Tailored sport coaching:

How does coach support of the basic needs relate to intrinsic motivation in athletes, and does need strength make a difference?

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Abstract

Intrinsic motivation is arguably a prime reason to engage in sports and is a reliable predictor of increased persistence, better performance, and lower dropout rates. Perceived support of the basic needs of autonomy, competence, and relatedness has consistently been related to enhanced intrinsic motivation. Sports coaches are therefore encouraged to support their athletes' basic needs, but it is unclear whether need support is more effective when athletes' need strength is high. Furthermore, research investigating athletes' need support from the perspective of both coach and athlete, is scarce. Hence, using a dyadic approach, the purpose of the current study was to assess whether coach's reported need support is positively related to athlete's perceived need support, and subsequently, to athletes' intrinsic motivation, moderated by athlete's need strength. Questionnaires were filled out by dyads of athletes and coaches and results were analyzed using Structural Equation Modeling. We found no relationship to intrinsic motivation for any of the variables. Furthermore, reported coach support was unrelated to perceived coach support, and need strength did not operate as a moderator. Explanations for these non-findings are discussed as well as the study's strengths and limitations, and areas for future research. For coaches and athletes who wish learn more about need support and improve their collaboration, open conversations about need support are recommended and a tool that can facilitate this is described in the Discussion.

Key words: self-determination theory, coach, sport(s), athlete, coach-athlete relationship, perceptual distance, need strength

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How does coach support of the basic needs relate to athletes' intrinsic motivation,

and does athletes' need strength make a difference?

For many athletes, intrinsic motivation, defined as doing something because of the satisfaction inherent in the activity (Deci, 1975), or, in lay terms, because they're enjoying themselves, is arguably a prime reason to engage in sports. Indeed, lack of intrinsic motivation has been found to be a large contributor to dropout in sports (Back et al., 2022; Gardner et al., 2017; Van Yperen et al., 2022), and intrinsic motivation has consistently been related to enhanced performance (Deci & Ryan, 1991; Mallett & Hanrahan, 2004), increased persistence and effort (Vallerand & Rousseau, 2001), and better well-being (Reis et al., 2000; Ryan & Moller, 2017). Furthermore, for most sports deliberate play, in which intrinsic motivation is a central motivator, has been found to be a suitable pathway to elite performance (Rees et al., 2016) and may have some advantages compared to the more well-known pathway of deliberate practice (Coutinho et al., 2016; Ericsson et al., 1993).

More fully understanding the mechanisms that can enhance or diminish intrinsic motivation would thus be of benefit to athletes of all performance levels. Research into motivational climate points to the central role for the coach and the coach-athlete relationship in supporting athlete intrinsic motivation (Keegan et al., 2011; Mageau & Vallerand, 2003; Mallett et al., 2016). The purpose of the current study is to build on, and contribute to, the study of motivation and our understanding of this coach-athlete relationship. The use of a dyadic approach is key to furthering our understanding of the role of the coach in this relationship, as to date relatively few studies addressed both perspectives at the same time. Increasing our knowledge of how coaches can contribute more optimally to their athletes' intrinsic motivation may not only benefit scientific debate, but also indirectly impact sport participation and performance, thereby positively influencing the physical and mental health

of athletes (Stensel et al., 2021; White et al., 2017). A visual representation of the theory-derived model that will be tested in this study can be found in Figure 1. This figure shows that coach's reported need support is assumed to be positively related to athlete's perceived need support, and subsequently, to athlete's intrinsic motivation, moderated by athlete's need strength. A more detailed description of the hypotheses and their theoretical and empirical support will be given in the remainder of the Introduction.

Athlete's Perceived Need Support and Intrinsic Motivation

Insight into the contexts and behaviors that facilitate intrinsic motivation was first provided by Deci and Ryan (1985) in their macro theory of human motivation, Self-Determination Theory (SDT). SDT (Deci & Ryan, 1985, 2000; Ryan & Deci, 2000) posits that humans are active agents with a natural inclination towards growth, which is facilitated by the fulfilment of three basic psychological needs. Fulfilment of these needs for autonomy, competence, and relatedness provides the person with the nutriments needed for intrinsic motivation. This fulfilment is theorized to result from support presently available in the (social) environment or inner resources that a person can use to find such support. When athletes perceive their coach's behavior as supportive of their basic needs, according to SDT this will contribute to their intrinsic motivation. Empirical support for the relationship between perceived need support, need satisfaction, and intrinsic motivation has been well documented in a variety of contexts (see Ryan & Deci, 2017). Support for this relationship in a sport context will be discussed in some more detail next, starting with the need for autonomy.

The need for autonomy has its origins in DeCharms' (1968) work on personal causation and concerns the need to act from volition and to make choices that align with one's sense of self (Ryan & Deci, 2000). To experience autonomy, a person has to perceive the self as the cause or origin of their behavior, and thus have an internal locus of causality

(Heider, 1958). This is theorized to be essential for the facilitation of intrinsic motivation (Deci & Ryan, 2000), as was indeed found by Pelletier et al. (2001) who investigated the relationship between swimmers' perceived autonomy support and different types of motivation. Swimmers who felt supported in their autonomy were more likely to have intrinsic motivation and subsequently showed more persistence at follow-up. Fenton et al. (2014) found further support for the role of perceived autonomy support in motivation in youth footballers and a longitudinal study by Jõesaar et al. (2012) showed a direct effect from coaches' autonomy support as perceived by athletes in a variety of sports on athletes' intrinsic motivation a year later.

