Control condition	166.7 (12.6)	165.3 (17.5)					14.94***	.21	18.81***	.25	39.78***	.41
7. Accuracy (total scores of lay-ups and free throws)			.40	.003	.83	.02						
A. Coach condition	13.33 (2.28)	13.07 (3.29)										
B. Athlete leader condition	13.63 (1.99)	13.83 (2.20)					.40	.01				
C. Combined condition	13.90 (1.94)	14.63 (1.99)					2.13	.04	.64	.01		
D. Control condition	13.90 (2.01)	13.83 (2.10)					.09	.001	.16	.003	1.76	.03

537 $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

538 *Note.* Time 1 represents the measurement after the first test session; Time 2 represents the measurement after the second test session. The post
539 hoc analyses represent the interaction effect of a 2 x 2 repeated measures ANOVA for each pair of experimental conditions. The partial eta
540 squared is used as effect size for Repeated Measures ANOVA's.

Accuracy. With regard to participants' accuracy, we found that the number of scored free throws increased over all conditions along the experiment ($F(1,116) = 5.88$; $p < .05$; $\eta_p^2 = .05$) while the number of scored lay-ups decreased ($F(1,116) = 4.15$; $p < .05$; $\eta_p^2 = .04$). Looking at the conditions separately, we found that only when both the coach and the athlete leader provided competence feedback participants scored significantly more free throws in the second test session compared with the first baseline test session ($F(1,29) = 4.82$; $p < .05$; $\eta_p^2 = .14$). Despite this difference, we did not obtain a significant interaction effect between the four conditions regarding the scoring percentage (neither for the free throws, nor for the lay-ups, or the combination of both). Motivational feedback thus leads to a faster performance execution, while maintaining the scoring percentage, which is in line with H1d and H2d.

Explanatory Role of Motivational Processes

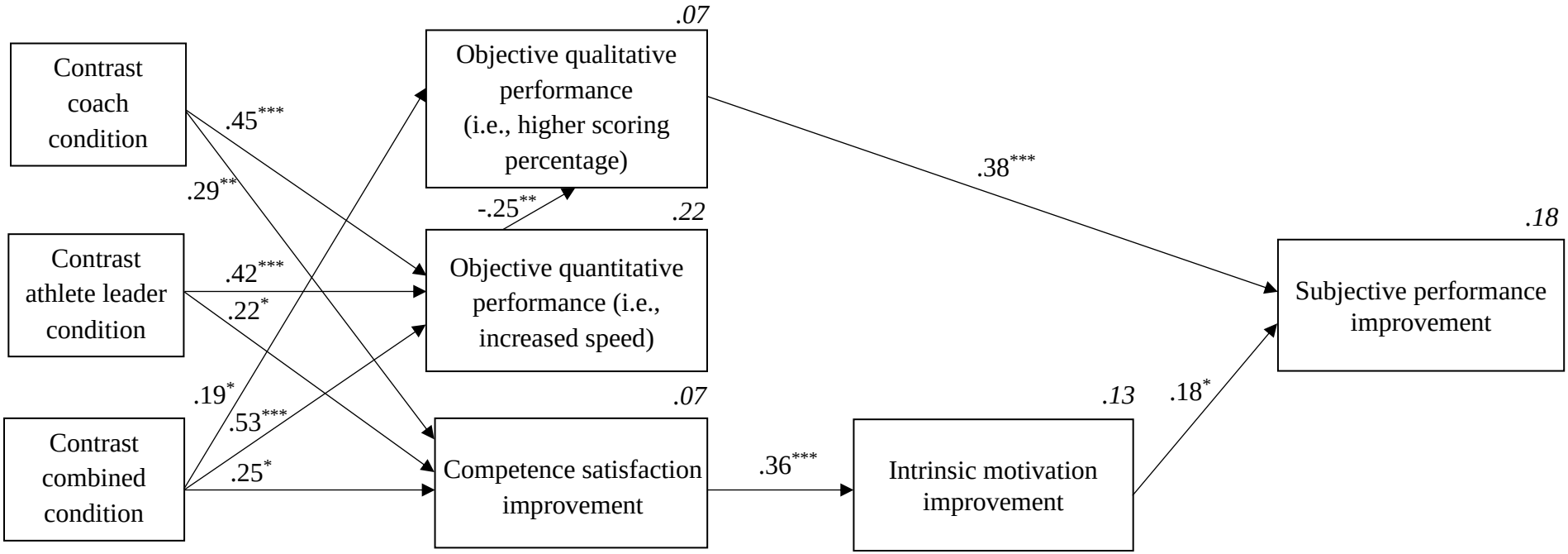
To examine the mediating role of competence satisfaction, we performed Structural Equation Modelling (SEM) using STATA. In order to be able to represent the four experimental conditions in our model, we took the control condition as the main reference point and created three dummy variables, of which the first represents competence support by the coach (i.e., comparing the situation in which no one provides competence support (0) to the situation in which the coach provides competence support (1)). Similarly, we also created dummy variables representing competence support by the athlete leader and competence support by both the coach and the athlete leader relative to the control group.

