The Relationship between coping, goal orientation and self-regulation in youth cyclists

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Abstract

The increasing prominence of young cyclists in elite cycling highlights the need to better understand psychological factors that contribute to early success. This study investigates the relationship between goal orientation, self-regulation and coping among youth cyclists aged 14 to 18 participating in a selection procedure for a talent development program. The research specifically aimed to answer: (1) whether goal orientation is related to coping, and (2) whether self-regulation is related to coping.

Thirty youth cyclists completed a psychological questionnaire assessing their goal orientations (both approach/avoidance and other/self/task), self-regulation (reflection, evaluation, and effort), and coping (coping with adversity, peaking under pressure, goal setting and mental preparation, confidence and achievement motivation, coachability, concentration and freedom from worry). Pearson's correlations and multivariate regression were conducted.

The results showed that coping was significantly positively related to approach-oriented goals, especially task- and other-based goals. Avoidance goals were generally unrelated to coping, except for a small positive relation with goal setting. Coping was also strongly related to self-regulation, with self-reflection emerging as the strongest predictor. Self-reflection significantly predicted coping constructs: goal setting, confidence, and freedom from worry.

These findings suggest that adopting an approach-based goal orientation and improving self-reflective abilities may enhance young cyclists coping, potentially contributing to better performance and long-term development.

Introduction

Professional road cycling is a rapidly developing sport. In the period 2018-2020 the average starting age in the Tour de France dropped by 1.5 years. The winners of this race also seem to be much younger. In the years 2000-2018 the average age of the overall winner of the Tour de France was above 30 whereas the most recent winners of the Tour de France Tadej Pogacar and Jonas Vingegaard were between age 21 and 26 (Janssens et al., 2022). This trend highlights the importance of early talent selection and development of young aspiring cyclists.

Much is known about the physiological part of cycling. However, while cyclists need to possess high levels of physiological fitness to reach the elite level, there seem to be minimal differences in physiological characteristics among top athletes, therefore other factors likely play a role determining race outcomes (Phillips & Hopkins, 2020). Among these factors are the psychological characteristics of the cyclists. These characteristics can influence the behavior of the athletes in training and during competitions (Olmedilla et al. 2018; MacNamara et al. 2010). Research shows that elite athletes score higher on important psychological characteristics compared to non-elite athletes (van Rossum, 2006; Mitić, 2021). This might imply that psychological characteristics are an important factor in an athletes' success, making it an important factor in talent selection and talent development. This research aims to provide better understanding of some of these psychological characteristics in young cyclist, specifically how the different characteristics related to each other.

One psychological characteristic that is important for successful sports performance is coping. In sports, athletes face multiple potential stressors, such as pressure to win or pain.

The inability to cope with stress is said to be an important factor in failure to function optimally in many types of athletic performance (Nicholls & Polman, 2007). Studies that focused on the age-related differences in coping found that in badminton older athletes are better prepared to cope with adversity and report higher emotional self-control (Bebetsos & Antoniou, 2003). It was also found that adults often responded with more concentration and were better at focusing on what they had to do next (Goyen & Anshel, 2998). However, there is very little research, especially in the sports context, that explains these differences. In current literature there are many definitions of coping. Some researchers see coping as a trait, where an individual has a consistent set of coping strategies that tend to remain stable over time and in different situations. Others see coping more as a dynamic process, in which the chosen coping strategy is determined as an interaction between the person and the task/environment (Nicholls & Polman, 2006).

In the current research coping can be seen as a multifaceted construct which consists of 7 subscales: coping with adversity, peaking under pressure, goal setting and mental preparation, confidence and achievement motivation, coachability, concentration, and freedom from worry (Smith et al. 1995). Coping with adversity is the ability to remain emotionally stable when faced with setbacks, for example dealing with a fall or having a bad day during an important race. Peaking under pressure is the ability to perform well in high-stakes situations, for example the last race of a grand tour. The subconstruct goal setting and mental preparation is about the tendency to set goals and prepare mentally for competition. Concentration is the ability to stay focussed on the task and block out distractions. Freedom form worry means that the cyclist has a low tendency to experience anxiety and/or self-doubt before of during competition. The subconstruct confidence and achievement motivation is about the cyclists' belief in their abilities and their drive to succeed. Lastly, coachability is the openness to learning and feedback from coaches or trainers (Smith et al. 1995). Research

from Kruger et al. (2013) shows that talented children aged 13 score higher on all these subscales compared to less talented children (Kruger et al. 2013). Therefore, the score of young cyclists on these constructs can be useful to determine future success.