SDT's second basic psychological need, the need for competence, stems from White's (1959) conceptualization of effectance motivation. Synergizing and explaining many earlier findings on motivation from psychological theorists and experiments, he opposed the idea of drives and instincts as the sole motivators of behavior. Rather, he argued, a need for competence, defined as the satisfaction people derive from effectively dealing with the environment (White, 1959) and mastering challenges (Deci & Ryan, 2000) may be behind much of what we do. According to SDT, effective competence support by a coach would facilitate higher intrinsic motivation, which is exactly what Fransen et al. (2018) found in their randomized controlled trial with basketball players. This effect of competence support of the coach on intrinsic motivation was mediated by players' perceived competence satisfaction and accompanied by an increase in performance. Furthermore, in their study on physical activity motivation in at-risk boys, Liu et al. (2020) found that perceived competence support was a powerful predictor of intrinsic motivation and a decrease in amotivation.

Finally, SDT's concept of relatedness as a fundamental human need was substantiated by Baumeister and Leary (1995), building on Maslow's (1943) need hierarchy and Bowlby's

(1969) attachment theory. Supported by a myriad of findings in medical and psychology research, they were the first to provide a strong base of evidence of the essential role relatedness plays in human health and well-being. The need for relatedness is defined as the need to reciprocally support and be supported (Hagger et al., 2006) while feeling a sense of security, connection, mutual trust and care (Deci & Ryan, 2000). Support for the relation between relatedness and intrinsic motivation in the sport context was found by Sparks et al. (2016). In a sample of 570 high school physical education students, they found that perceived relatedness support of the teacher was positively related to intrinsic motivation, mediated by relatedness need satisfaction.

Based on the research stated above, the first hypothesis of the current study is as follows: Athlete's perceived support of each of the three basic needs (autonomy, competence and relatedness) is positively related to intrinsic motivation.

Athlete's Need Strength

A basic tenet of SDT is that the three needs are considered innate and universal. Deci and Ryan (2000) argue that although the behaviors that allow fulfilment of the basic needs differ across time and cultures (Chen et al., 2015), fulfilment of the needs universally leads to better outcomes. Because the basic needs are assumed to be innate for all humans and thus not learned, according to Deci and Ryan (2000), the concept of need strength was deemed to be of lesser (or no) importance. Historically, however, an interest in individual differences in the strength of different kinds of needs and drives (i.e., the need for cognition) was taken by many scholars (e.g. Murray, 1938; McClelland, 1965). Hence, we would like to argue, also for the practical benefits of tailored coaching, the effect of need strength may be of significant importance. Indeed, every person needs support in all three areas, just like every plant needs water, oxygen and light. However, a person or plant that is not functioning up to potential may benefit greatly when the support is aimed at the need they experience most

strongly. Just as both light deprived plants (i.e., need deprivation) and plants that naturally have a higher need for light (i.e., individual differences), may benefit immensely from more light, it is reasonable to expect that – regardless of the origin of this high need strength – a person that currently experiences a very strong need for autonomy may benefit most from support in that area.

Reasons for differences in need strength may range from momentary ups and downs (that are theorized to have resulted from need support or deprivation in the recent past or present) to relatively stable individual differences (theorized to have partly resulted from need support or deprivation in the developmental past; Deci & Ryan, 2000). Regardless, ignoring the existence of individual differences when it comes to the basic needs of autonomy, competence and relatedness seems to leave an unnecessary gap in our knowledge. On top of that, ignoring this avenue of research may block us from opportunities to help people fulfil their individual needs in the most direct and effective way. In short, whereas Deci and Ryan (2000) argue for broad research into the environmental conditions that will help humanity thrive, we argue there may also be considerable benefit to personalized support that helps a specific human thrive, by focusing exactly on what support this human may need in this moment.

As already indicated, this is consistent with the earlier theorizing of Murray (1938) and McClelland (1965), but also with current research by Schüler et al. (2016) who investigated differences in autonomy need strength. They refer to Motive Disposition Theory (MDT; McClelland, 1985) which posits that different incentives have different effects on people in terms of how rewarding their experience is. Following this reasoning, and consistent with their findings, they argue that whilst the *need* for autonomy may be universal, that people do differ in how much they *want* autonomy (see Sheldon & Schüler, 2011). People who more strongly experience this wanting are found to experience more enhanced

well-being and more flow following autonomy need fulfilment (Schüler et al., 2016). Other results are less clear about the moderating effect of need strength. Chen et al. (2015) found support for individual differences in need strength cross-culturally, but not for a moderating effect. On the other hand, Wörtler et al. (2020) did find modest support for the moderating effect of need strength in an organizational setting, but overall concluded that psychological need fit was of lesser importance than general need fulfilment. Finally, Van Assche et al. (2018) found some evidence for autonomy need strength acting as a moderator in a first study, but no support in a second study.

As mixed results continue to be found, scholars argue for continued scientific attention to this phenomenon. Investigating the effect of need strength in the sport context in this study will further our understanding of the possible moderating effect of need strength, thereby contributing to scientific debate and theory construction. In practice, the potential moderating effect of need strength in the relationship between athletes' perceived need support and intrinsic motivation may guide the future of coaching, increasing attention for individual preferences and suggesting a more tailor-made approach when it comes to basic need fulfilment. Based on the findings above, the second hypothesis states: The relationship between perceived basic need support and intrinsic motivation is moderated by the athlete's need strength, creating a stronger relationship for athletes with higher need strength. So far, the role of the coach in this relationship seems pretty straightforward, but is it?

Coach's Reported Need Support

Sport coaches have a uniquely influential position in relation to athletes, as they shape the motivational climate (Mageau & Vallerand, 2003) and their behaviors can thwart or support their athletes' basic needs. Considering that it is the *perceived* need support of the athlete that influences intrinsic motivation, a key question is whether coaches' self-reported supporting behavior is related to athletes' perceptions of need support. On the surface, it

makes logical sense to assume that the support athletes perceive is strongly related to the support that coaches report to give, as both are supposed to judge the same behaviors. This assumption is indeed made in much of the need support research, as often only one perception of need support is included (usually need support is measured in an athlete questionnaire). In this way, a vital portion of information about need support is largely missing from our data as these studies leave no place for a possible mismatch between perceptions of coaches and athletes. Some empirical results and theorists have challenged this assumption (Gjesdal, 2018; Mallett et al., 2016; Rocchi & Pelletier, 2018; Smith et al., 2016) and indeed found that the amount of agreement between coach and athlete perceptions was not as straightforward as initially expected. Rocchi and Pelletier (2018) found that agreement was present in only 40% of their dyads, and Smith et al. (2016) found significant relationships between coach and athlete perceptions for some, but not all dimensions in their study.