The included outcome variables (i.e., all on individual level) all reflect improvement over time. For competence satisfaction, intrinsic motivation, subjective (individual) performance, and performance accuracy, the improvement variable is calculated by the variable at T2 minus the variable at T1. For the time needed to execute the task, the opposite applies (i.e., T1 minus T2) since a decrease in time points at a performance improvement. Furthermore, it is noteworthy that the motivational variables and subjective performance were not assessed during activity

engagement but afterwards. Given their timing, it was more logical to model objective performance as a potential driver of one's motivational functioning and subjective performance.

Structural Equation Modelling (SEM) confirmed the idea of a dual pathway, involving a motivational route and another performance-related route. The final model, which is presented in Figure 3, yielded the following fit ($\chi^2(14) = 20.00$; $p = .13$; *CFI* = .93; *TLI* = .87; *RMSEA* = .06; *pclose* = .35; *SRMR* = .06). As for the motivational pathway, competence support provided by either the coach, the athlete leader, or both, relative to the control group, predicted an increase in competence satisfaction which explained an increase in intrinsic motivation (confirming H4a). As for the performance pathway, all three dummy codes equally increased the quantitative aspect of objective performance (i.e., time), while only the combined condition resulted in a significant improvement in the qualitative aspect (i.e., accuracy as reflected by scoring percentage), thereby partially confirming H4b. Finally, athletes' subjective individual performance did not only stem from their objective scoring percentage (i.e., the accuracy in particular), but also from their improvement in intrinsic motivation.

Figure 3. Structural model, representing the influence of competence support on participants' objective performance and competence satisfaction, where the latter in turn influences players' intrinsic motivation and their subjective performance. All variables represent the improvement over time. Standardized regression coefficients are included ($^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$), as well as the proportions of explained variance (in italics).



Discussion

The Motivational Role of Athletes and Coaches

To our knowledge, the present study was the first to directly compare the impact of motivational feedback by the coach and athlete leader in an experimental field setting, thereby investigating their unique and potentially additive impact on athletes' competence satisfaction, intrinsic motivation, and both subjective and objective performance. The findings confirmed that both the coach and the athlete leader have the potential to positively influence athletes' competence satisfaction, intrinsic motivation, and performance by providing motivational feedback, a key facet of a competence-supportive coaching style. Importantly, in line with the premises of the Cognitive Evaluation Theory (Ryan & Deci 2017; Vansteenkiste et al. 2010), we found that competence satisfaction could account for the relation between motivational feedback and intrinsic motivation, while motivational feedback yielded a direct performance-enhancing effect as well.