Another important psychological characteristic that can determine success in sports is self-regulation. Self-regulation refers to the ability to manage one's thoughts, emotions, and behaviors. It therefore helps individuals adjust to their social and physical surroundings (Toering et al., 2012). Self-regulation is crucial in endurance sports, such as road cycling, as there are many demands that athletes must deal with. Endurance athletes have to deal with all kinds of stressors during competition which can be competitive, environmental or personal. They also have to make the right pacing decisions in a dynamic environment. To perform well, the athlete must be willing to put in the effort and needs to be able to evaluate and reflect on their own performance (McCormick et al., 2017). Research shows that individuals must be committed to putting in maximum effort and maintaining it over time to achieve peak performance levels (Ericsson, Krampe & Tesch-Römer, 1993). Self-evaluation and self-reflection play a key role in self-regulation, as they foster personal growth and enhance the learning process. By allowing individuals to draw on past experiences and strategies, they become better equipped to make informed decisions and improve future actions (Toering et al., 2012). Previous research has shown that self-regulation significantly differs between talented and less talented athletes across various sports, with higher levels of self-regulation being associated with higher competitive levels (Jonker et al., 2010). These constructs therefore are likely to play an important part in the development of young cyclists and are expected to predict cycling success.

A third characteristic that is often linked to sporting success is goal-orientation. According to the 3x2 achievement goal framework from Mascret et al. (2015) goal orientation can either be approach oriented or avoidance oriented and can either be focused

on the task, oneself or others (Mascret et al., 2015). Achievement goals can be placed in a hierarchical order, in which an other-based approach is often seen as the most important overarching goal in the sports context, as athletes are often focused on winning. However, task- and self-based goals (i.e. mastery goals) are often used to improve and therefore help achieve the goal of winning (Van Yperen, 2022). According to Stoeber and Crombie (2010), an approach goal orientation is more advantageous for performance and qualification success in sports because it promotes positive, goal-oriented behaviors and enhances motivation. In contrast, avoidance-oriented goals tend to hinder athletes' ability to perform at their best, as they focus more on avoiding failure rather than pursuing mastery or striving for success. In talent development a task orientated approach orientation is important as athletes with this goal approach primarily focus on improving their skills, often show great work ethic and enjoy the process of improvement. This intrinsic motivation is key for fulfillment and long-term development of the athlete (Lochbaum & Roberts, 1993). Athletes with a more other approach orientation are focused on winning and often perform well in competitive environments but can be less satisfied when they don’t perform at a high level relative to others. They might also experience greater stress and anxiety, which can negatively impact development (Lochbaum & Roberts, 1993). This suggests that task-oriented goals would be more beneficial for the development of young cyclists and would lead to a more sustainable career in the future.

Even though there is research showing that coping, self-evaluation and the right goal orientation are important for athletic performance, there is not much research that looks at the way these characteristics might influence each other in sports. Therefore, the aim of this research is to analyse how goal orientation and self-regulation relate to coping among youth cyclists participating in a selection procedure for a talent development program. Research on the relations between coping strategies and goal-orientation in middle school children in

science, shows that students that have a more mastery-approach goal orientation or performance-avoidance goal orientation used more positive coping strategies, while mastery-avoidance goal orientations were negatively associated with the use positive coping strategies (Münevver & Yasemin 2016). Research from Delahaij & Dam (2016) on the impact of goal orientation on coping in Dutch military recruits shows that individuals with a greater mastery approach orientation developed a more effective coping style after military training (Delahaij & Dam, 2016).

Ataii et al. (2021) looked at the effect of self-regulation on academic resilience and found a direct positive effect of self-regulation on academic resilience (Ataii et al. 2021). The systematic self-reflection model of resilience strengthening introduced by Crane et al. (2018) highlights the importance of self-reflection as a mechanism to strengthen resilience (Crane, Kangas & Searle, 2018). Research from Artuch-Garde et al. (2017) also shows that self-regulation was a significant predictor of coping, resilience, confidence, persistence and adaptation in students aged 15 to 21 (Artuch-Garde et al., 2017).