Hence, the current study contributes to this line of research by comparing both coaches' and athletes' perceptions using a dyadic approach. Based on the arguments provided above, the third hypothesis states: Coaches' reported need support is positively related to athletes' perceived need support for each of the basic needs. Whereas common sense would have us expect a very strong relationship between these perceptions, the small amount of dyadic research performed so far points us to the possibility that this relationship might just be a lot weaker than initially expected. A stronger scientific base for the existence of some perceptual distance may inspire applied scientists to create targeted interventions aimed at improving the process of coach-athlete support and convince coaches and athletes of the need for clear and open communication to ensure agreement and high levels of perceived support by the athlete.

Method

Power Analysis

A G*Power 3.1 analysis (Faul et al., 2009) was performed to determine the power of the analyses. A priori power testing for the correlation analysis shows that a sample size of 82 dyads is required to obtain a power of .80 for medium effect sizes. However, due to time constraints this was not possible for the current thesis. With the sample of 55 dyads, power drops to .629 for the current study. For the paired sample t-tests a sample size of 27 dyads is sufficient to reach a power of .80 with medium effects. The current sample obtains a power of .954. For a chi-square test the sample should contain 418 dyads when testing a model for the first hypothesis ($df = 84$). 483 dyads are required for model 2 ($df = 117$), and 674 dyads are required for model 3 ($df = 246$). With 55 dyads the obtained power to reject the null hypothesis of the first hypothesis is .106 for a medium effect size ($df = 84$). For hypothesis 2 ($df = 117$) power is .095 and for hypothesis 3 ($df = 246$) power is .078.

In addition, for testing in AMOS, Hoelter's (1983) critical N (CN) value was determined for each of the models. For the model testing the first hypothesis, a value of $CN = 53$ was found, for the second hypothesis $CN = 55$ and for the third $CN = 37$. All these values are lower than 200, indicating that the sample size is not large enough to yield adequate model fit in a chi-square test (Byrne, 2001).

Participants

A total sample of 55 dyads of coaches (24% female), aged 20 to 67 ($M = 40$, $SD = 14.81$) and athletes (58% female), aged 12 to 59 ($M = 20.89$, $SD = 7.67$) was used in the study. A wide diversity of 25 different sports ranging from soccer and tennis to pole dancing and jiu jitsu was included in the sample (an overview of the sports is provided in appendix A). The majority of the participants engaged in team sports (63.6%), semi-individual sports and individual sports represented 20% and 16.4% of the sample respectively. Performance levels ranged from amateurs ($n = 47$) to professional athletes (top 5% in their sport; $n = 8$).

Completed education levels of coaches ranged from VMBO to HBO and of athletes from primary school to university. On average, coaches started coaching 14 years (SD = 12.89) before participating in the study and athletes had been active in their current sport for 7 years (SD = 10.57). The amount of hours that the coaches reported spending on coaching this sport ranged from half an hour a week[1] to 10 hours a week (M = 3.6, SD = 2.16). The athletes reported spending from 1 to 45 hours a week on their sport (M = 6.6, SD = 6.75).

Procedure

A combination of primary and secondary data was used to test the model empirically. A sample of existing data containing 47 dyads of coaches and athletes was recruited as part of another thesis (Hegeman, 2020) and used in the current study. To increase statistical power[2], an additional sample of 8 dyads was recruited using a convenience sampling method. Participants of both samples were invited to participate in the study via email, social media or personal contact with the researcher. Data of the first sample was obtained between February and March 2020. Data obtained in the current project was collected in October 2022.

Informed consent was given by all participants[3] or their parents and ethical approval of the study was given to the primary researcher of the first sample (Hegeman, 2020) by the Ethical Committee of Psychology of the University of Groningen (Dos. nr. PSY-1920-S-0146).

After agreeing to participate, the participants received an e-mail with instructions and a link to the questionnaire on the XOET-company website[4]. A step-by-step manual was

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[1] Half an hour a week was reported by one participant, who was assistant coach to a sports team.

[2] Power increased from .56 to .63 for correlations and from .92 to .95 for t-tests by adding the eight new dyads.

[3] For three participants permission for use of the data was obtained via e-mail by the primary researcher of the first sample (Hegeman, 2020).

[4] The XOET-company offers the XOET-scan (Jonker et al., 2018) to companies and professionals as an informative tool and conversation starter on how to improve and optimize coaching. Besides the SDT characteristics, self-regulation (goal-setting, feedback and reflection; Zimmerman, 2000) need strength (as perceived by athlete and estimated by coach) and coach support (as perceived by athlete and reported by coach) are also measured to offer a more complete set of psychological characteristics

provided as well. Dyads were connected in the system by a team id and names of corresponding athletes and coaches were filled in by the online platform based on team ids for coaches and based on an earlier question for athletes. Athlete questionnaires started with an age check. For underage children (younger than 16) this was followed by a question about parental permission, which would end the questionnaire when they answered they did not have permission. Children who answered 'don't know' were encouraged to ask their parents for permission and were asked the same question again. Confidentiality was assured in the email and permission for use of their data in scientific research was asked at the end of the questionnaire. Going back to adjust answers to previous questions was permitted, but skipping items was not possible. Participants could choose to answer the questions in English or Dutch by clicking a flag icon in the bottom of the page.