These findings corroborate the general literature on the positive impact of coaches and athlete leaders (for reviews, see Cotterill & Fransen 2016; Horn 2008), and more specifically, the earlier findings on the importance of athlete leaders' competence support (e.g., Fransen et al. 2017b). As stated before, most previous studies on the motivating role of the coach in the tradition of Self-Determination Theory focused on autonomy support (although the used questionnaires often allegedly include items on competence support as well; e.g., Gillet et al. 2010; Jõesaar et al. 2012). Moreover, most previous studies failed to adopt an experimental design, preventing scholars from drawing causal conclusions. Moving beyond previous work, the present study provides unique experimental evidence obtained in an ecologically valid team sports setting suggesting that leaders' competence support positively influences athletes' competence satisfaction, motivation, and performance.

By targeting both the coach and the athlete leader, the potentially differential impact of both types of leaders could be investigated. Unlike previous literature highlighting the differential impact of coaches and athlete leaders (Fransen et al. 2016a; Price & Weiss 2013), we noted in the current study that coaches and athlete leaders yielded a very similar impact on athletes' competence satisfaction, intrinsic motivation, and performance. That is, the motivational feedback of athlete leaders enhanced athletes' perception of effectiveness and interest in the exercise, while reducing the time needed to perform the exercise without a loss of accuracy to the same extent as the positive feedback delivered by coaches. Further, as hypothesized based on CET and demonstrated in prior work (De Muynck et al. 2017; Vallerand & Reid 1984), the observed increase in intrinsic motivation could be fully accounted for by increases in athletes' perceived competence, which stems from the provided motivational feedback. Going beyond past work, each of the three experimental conditions yielded a competence- and intrinsic motivation-benefit relative to the control group, not just the provision of coach motivational feedback.

Although the condition in which both leaders provided competence support yielded no surplus effect for competence satisfaction, intrinsic motivation, or subjective performance, a surplus effect did emerge for objective performance. Indeed, athletes performed better when both the coach and the athlete leader provided competence support instead of only the coach. Our findings thus add to the current literature that, in order to maximize the team performance, it is important for coaches to stimulate their athlete leaders to encourage their teammates, above and beyond providing motivational feedback themselves. These findings thereby contradict earlier work in organizational context showing that the feedback of the supervisor was more highly related to performance than the feedback of peers (Becker & Klimoski 1989).

A Differentiated Approach to Performance

The use of a differentiated measure of performance, involving both subjective and objective features and both quantitative and qualitative aspects, produced some interesting new insights.

First, although motivational feedback increased a composite score of objective performance, when disentangled, the performance-benefit associated with motivational feedback was primarily driven by the more quantitative aspect, that is, under motivational feedback conditions athletes were faster to execute the activity. Given the short time frame of our experimental design, such findings indicate that both coaches and athlete leaders can generate an *instant* effect on team members' performance by providing motivational feedback, presumably because athletes put extra effort in the activity at hand. This is an important finding given that in competitive games faster execution times lead to faster rebounds and more scoring opportunities. In particular at the end of an exhausting tight game, a faster play can make the difference between winning and losing. This is especially true since our findings showed that motivational feedback leads to a faster task execution, without producing a reduction in accuracy, as would be reflected in a reduced scoring percentage. Even on the contrary, when both the coach and the athlete leader provided competence feedback, participants' scoring percentage in free throws even increased compared to the baseline test session, while no differences with the baseline emerged for the other conditions.

Second, while motivational feedback did increase *objective* performance, no direct effect emerged on athletes' *subjective* perceptions of their own performance. The non-significant direct effect for subjective individual performance aligns with more limited observed effects for qualitative aspects of performance. Indeed, Figure 3 shows that subjective performance was predicted by an improvement in scoring percentage, but not by an improvement in execution time. Presumably, athletes ground their performance perceptions on the direct performance feedback of their scored shots rather than on their execution time,

which was not communicated to the athletes, and which they could not take track of. For coaches and athlete leaders, it is thus important to provide team members with feedback on all aspects of their performance, rather than only the visible performance parameters which serve already as a source of direct performance feedback for the athletes. Interestingly, also subjective satisfaction with one's performance seems not only to stem from the objective performance as such but also from the motivational chain. That is, the provided positive feedback indirectly related to greater subjective performance satisfaction via improved competence and intrinsic motivation.