Looking at the different subconstructs of coping, a few of these constructs are linked to goal-orientation and self-regulation in the literature. Approach goals help mentally prepare for a task by setting clear goals to preform well. This directly links with the subscale goal setting and mental preparation. Especially a task-oriented approach goal orientation supports mental readiness for competition as the focus is on effort, improvement, and mastery (Duda & Nicholls, 1992). Self-regulation helps set effective goals for a specific race, as the cyclists knows what is needed of them to do well. According to literature are athletes who engage in self-regulatory processes better in setting clear and challenging goals (Jonker et al., 2010). Confidence is also often linked to approach goal-orientation and self-regulation. Research shows that athletes with a task-oriented approach goal orientation report higher levels of sport confidence, as their focus on personal improvement strengthens their perceived competence

and their belief in their ability to succeed (Horn, 2004). Further self-regulatory behaviours are said to enhance self-efficacy and perceived control, which are key elements of sports confidence (Cleary & Zimmerman, 2001). Lastly freedom of worry is likely to have a positive relation with self-regulation as self-regulation helps with reframing negative thoughts and managing competitive anxiety. Athletes with stronger self-regulatory skills are therefore better at coping with stress and reducing performance-related worry (Nicholls et al., 2010).

The two main questions of this research are: is there a relation between the preferred goal orientation of youth cyclists and their score on coping and the different subscales of coping? And is there a positive relation between self-regulation and coping and the different subscales if coping? Based on the current literature it is hypothesized that the findings will show a positive relationship between the dominant approach (task) goal orientation and coping as well as a positive relationship between self-regulation and coping. Subconstructs of coping that are most likely to be influenced by goal-orientation and self-regulation are goal setting and mental preparation, confidence and freedom of worry.

Method

Participants

Participants in this research were young cyclists who wanted to participate in the selection procedure of a talent development program for young talented cyclists. In total 30 young cyclists filled out the questionnaire, of whom 20 were male and 10 were female. The cyclists were aged 14-18. All participants signed an informed consent and agreed to the use of their information in this research.

Research design

This study employs a cross-correlational research design to examine the relationship between goal orientation and coping as well as the relationship between self-regulation and coping. In a cross-correlational framework, the primary aim is to explore how these variables are related to each other without manipulating or controlling them in any way. Specifically, the study investigates whether certain types of goal orientation relate to a cyclist's coping, and similarly, whether different levels of self-regulation relate to a cyclist's coping.

The research is conducted using a cross-sectional research design, meaning that data is collected at a single point in time from each participant. This approach provides a snapshot of the relationships between variables as they naturally occur.

Procedure

The CCNL psychological questionnaire is administered to the cyclists on the website of CyclingClassNL as part of their application for the selection procedure of CCNL. Cyclists of every level, aged 14-18 are allowed apply for the selection program. All cyclists that want to apply are asked to fill in the questionnaire, but the answers on the questionnaire are not

used in the selection procedure in any way. All participants had a free choice if they are willing to share their answers for scientific analyses.

Questionnaire

The CCNL psychological questionnaire consists of three different parts. The first part focusses on goal-orientation and is measured on a 7-point Likert-scale. This part consists of 18 statements based on the 3x2 achievement goal questionnaire from Mascret et al. (2015). Examples of the statements in this section are: 'my goal during races is performing better than before' or 'my goal during races is not doing worse than others'. The second part focusses on self-regulation and is divided into 3 subcategories: reflection, evaluation and effort. Examples of statements in this section are: 'I know my strengths and weaknesses and during every training I plan how I can improve them', 'After every training I think about what I did right and wrong during the training', and 'I work as hard as possible during my training'. Reflection and evaluation are both scored on a 5-point likert scale whereas effort is measured on a 4-point likert scale. The last part of the questionnaire consists of 28 statements about coping and is measured on a 5-point likert scale. Coping is divided into 7 subcategories: goal setting, confidence, coachability, concentration, coping with adversity, peaking under pressure, and freedom of worry. The different parts of the questionnaire are based on questionnaires introduced in earlier research by Mascret et al. (2015), Toering et al. (2013) and Smidt et al. (1995). Examples of statements in this section are: 'I stay positive during competitions, no matter how bad things are going', I worry quite a bit about what others think of my performance', and 'I don't need to be pushed to train or work hard, I give 100%'.The questionnaire is translated and is slightly adapted to measure specifically for cycling. The scores on the subscales are calculated using the sum of the scores on the questions for that specific subscale divided by the number of questions for that subscale.