After filling out the questionnaire, the participants received their scores and the comparison between coach and athlete scores in their dyad. Scores were presented visually in hexagons, allowing for a quick overview of discrepancies between both coach and athlete and between need strength and perceived support. An example of this can be found in Figure 2, and will be discussed in more detail in the Discussion. All participants were encouraged to discuss the results within their dyad and were offered a more detailed explanation by the researcher of how to interpret the scores and use them for improvement if they were interested.

Measures

Unless otherwise specified, we used a 7-point Likert response scale ranging from '*never*' to '*always*'.

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important in a self-regulative coaching climate. All characteristics were measured in the questionnaire, but only SDT scores were included in the present study.

Athlete's Perceived Need Support. Four items assessed to what extent athletes felt supported in their *autonomy* by their coach (α = .69): (1)"[Name coach] listens and provides advice, but lets me decide for myself what is good for me as an athlete", (2)"[Name coach] lets me decide for myself how to approach things in my sport", (3)"I consult with [name coach], but he/she gives me freedom to make my own choices", and (4)"[Name coach] involves me in choices to be made that can have consequences for me."

Three items assessed to what extent athletes felt supported in their *competence* by their coach (α = .77): (1) "[Name coach] gives me a feeling of trust and confidence in my abilities", (2) "[Name coach] motivates me to challenge myself", and (3) "[Name coach] gives me the feeling that I can achieve my goals".

Five items assessed to what extent athletes felt supported in their *relatedness* by their coach (α = .75): (1) "I feel supported by [name coach]", (2) "I can go to [name coach] if I have problems", (3) "I have confidence in [name coach]", (4) "I feel that [name coach] accepts me", and (5) "[Name coach] explains to me why certain decisions are made".

Athlete's Need Strength. Four items were used to asses athletes' *autonomy* need strength (α = .84): (1) "It is important for me that [name coach] gives me freedom to decide for myself what is good for me as an athlete", (2) "I would like [name coach] to let me decide for myself how to approach things in my sport", (3) "I want [name coach] to give me the freedom to make my own choices", and (4) "It is important for me that [name coach] involves me in choices to be made that can have consequences for me."

Three items were used to asses athletes' *competence* need strength (α = .73): (1) "It is important for me to feel capable of what I do as an athlete", (2) "It is important for me to be capable to execute difficult exercises as an athlete", (3) "It is important for me to be capable as an athlete".

Three items were used to asses athletes' *relatedness* need strength (α = .75): (1) "It's important for me to have confidence in [name coach]", (2) "It's important for me that I can share my problems with [name coach]", and (3) "I would like [name coach] to support me".

Coach's Reported Need Support. Four items measured the extent to which coaches believed they supported this athlete in their *autonomy* (α = .72): (1)"I listen and give advice, but I let [name athlete] decide for himself/herself what is good for him/her as an athlete", (2) "I let [name athlete] decide for himself/herself how to approach things in his/her sport", (3) "I consult with [name athlete], but I give him/her the freedom to make his/her own choices", and (4) "I involve [name athlete] in making decisions that can have consequences for him/her."

Three items measured the extent to which coaches believed they supported this athlete's need for *competence* (α = .81): (1) "I give [name athlete] a feeling of trust and confidence in his/her abilities", (2) "I motivate [name athlete] to challenge himself/ herself", and (3) "I give [name athlete] the feeling that (s)he can achieve his/her goals".

Five items measured the extent to which coaches believed they supported this athlete's need for *relatedness* (α = .75): (1) "I give [name athlete] a feeling of trust", (2) "I let [name athlete] know that he can share his/her problems with me", (3) "I give [name athlete] the feeling that he/she can trust me", (4) "[Name athlete] feels accepted by me", and (5) "I explain to [name athlete] why certain decisions are made".

Athlete's Intrinsic Motivation. Three items measured athletes' intrinsic motivation (α = .83): (1) "Do you like your sport?", (2) "Do you have fun whilst playing your sport?", and (3) "Do you love your sport?". Reponses ranged from "not at all" to "very much" and were given on a 5-point Likert scale.

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Results

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Outliers

The variable starting age had two outliers, both of which seemed to be mistakes, as the starting age was well above the participants' current age. The values of these outliers were recoded as missing values. Mahalanobis distance values revealed no significant multivariate outliers in the data.

Assumptions

The assumption of normality was not met. The data does not meet the assumption of positive skewness for log-transformation. To deal with non-normality of the data, bootstrapping will be performed in AMOS (5000 samples) and Bollen-Stine values will be reported along with the fit statistics. The assumption of homoscedasticity was also not met. Therefore, after testing the model using Structural Equation Modeling (SEM) software, Weighted Least Squares regression coefficients will be calculated in SPSS for significant relationships. This further substantiates any found support for the model and allows confidence that heteroscedasticity did not influence the results. The assumption of multicollinearity was met for each of the predictors.

Descriptives

Table 1 displays the means, standard deviations, and correlations for all variables in the model. Most remarkable is that none of the variables were correlated to intrinsic motivation. Subsequently, within each category of coach's reported need support, athlete's perceived need support, athlete's need strength, a series of t-tests were performed to compare average scores. As shown in Table 1, means for relatedness were consistently higher than means for autonomy, for all three categories of variables.

Hypothesis Testing

For hypothesis testing, SEM-software IBM SPSS AMOS 27 was used. The use of SEM allows simultaneous testing of all relationships in the model and to judge the fit of the model as a whole as well as for each of the hypotheses separately (Byrne, 2001). The first

hypothesis states that athlete's perceived support of each of the three basic needs (autonomy, competence and relatedness) is positively related to intrinsic motivation. To test this hypothesis, a mixed model of athletes' perceived need support and intrinsic motivation was compared to the data using maximum likelihood estimation and 5000 bootstraps. The independence model could not be rejected $\chi^2(84) = 109.139$, $p = .03$. Other fit indices (Comparative Fit Index (CFI) = .919; Root Mean Square Error of Approximation (RMSEA) = .074) were equally unsatisfactory. The Bollen-Stine value of $p = .41$ indicates increased model fit when bootstrapping, with 17% of the variance in intrinsic motivation explained by the predictors. However, none of the relationships to intrinsic motivation are significant (for perceived autonomy $p = .57$, for perceived competence $p = .52$ and for perceived relatedness $p = .65$), see also Table 1. Overall, these statistics indicate that the model fits the data poorly. Hence, the first hypothesis was rejected.