A third set of findings concerns athletes' perceptions of the team's performance. Although competence support did not directly affect players' perceptions of their individual performance, it did positively impact their perceptions of the team's performance, and in particular of the speed with which the team completed the exercise. As external observer (when a teammate is performing the task), it is apparently easier for players to assess time factors (and take them into account when rating the team's performance) than when they are performing the task themselves.

Finally, it should be noted that objective performance, and more particularly the performance's accuracy (i.e., scoring percentage), was significantly related with athletes' competence satisfaction (r = .19 at Time 1 and r = .21 at Time 2; both $p < .05$), although this link only showed a trend towards significance in our model (p = .07). This link suggests that our model might reflect a recursive loop with improved performance positively impacting on competence and intrinsic motivation, while intrinsic motivation and enhanced effectiveness feeding back into (subjective) improved performance.

Amount of Motivational Feedback being given

A final interesting annotation pertains to the exact amount of the provided positive feedback. One could argue that receiving too much positive feedback might actually have a

reverse effect on motivation and performance. For example, within educational contexts, it has been shown that excessively praising someone entails the risk to diminish students' capacity to find intrinsic reward in their activity (Eisenberger et al. 1998).

If we look closer at the exact amount of feedback provided, we see that the athlete leader on average provided 41 times competence-supportive feedback in the respective experimental conditions (i.e., athlete leader and combined conditions), while the coach adhered to the script and provided 100 times feedback per session. Although this abundant feedback may have caused an underestimation of the potential impact of the athlete leaders, additional analyses did not reveal any curvilinear trend in our data. Instead, the higher the perceived competence support of either the coach or the athlete, the higher the competence satisfaction, intrinsic motivation, and performance amongst participants. The same holds at the team level for the exact amount of feedback provided by the athlete leader (while the coach always adhered to the script and provided 100 times positive feedback).

These findings thus contrast the idea that an excessive amount of positive feedback would have a detrimental effect on competence satisfaction, intrinsic motivation, and performance. Our findings align with previous work of Vallerand (1983), who did not find such a negative effect either. Instead, his work revealed that hockey players who received positive feedback displayed higher levels of competence than players in the control group, irrespective of the objective frequency of verbal feedback. Although in our study more frequent feedback of either the coach or the athlete leader did yield beneficial outcomes, the combined condition did not yield a surplus effect. It thus seems that once positive feedback is provided, *additional sources* of positive feedback contribute nothing further.

Strengths, Limitations, and Avenues for Future Research

The present study is the first to (1) examine the impact of the competence support by coach and athlete leader concurrently; and (2) investigate their impact on athletes'

competence satisfaction, intrinsic motivation, and both subjective and objective performance. While most previous experimental studies investigated the impact of competence support in a laboratory setting using a simple motor task (Vallerand & Reid 1984; Vallerand & Reid 1988), we have opted for a design with a higher ecological validity. We used a basketball task characterized by interaction and by game-relevant skills (i.e., passing, dribbling, free throws, and lay-ups). Furthermore, in contrast to previous studies (e.g., Fransen et al. 2015a; Fransen et al. 2016b), we manipulated the competence support of the real athlete leader (based on a pre-test leadership analysis), rather than of an external confederate who acted as an athlete leader.

Despite our attempts, some compromises had to be made in order to standardize the protocol as much as possible and balance ecological validity with internal validity. For example, we chose for teams of five players, instead of complete teams. Furthermore, even though we manipulated the behavior of the real athlete leader, we used a research confederate to act as the coach of the team. While our research confederate underwent a more intensive training to provide competence support, the athlete leader was briefly instructed how to provide motivational feedback on the spot, such that the potential impact of the athlete leader might have been underestimated. At the same time, it is possible that the potential impact of the coach was underestimated given that an external research confederate rather than the real coach of the team provided motivational feedback. Future research could further enhance the ecological validity by instructing the actual coach how to provide motivational feedback and by opting for complete teams, instead of teams of five players.