Data analysis

Goal-orientation and coping

Firstly, Pearson's correlation-analyses are performed using SPSS 29, to determine the correlation between the different goal-orientations and each of the subcategories of coping. In line with other research in the field of individual differences research correlations larger than .30 are seen as relatively large effect sizes (Gignac & Szodorai, 2016).

To determine which goal orientations predict specific subconstructs of coping, a multivariate regression analysis was conducted using SPSS. It is chosen to use the Pillai's Trace multivariate test as the sample is relatively small. The independent variables in the regression were the 6 subcategories for goal orientation: task-approach, self-approach, other-approach, task-avoidance, self-avoidance and other-avoidance. The dependent variables in the regression were the 7 subcategories of coping: goal setting, confidence, coachability, concentration, coping with adversity, peaking under pressure, and freedom of worry.

Self-regulation and coping

Pearson's correlation analysis is also performed to determine the correlation between the different subscales of self-regulation and each of the subcategories of coping. A multivariate regression analysis was performed to identify which subconstructs of self-regulation predict the various subconstructs of coping. Again, Pillai's Trace test statistics are used for this analysis. In this regression the 3 subcategories of self-regulation: reflection, evaluation and effort are the independent variables. The 7 subcategories of coping are the dependent variables.

Results

Descriptives

A descriptive analysis of the data shows that the mean score of the participants on coping was 3.02 (SD = .29) on a 4-point Likert scale. The mean score on goal setting was 5.41 (SD = .95) on a 7-point Likert scale. The mean score on self-regulation was 3.02 (SD= .29, however it is important to note that the subscales are measured on different subscales. Descriptive statistics for the subcategories of coping, goal setting, and self-regulation are presented in Table 1.

Table 1a Descriptive statistics coping

	N	Minimum	Maximum	Mean	Std. Deviation
goalsetting	30	1.25	3.50	2.4750	.72024
confidence	30	1.75	4.00	3.2000	.59957
coachability	30	2.75	4.00	3.6500	.30513
concentration	30	2.25	3.75	3.2250	.44697
coping_with_adversity	30	2.00	4.00	2.9333	.43018
peaking_under_pressure	30	1.25	3.50	2.4917	.59626
freedom_of_worry	30	1.00	4.00	3.1667	.75525
Valid N (listwise)	30				

Table 1b Descriptive statistics goalsetting

	N	Minimum	Maximum	Mean	Std. Deviation
task_approach	30	2.00	7.00	5.9000	1.18790
self_approach	30	3.00	7.00	5.8556	1.00833
other_approach	30	2.67	7.00	5.2667	1.35726
task_avoidance	30	2.00	7.00	5.3222	1.24255
self_avoidance	30	1.33	7.00	5.2556	1.30922

other_avoidance	30	1.00	7.00	4.8444	1.61110
Valid N (listwise)	30				

Table 1c Descriptive statistics self-regulation

	N	Minimum	Maximum	Mean	Std. Deviation
reflection	30	1.44	4.56	3.6296	.73026
evaluation	30	2.17	4.67	3.6278	.66044
effort	30	2.67	4.00	3.5963	.37423
Valid N (listwise)	30				

Table 1: the descriptive statistics of the subcategories from coping (1a), goal-orientation (1b) and self-regulation (1c).

Relations between coping and goal orientation

The correlation between coping and goal-orientation is determined using the Pearson correlation in SPSS. A significant positive correlation was found, $r(28) = .40$, $p = .013$. The correlations between the subscales on coping and the subscales on goal orientation are presented in Table 2. A significant positive correlation was also found between approach goal orientation and coping $r(28) = .57$, $p < .001$, but not for avoidance goals $r(28) = .14$, $p = 23$. Significant positive correlations can be found for both task-based goals $r(28) = .42$, $p = .010$ and other-based goals $r(28) = .40$, $p = .014$, but not for self-based goals $r(28)$ .15, $p = .214$.