The second hypothesis states that the relationship between perceived basic need support and intrinsic motivation is moderated by the athlete's need strength, creating a stronger relationship for athletes with higher need strength. Adding need strength as a moderator into the model somewhat improves model fit $\chi^2(117) = 143.182$, $p = .05$. Other fit indices have similarly improved (CFI = .920; RMSEA = .064), but not enough to make model fit satisfactory. The Bollen-Stine value is insignificant ($p = .55$), but all variables, including the three moderators, have an insignificant relationship to intrinsic motivation (for the autonomy moderator $p = .78$, for the competence moderator $p = .45$, and for the relatedness moderator $p = .85$). Therefore, it is concluded that the model does not fit the data well, and the second hypothesis was rejected.

The third hypothesis states that coaches' reported need support is positively related to athletes' perceived need support for each of the basic needs. Because there are no significant relationships to intrinsic motivation, for this hypothesis, only the need support variables are

included in the model. Chi-square value ($\chi^2(246) = 414.058$, $p < .001$) as well as other fit indices (CFI = .688; RMSEA = .112) indicate poor model fit. The Bollen-Stine value ($p = .31$) indicates better fit with bootstrapping. None of the hypothesized relationships are significant (for autonomy $p = .11$, for competence $p = .65$, and for relatedness $p = .27$). 9% of the variance in perceived autonomy is explained by reported autonomy, <1% of the variance in perceived competence is explained by reported competence and 4% of the variance in perceived relatedness is explained by reported relatedness. On the basis of these statistics, it is concluded that the third model is not a good fit to the data and the third hypothesis was rejected.

Provided that complete model fit can never be better than the building blocks it's made up of and that none of the partial models tested had a good fit to the data, testing the entire model at once does not make sense. The notion that the complete model is a good representation of the data is rejected.

Discussion

Intrinsic motivation in athletes has been related to a host of positive outcomes (Deci & Ryan, 1991; Mallett & Hanrahan, 2004; Reis et al., 2000; Ryan & Moller, 2017; Vallerand & Rousseau, 2001), not the least of which are (youth) sport participation (Brustad et al., 2001; Weiss and Petlichkoff, 1989) and dropout (Back et al., 2022; Gardner et al., 2017; Van Yperen et al., 2022). The coach-athlete relationship can be of great benefit in this regard, as it greatly influences the motivational climate (Keegan et al., 2011; Vazou et al., 2005). The purpose of the present study was to investigate the relationship between coach support of the basic needs on the intrinsic motivation of athletes. Unexpectedly, however, we could not replicate previous findings (e.g., Fenton et al., 2014; Fransen et al., 2018; Jõesaar et al., 2012; Liu et al., 2020; Pelletier et al., 2001; Sparks et al., 2016) that athlete's perceived support of each of the three basic needs (autonomy, competence and relatedness) was positively related

to their intrinsic motivation. Furthermore, the relationship between perceived basic need support and intrinsic motivation was not moderated by the athlete's need strength, and coaches' reported need support was not positively related to athletes' perceived need support for each of the basic needs.

A first possible explanation for these unexpected findings is the small sample size. As shown in the power analysis, the number of dyads in the study was insufficient for most of the statistical tests. Low power reduces the chance of finding a true effect and rejecting the null-hypothesis when a relationship does exist (Field, 2017). Relationships between the perceived need support variables and intrinsic motivation were in the expected direction, but small and non-significant, which is consistent with the expected result of a lack of power. Given the strong evidence for the positive link between perceived need support and intrinsic motivation in many domains and contexts (e.g., Fenton et al., 2014; Fransen et al., 2018; Jõesaar et al., 2012; Liu et al., 2020; Pelletier et al., 2001; Ryan & Deci, 2017; Sparks et al., 2016), however, even a smaller sample would be expected to yield at least some (close to) significant results. The results of the present study thus do not align with previous research. We checked whether the results could be ascribed to young athletes who might have misunderstood questions or found them difficult to answer, as the validity of child self-reports about more abstract concepts such as emotions and needs is strongly related to age (Taber, 2010). However, the same results were found when only data from participants over 16 years old were analyzed. Similarly, considering that a one-on-one relationship with a coach may be experienced differently than a relationship between a coach and a team, another analysis was performed including only individual and semi-individual sports. This too, resulted in similar non-findings.

Another factor that may have influenced the results is a possible ceiling effect for the outcome variable. On average, athletes scored their intrinsic motivation 4.77 on a 5-point

Likert scale with only one athlete scoring below 4. All three questions measuring intrinsic

motivation have a median and a mode of 5, indicating little differentiation between athletes

for this variable. The small range of scores may obscure the relationship between the

variables (Šimkovic & Träuble, 2019). To put it plainly, if all athletes report to like their

sport a similar amount, it becomes more difficult to find out statistically to what this 'liking'

is related. A 7-point Likert scale may improve future studies, allowing for more subtle

differences between participants' intrinsic motivation to be taken into account.