A second limitation refers to the manipulation check. While according to the objectively rated level of provided competence feedback our manipulation was successful, a somewhat different picture emerged with respect to the *perceived* competence support by the athletes. Although the manipulation was successful with respect to the perceived competence

support provided by the athlete leader, some deviations were observed for the perceived competence support by the coach. Specifically, athletes involved in the athlete leader condition perceived their coach to be more competence-supportive, even though the coach did not provide any direct competence support. Perhaps, athletes indirectly experienced competence support by their coach because the coach asked the athlete leader to encourage his teammates. This indirect perceived competence support might have confounded our results in the athlete leader condition. Experimental designs in which the instructions to the athlete leader are given by an external researcher (such as in the work of Fransen et al. 2015a) might provide clearer insight in this matter. However, we should keep in mind that the actual experimental design better represented the actual sporting environment in which the coach directly instructs his athlete leader. Furthermore, these findings indicate that coaches who engage their athlete leader (i.e., a form of autonomy support) via a short-term intervention also indirectly affect athletes' perceived competence support, and hence their motivation and performance.

A third limitation pertains to the fact that we did not take into account the quality of the competence-supportive feedback, neither the way in which the feedback was communicated (Carpentier & Mageau 2013; Mageau & Vallerand 2003). In our experiment, we assessed the amount of feedback, without taking into account its quality as reflected by its perceived persuasiveness, authenticity, or legitimacy. As for style, recent work suggests that a more inviting style of providing feedback, when compared to a controlling style, matters for athletes' need-based experiences and intrinsic motivation (De Muynck et al. 2017). Also other researchers highlighted the synergistic nature of autonomy support and competence support (e.g., Curran et al. 2013; Jang et al. 2010; Sierens et al. 2009). In other words, when leaders provide competence-supportive feedback by adopting an autonomy-supportive communication style (e.g., "you can…") rather than a more controlling style (e.g., "you

should"), their impact on beneficial outcomes such as behavioral engagement may be enhanced. In addition, also the content of the provided feedback (e.g., motivational or technical feedback) might influence the motivational outcomes (Staley & Moore 2016). Future research can provide more insight in the effectiveness of feedback by coach and athlete leader by differentiating the quality, style, and content of the feedback.

Perspective

The study findings highlight the importance of leaders, and more specifically of the competence support they provide, in fostering teammates' intrinsic motivation and performance. Based on these results, coaches should realize that, when it comes to maximizing athletes' performance, it is beneficial also to engage their athlete leaders to provide positive feedback. It is noteworthy that the impact of competence support by the athlete leader was as strong (and on objective performance even stronger) as the impact of the coach. Therefore, the coach could focus on providing technical and tactical feedback, as long as he clearly instructs his athlete leader to care for the provision of motivational feedback. Given that the instructions to the athlete leader in the current experiment only lasted for about two minutes, it seems that we have developed a very short-term intervention with a large impact, not only on athletes' motivation, but also on objective performance measures.

It should be noted that it is essential to involve the right athlete leader as provider of positive feedback, that is, a leader who is also perceived as a leader by his teammates. Coaches might tend to address the captain by default or based on reasons that have nothing to do with leadership (Fransen et al. 2017a). However, it has been shown that the captain is clearly not always the best leader in the team (Fransen et al. 2015c; Fransen et al. 2014). As a consequence, the captain's leadership will not be as effective as the observed effect in the present study. Instead, the best choice of athlete leader depends on the perceptions of the team members. Coaches should thus use a similar method as adopted in the current study to

identify the best leader in the team (for more information on this method, see Fransen et al. 2015b; Fransen et al. 2015c).

Conclusion

In conclusion, we can state that by supporting the competence of their players, or by engaging their athlete leaders to do so, coaches can have an important impact on athletes' competence satisfaction, motivation, and performance, all crucial determinants in the sporting context.

Acknowledgments

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Appendix. The comprehensive competence feedback script provided to coaches and athlete leaders for each of the experimental conditions.