In contrast to the established link between perceived need support and intrinsic

motivation, there is considerable debate over whether individuals' need strength is of

significant importance when it comes to basic need support (Chen et al., 2015; Glendinning et

al., 2021; Schüler et al., 2016; Van Assche et al., 2018; Wörtler et al., 2020). In line with

Chen et al. (2015) we did not find empirical support for the moderating effect of need

strength. The results of the current study should be read with caution, however, because of

the explanatory factors for our non-findings outlined in the previous paragraph and the

limitations that will be described in the strengths and limitations section. Interestingly, studies

that did find a moderating effect for need strength point to different possible factors that may

play a role. A study by Van Assche et al. (2018) compared measures of need valuation and

need desire, and found a moderating effect for explicit need desire, but not for explicit need

valuation. Likewise, the use of implicit, rather than explicit measures of need strength has

also been found to make a difference (Schüler et al., 2016). Finally, Glendinning et al. (2021)

found that need strength acted as a moderator in people with a unidimensional identity (i.e.,

people who relate their identity mostly to investment in one specific activity) but not in

people with a multidimensional identity. It appears then, that the moderating effect of need

strength might itself be moderated, and that operationalization must be taken into account

when reviewing the seemingly contradictory findings. All of these factors may have

influenced the current results and additional research into need strength is needed in order to more fully understand the moderating effect of need strength in all its complexity.

Another ongoing debate is about the link between perceived need support by the athlete, and self-reported need support by the coach. In line with previous findings (e.g., Gjesdal, 2018; Mallett et al., 2016; Rocchi & Pelletier, 2018; Smith et al., 2016), in the current study, we did not observe high levels of agreement between coach's reported need support and athlete's perceived need support. In fact, the current study found no relationship at all between coach and athlete perspectives. Three interesting questions arise in relation to this finding that coaches and athletes disagree about the amount of need support that the coach gives. Firstly, in what direction do coaches and athletes have differing perceptions about need support? In their chapter on autonomy support in the coaching practice, Mallett et al. (2016) point out that in their experience, coaches often overestimate the amount of autonomy support that they give. This is consistent with findings of Smith et al. (2016), who found that most of the coaches in their study reported their own behavior more favorably than the athletes did. Interestingly, Rocchi and Pelletier (2018) found that 29% of the coaches in their study indeed over-reported need supportive behaviors, but that another 31% of the coaches in their study *under*-reported need supportive behaviors compared to athletes. Coach perceptions may thus be different from athlete perceptions in different ways for different coaches.

Secondly, what do we know about the effects of over- and under-reporting of coaches for athletes? The sample used in the current study was too small to be able to answer this question, but earlier findings can shed light. Rocchi and Pelletier (2017) found that over-reporting had more negative consequences for athlete need satisfaction than under-reporting and, similarly, in an empirical study by Gjesdal (2018), over-estimation of positive behaviors by coaches had the most negative effect on the motivational climate. These findings suggest

that especially coaches who think they meet their athlete's needs, but don't, would benefit from learning to be more aligned with their athletes, to avoid negative consequences.

Lastly, whose perceptions are more closely linked to reality? In studies where perceptions of athletes regarding coach behavior are compared to *observers'* perceptions, observers tend to agree with the athletes (Curtis et al., 1979; Haerens et al., 2013), which offers some preliminary evidence that athlete perceptions are most in line with the actual behavior of the coaches. However, contrary to this, Smith et al. (2016) found no relationship between observers' and athletes' perceptions of need support by coaches. Regardless of who is 'right', in practice, starting open conversations on the topic of need support will likely be the most effective solution to ensure agreement, and reap the practical benefits of a coach that meets their athlete's needs. This need for increased alignment is supported by Gjesdal (2018), who found that perceptual agreement between coach and athlete was found to strengthen the enhancing effect of a positive motivational climate.

Strengths and Limitations

A major strength of this study was the use of a dyadic approach, as not many studies had investigated coach-athlete need support from the perspectives of coaches and athletes at the same time (Rocchi & Pelletier, 2018). Dyadic research has the unique advantage to allow investigation of the similarity and discrepancy between views or perceptions (Maguire, 1999), which can point researchers towards useful avenues of intervention. To illustrate, is it simply a lower level of need support that lies at the heart of diminished intrinsic motivation in an athlete or could it be that coaches and athletes disagree about which behavior is supportive of the athlete's needs? The current study sought to answer this question by comparing both perspectives at the same time. Another strong aspect of this study was the heterogeneity in the sample in terms of the diversity in sports (see Appendix A) and levels (i.e., both amateurs and professionals). Lastly, analysis through SEM is uniquely suited to study models with

multiple hypotheses, to test path and structural models simultaneously and to account for measurement error in all variables (Byrne, 2001).

Besides these strengths, this study also has some limitations. As already indicated, the first and most obvious one, is the small sample size. The extra dyads recruited for this thesis were unfortunately not enough to overcome this obstacle. Due to time constraints, more dyads could not be recruited within the scope of this thesis. A second limitation that has already been discussed is the possible ceiling effect for intrinsic motivation. As discussed, this makes it harder to identify relationships of the variable with other variables in the model (Šimkovic & Träuble, 2019).

Finally, the static design of the study is unable to inform us about the causal direction of the relationship between the variables. Whereas theoretically it is the perceived need support that influences intrinsic motivation, as depicted in our model and described in SDT, it is also possible that athletes with high intrinsic motivation see their coach's support in a more favorable light. They may then interpret their coach's behavior as more supportive because they are enjoying themselves. A third, and most likely, option is that the relationship may be reciprocal, creating positive or negative spirals that continue to influence both variables. Therefore, the static research design is less than optimal for fully understanding the dynamic nature of the relationship between these variables.

Future Research

To overcome this last limitation, longitudinal research designs and intervention studies are recommended for future research. An overreliance on static research designs provides us with only superficial knowledge about the relationships between the variables under study. Intervention studies will allow us to make causality claims and to get a more detailed understanding of the nature of these relationships. In order to shed light on the direction of the relationship between athletes' perceived basic need support and their intrinsic

motivation, two types of intervention studies can be conducted. One intervention may focus on enhancing coaches' need supportive behaviors, and measuring its effect on intrinsic motivation. In the second study need support is held stable and *perceived* basic need support is measured as the outcome variable, both before and after manipulating intrinsic motivation by a factor known to influence it. For example, positive emotions could be induced by an imagery exercise (Siedlecka & Denson, 2019) before training sessions, as they have been shown to facilitate intrinsic motivation (Løvoll et al., 2017). Additionally, longitudinal research will make it more likely that athletes with low intrinsic motivation can be part of the study (before they drop out, allowing for more differentiation in the outcome variable), and allows us to investigate how intrinsic motivation develops in people over time as a function of their perceptions of their coaches need support.