First test session (i.e., baseline measure)

During the first test session, the coach acts in a neutral way and does not provide any competence-supportive feedback. He only provides an update on the number of remaining rounds the team has to complete. Furthermore, no instructions are provided to the athlete leader in the team.

Second test session

Coach condition. The coach was instructed prior to the experiment on the scripts to adhere to. Furthermore, some trial experiments were organized so the coach could practice the script and learn how to provide the motivational feedback in a convincing way.

Before the start of the second test session, the coach calls the athlete leader in the team (as determined based upon earlier social network analyses) and asks him to make sure there are three extra balls in the middle circle. Furthermore, the coach instructs him to get everyone in the team together. This short conversation with the athlete leader is meant to control for the effect of talking to the athlete leader, something which also occurs in the other conditions. In this condition, however, no instructions are given to the athlete leader to provide motivational feedback. Instead the coach gives the following speech to his team:

> "I have compared your results to the existing norm tables and you are performing very well! If you keep up this play during the next test session, your team will end up amongst the best basketball teams. So do your best, keep up the good work, and try to maintain your time, and potentially even improve it to increase in the ranking. We will now start with the second part of this contest. You will have to engage in the same exercise as you did earlier on and repeat it again 50 times as a team, such that every player completes the exercise 10 times. Also now it is important that you score as

many lay-ups and free throws as possible. Remember, for each missed lay-up and free throw, you will get five seconds penalty time. When a ball gets lost, someone can throw in one of the additional balls to the place where the ball got lost. Thus, do not lose time by running after a ball, but make sure that you are ready to throw in a ball when a teammate loses a ball. Is everyone ready? Alright, please get to your positions!"

While the coach is present on the field (while recording the feedback given by the athlete leader), he provides motivational feedback to his team. When a player scores a shot, he compliments the player by saying, for example, "Well done!" or "Nice shot!". If a player misses a lay-up or free throw, the coach would try to cheer him up and motivate him for the next action; "You can do this! You will make it the next time", "Come on, go for the next one!", "Keep that speed up, you can do this!", "No worries, your execution was good." In addition, the coach also provides positive feedback to the team in general, such as "Good work team!", "Good speed", "You can do this. Keep the speed high." To standardize this process, we asked the coach to provide motivational feedback to each individual player (i.e., give feedback on either his lay-up or shot) and to provide motivational feedback to the entire team every five rounds.

After completing the second test session, the coach assembles his team, after pro forma asking the executing times and scores to the experiment leader (who tracked this information during the experiment). He concludes to the team:

"Well done team! I have just compared your results with the existing norm tables and you have performed very well compared to the average team within your age group and at your competitive level. You can be proud on that accomplishment."

Athlete leader condition. As soon as the athlete leader (as determined based upon earlier social network analyses) has completed the questionnaire, the coach calls him and says:

"The questionnaires we conducted last week revealed that the other players perceive you as the strongest leader on the field. They thus also expect from you that you will motivate them on the field. I would like to ask you to show this extremely during the next test session. On this overview you can see how you can do this."

The coach shows the athlete leader the following overview:

<table>
<tr><th colspan="2">Feedback to <u>your teammates</u>

Whenever your teammates …</th></tr>
<tr><th><u>SCORE</u> A SHOT</th><th><u>MISS</u> A SHOT</th></tr>
<tr><td>- "Well done"
- "Great shot"</td><td>- "You can do this! You will make it the next time"
- "Come on, go for the next one"
- "Keep that speed up, you can do this!"
- "No worries, your execution was good."</td></tr>
<tr><td colspan="2">Feedback to <u>the team</u>

- "Good work team!"
- "Good speed"
- "You can do this. Keep the speed high."</td></tr>
</table>

The coach verbally clarifies these instructions, as we believed that for the athlete leader it was most clear when he obtained both visual and auditory information on how to provide competence support. Furthermore, he asks the athlete leader if he understands all the information and asks him to repeat it. The coach further clarifies if necessary and ensures that the athlete leader perfectly understands what is expected. In addition, the coach clearly

instructs the athlete leader to provide one time feedback to each executing player, as well as in between to the team in general. Next, the coach gives him the following information:

> "I have also compared your results from the first test session with existing norm tables and you are performing very well! If you keep up this play during the next test session, your team will end up amongst the best basketball teams. Could you assemble your team and tell them that? Just motivate them to do their best and keep up the good work. If you can maintain your time and potentially even improve it in, your team can even increase in the ranking."