A second promising direction for future research would to be to include not only intrinsic motivation, but all forms of autonomous motivation into the research model. In contemporary research, focus has shifted from intrinsic motivation to autonomous motivation (sometimes referred to as self-determined motivation). Autonomous motivation refers to motivation that is volitional and in line with one's values, and includes both intrinsic motivation and two forms of extrinsic motivation. Identified and integrated regulation are forms of extrinsic motivation that energize people to do things that they feel that are in line with their values, but that they don't particularly enjoy. It is not hard to realize how this may relate to sport. A cold and rainy practice, the monotony of repetitive training when preparing for a big game or recovering from injury to be able to play again are all not particularly enjoyable or interesting in themselves. Still, no one would argue they don't matter when you play sport. A combination of all these forms of autonomous motivation may thus be more beneficial to an athlete than a sole focus on intrinsic motivation. Teixeira et al. (2012) did indeed find that these different kinds of motivation have different functions when it comes to

exercise. Whereas identified regulation was more strongly related to adopting a new exercise regimen, intrinsic motivation was a stronger predictor of long-term adherence.

A final recommendation for future research pertains the usefulness of the uncovered knowledge in practice. Whereas the value of need supportive coaching is becoming more and more evident, one question remains rather elusive: How? What exactly should a coach do when (s)he wishes to improve his/her need supportive behaviors? One simple answer, of course, is to just ask the athlete, which is indeed useful and recommended. But surely, how often do we not know what we need until we receive it? Some research has been done into specific behaviors that make up need supportive coaching (see Jonker & Van Yperen, 2020; Keegan et al., 2011; Mageau & Vallerand, 2003), but the majority of it is focused on autonomy support, leaving competence support and relatedness support in the margins. On top of that, all too often findings from educational research are simply translated to the sport context, or ideas are offered without any sign of a scientific basis for them. Qualitative research, more specifically semi-structured interviews, in the context of coach-athlete relationships may be much more informative. Simply asking many athletes when they feel most supported by their coach in each of their basic needs and looking for patterns in their answers may bring us much closer to advice that coaches can actually use. Quantitative research, well thought out questionnaires and rigorous statistical testing are essential for building a steady scientific base for our theories, but to get to the heart of actual perceptions and actual behaviors, to really understand what makes a difference, the most effective tool we have is listening (Kvale, 2007). Perhaps combined with observation of micro-level interactive behaviors and reactions in coach-athlete dyads, this can help us figure out exactly which coach behaviors are construed as need supportive by most athletes. Taking our research a few steps away from theory and a few steps closer to lived reality may be the most important, promising and useful direction we should be taking next.

Conclusion

Whereas the limitations of the current study make it hard to come to firm conclusions on the basis of these findings, the message we can still take home is not hard to grasp. If we want to improve the quality of coaching, we need to listen to our athletes. In small, one-on-one conversations and in big, organized semi-structures interviews. A long tradition of research has offered us a solid understanding of the importance of autonomy, competence and relatedness, not only to our motivation, but to our health, well-being and the quality of our lives (Ryan & Deci, 2017). The first step to take for any of us, coaches, athletes and researchers alike, would thus be to start an honest, open conversation.

For coaches and athletes who are looking for a way to jumpstart such a conversation, the XOET-scan that was used in the current study can be a great way to start. As described in the Method section, the XOET-scan is an online questionnaire coaches and athletes can fill in about their collaboration. Their scores on six psychological dimensions of self-determination (autonomy, competence, and relatedness) and self-regulation (goal setting, feedback, and reflection) are compared in three ways. Firstly, athlete need strength is compared to perceived support, in order to see to what degree the coaching already meets the athlete's needs. Then coach's reported support is compared to athlete's perceived support, as has been done in the current study, which offers information on the level of agreement between coach and athlete. Finally, a comparison between athlete need strength as estimated by the coach and as reported by the athlete can shed light on a possible mismatch between what the coach thinks the athlete needs and what (s)he actually needs. Comparisons are shown visually in hexagon figures, an example of which can be found in Figure 2. The main goal of the XOET-scan is to get coaches and athletes to start an ongoing conversation about what the athlete needs and how the coach can contribute to meeting these needs.

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Table 1

Descriptive Results.

	Range	M	SD	Pearson correlations (*r*)								
				2	3	4	5	6	7	8	9	10
1. Athlete's perceived autonomy support	1-7	5.45^b	.83	.66*	.77*	.58*	.44*	.57*	.22	.23	.10	.05
2. Athlete's perceived competence support	1-7	5.52^b	.89		.63*	.39*	.38*	.53*	-.10	.11	-.07	.10
3. Athlete's perceived relatedness support	1-7	5.91^a	.74			.45*	.38*	.59*	.17	.18	.10	.21
4. Athlete's autonomy need strength	1-7	5.32^b	.94				.50*	.56*	-.04	-.02	-.17	-.07
5. Athlete's competence need strength	1-7	5.93^a	.78					.48*	-.12	.07	-.14	.07
6. Athlete relatedness need strength	1-7	5.93^a	.93						-.05	.11	-.08	.13
7. Coach's reported autonomy support	1-7	4.78^b	1.08							.54*	.64*	-.09
8. Coach's reported competence support	1-7	4.89^b	.97								.72*	.10
9. Coach's reported relatedness support	1-7	5.14^a	.86									-.05
10. Athlete's intrinsic motivation	1-5	4.77	.39									

Note. N = 55 dyads. $^{a, b,}$ Within each category, means without a common superscript differ (*p* < .05). * Correlation is significant at the .01 level (2-tailed).

Figure 1

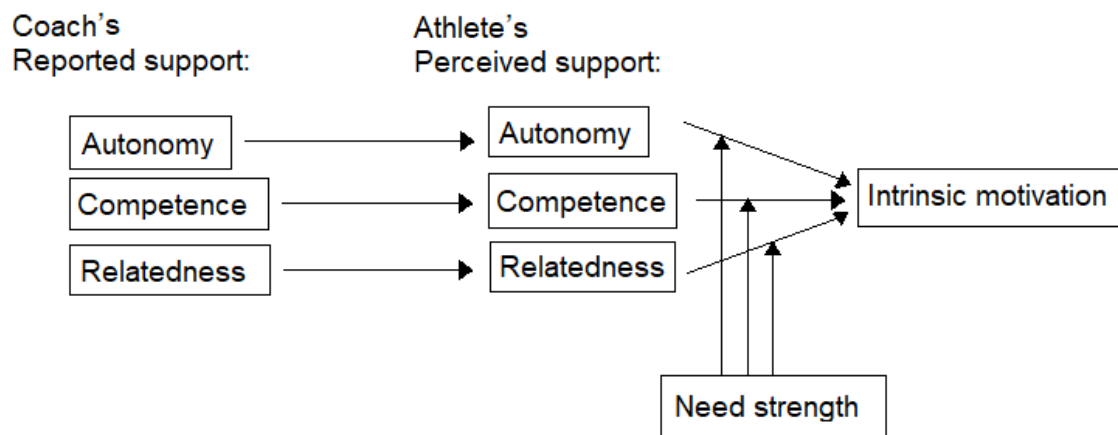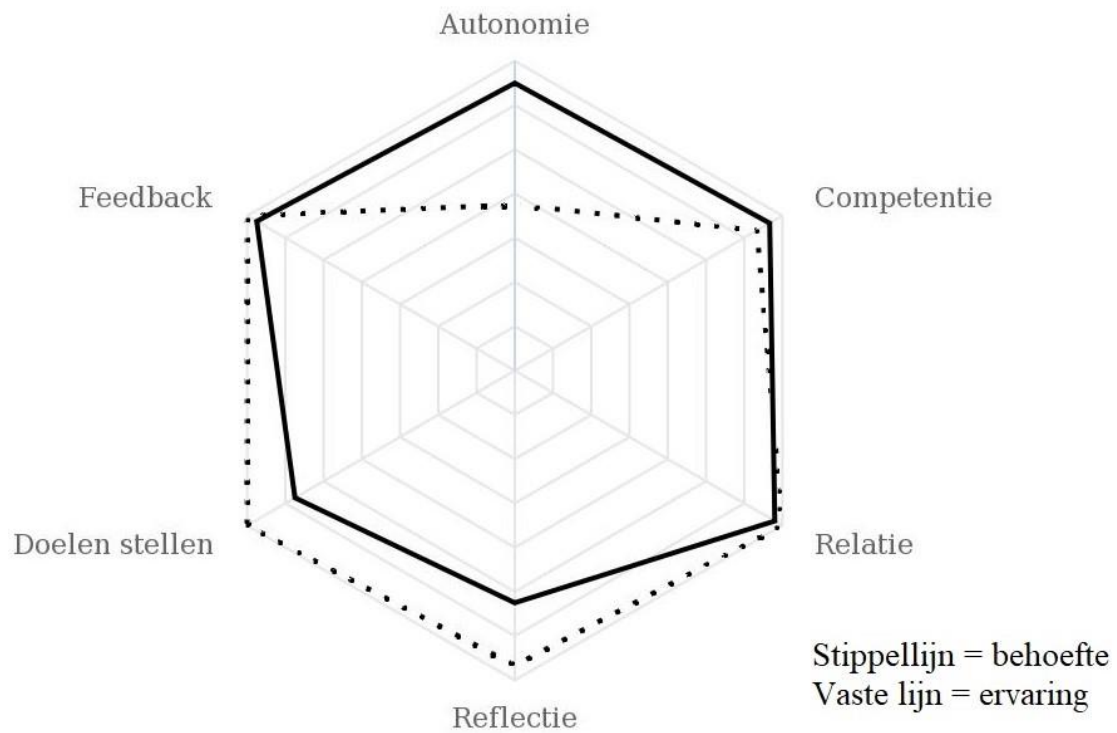*Theory-derived Model of Basic Need Support and Intrinsic Motivation.*

Figure 2

Visual Representation of Score Comparison of Need Strength and Perceived Support.

Note. The hexagons should be read from the inside out, each line representing 1 point on the Likert scale for that characteristic. Translation clock-wise from top: autonomy, competence, relatedness, reflection, goal setting, feedback. Dotted line = athlete's need strength, straight line = athlete's perceived support.

Appendix A

Overview of the Sports.

	Sport	Frequency	Percentage
Team sport	Soccer	14	25.4
	Volleyball	5	9.0
	Hockey	4	7.2
	Basketball	3	5.4
	Korfball	2	3.6
	Rowing	2	3.6
	Handball	1	1.8
	Floorball	1	1.8
	Rugby	1	1.8
	Beach volleyball	1	1.8
	Quidditch	1	1.8
	Subtotal	**35**	**63.6**
Semi-Individual	Badminton	3	5.4
	Fencing	2	3.6
	Swimming	1	1.8
	(Ice) skating	1	1.8
	Jiu Jitsu	1	1.8
	Tennis	1	1.8
	Table tennis	1	1.8
	Dancing	1	1.8
	Subtotal	**11**	**20**
Individual	Personal training	2	3.6
	Survival	2	3.6
	Triathlon	2	3.6
	Bouldering	1	1.8
	Pole dancing	1	1.8
	Gymnastics	1	1.8
	Subtotal	**9**	**16.4**
	Total	**55**	**100**