After the athlete leader has talked to his team, the coach announces the start of the second test session and shortly outline the rules (similar as in the first baseline test session). For the exact phrasing, we refer to the control condition.

During the experiment, the coach acts neutral and does not give any competence support. He observes the athlete leader and ensures that he fulfills his task well. When the athlete leader does not follow the guidelines, the coach will remind him about his task as follows: "Do not forget to motivate your teammates!", "Remember to give your teammates positive feedback on how they performed!", "You can make the difference by encouraging your teammates, keep that in mind!"

After completing the second test session, the coach calls the athlete leader with him, after pro forma asking the executing times and scores to the experiment leader (who tracked this information during the experiment). He concludes to the athlete leader:

> "Well done! Please tell your team that I have just compared the team's results with the existing norm tables and that your team has performed very well compared to the average basketball team within your age group and at your competitive level. You can be proud on that accomplishment. You better congratulate your team!"

Combination condition. In this experimental condition, both the coach and the athlete leader provide competence support. As soon as the athlete leader completes the questionnaire after the first test session, the coach calls him and gives the same speech as in the athlete leader condition. In other words, both visually (through the scheme) and verbally the coach explains the athlete leader how and when to provide positive feedback to his teammates. When the coach is ready, he assembles the whole team and says the following:

> "The questionnaires you completed last week have revealed that you perceived this player as the best leader in your team. During the test, he will try to help you to further improve your performance and so end up higher in the ranking than the other teams. Furthermore, I have compared your results to the existing norm tables and you are performing very well! If you keep up this play during the next test session, your team will end up amongst the best basketball teams. So do your best, keep up the good work, and try to maintain your time, and potentially even improve it to increase in the ranking."

Next, the coach announces the start of the second test session and shortly outline the rules (similar as in the first baseline test session). For the exact phrasing, we refer to the control condition. During the test session both the athlete leader and the coach provide competence support, thereby adopting the same frequency (i.e., once every round to the executing player, and once every five rounds to the team in general). The coach observes the athlete leader and, like in the athlete leader condition, reminds him about his task if necessary.

After completing the second test session, the coach assembles his team, after pro forma asking the executing times and scores to the experiment leader (who tracked this information during the experiment). He concludes to the team:

"Well done team! I have just compared your results with the existing norm tables and you have performed very well compared to the average team within your age group and at your competitive level. You can be proud on that accomplishment."

Control condition. The control condition perfectly resembles the first baseline test session. Before the start of the second test session, the coach calls the athlete leader in the team (as determined based upon earlier social network analyses) and asks him to make sure there are three extra balls in the middle circle. Furthermore, the coach instructs him to get everyone in the team together. This short talk with the athlete leader is only meant to control for the effect of talking to the athlete leader, which also happens in the athlete leader and the combination conditions. The speech of the coach is in this condition limited to the announcement of the second test session:

"We will now start with the second part of this contest. You will have to engage in the same exercise as you did earlier on and repeat it again 50 times as a team, such that every player completes the exercise 10 times. Also now it is important that you score as many lay-ups and free throws as possible. Remember, for each missed lay-up and free throw, you will get five seconds penalty time. When a ball gets lost, someone can throw in one of the additional balls to the place where the ball got lost. Thus, do not lose time by running after a ball, but make sure that you are ready to throw in a ball when a teammate loses a ball. Is everyone ready? Alright, please get to your positions!"

During the test session, the coach behaves neutrally and does not give any motivational feedback.