Table 2 Correlations coping and goal-orientation

		approach_goal	avoidance_goal	task_goal	self_goal	other_goal
coping_total	Pearson Correlation	.570	.206	.421	.150	.401
	Sig. (1-tailed)	.000	.138	.010	.214	.014
	N	30	30	30	30	30

Table 2 Pearson correlations between the subconstructs of coping and goal setting

A multivariate regression analyses is performed in SPSS to determine if goal direction (approach/avoidance) predicts coping, as well as determining specific effects on each subconstruct. The Pillai's Trace multivariate regression showed a significant multivariate relation between approach goals and coping Phillai's Trace = .551, $F(7,21) = 3.70$, $p = .009$, $\eta^2 = .552$, but not between avoidance goals and coping Phillai's Trace = .281, $F(7,21) = 1.18$, $p = .354$, $\eta^2 = .283$ (Appendix Table 1a). The goal-directions combined significantly predicted the subconstructs goal setting $F(6, 27) = 6.24$, $p = .006$, $\eta^2 = .316$), confidence $F(6, 27) = 5.44$, $p = .010$, $\eta^2 = .287$ and peaking under pressure $F(6, 27) = 6.66$, $p = .0041$, $\eta^2 = .330$. Further analysis of the approach goal orientation showed it significantly predicted goal setting $F(1, 27) = 12.40$, $p = .002$, $\eta^2 = .315$ confidence $F(1, 27) = 6.01$, $p = .021$, $\eta^2 = .182$; and peaking under pressure $F(1, 27) = 12.62$, $p = .001$, $\eta^2 = .318$, whereas avoidance goals only significantly predicted the subconstruct goal setting $F(1, 27) = 4,96$, $p = .034$, $\eta^2 = .155$ (Appendix Table 1b).

A multivariate regression analyses is also performed in SPSS to determine if goal orientation (task, self and other) predicts coping, as well as determining which subconstructs of coping are best predicted by which goal orientation. The Pillai's Trace multivariate regression showed there was no significant multivariate relation between the different goal orientations and coping (Appendix Table 2a). All goal-orientations combined only

significantly predicted subconstruct confidence $F(3, 26) = 4.45$, $p = .012$, $\eta^2 = .339$. Among the individual goal orientations, only task-based goals showed a significant relation with confidence $F(1, 27) = 4.73$, $p = .039$, $\eta^2 = .154$. No other significant relations were found between the individual goal orientations and the remaining coping subconstructs (Appendix Table 2b).

Relations between coping and self-reflection

The relation between coping and self-regulation is determined using the Pearson correlation. A significant positive correlation was found $r(28) = .68$, $p < .001$. The correlations between coping and the subconstructs on self-regulation are presented in Table 3.

Table 3 Correlations coping and the subconstructs of self-regulation

		reflection	evaluation	effort
coping_total	Pearson Correlation	.758	.603	.483
	Sig. (1-tailed)	.000	.000	.003
	Sig. (1-tailed)	30	30	30

Table 3 Pearson correlations between coping and the subconstructs of coping

To determine how the different subconstructs of self-regulation predict the different subconstructs of coping, again a multivariate regression is conducted using SPSS. The analysis showed there is a significant multivariate relation between self-reflection and coping Phillai's Trace = .644, $F(7,20) = 5.17$, $p = .002$. No significant multivariate relations are found between self-evaluation and coping Phillai's Trace = .319, $F(7,20) = 1.34$, $p = .284$ and between effort and coping Phillai's Trace = .412, $F(7,20) = 2.01$, $p = .104$ (Appendix Table

3a). All components of self-regulation combined significantly predicted the subconstructs goal setting $F(3, 26) = 10.45$, $p < .001$, $\eta^2 = .547$, confidence $F(3, 26) = 12.02$, $p < .001$, $\eta^2 = .581$, and freedom of worry $F(3, 26) = 3.14$, $p = .042$, $\eta^2 = .266$. At the individual level, self-reflection significantly predicted goal setting $F(1, 26) = 9.03$, $p = .006$, $\eta^2 = .258$), confidence $F(1, 26) = 6.53$, $p = .017$, $\eta^2 = .201$, and freedom of worry $F(1, 26) = 7.39$, $p = 0.12$, $\eta^2 = .211$. Self-evaluation only significantly predicted freedom of worry $F(1, 26) = 6.05$, $p = 0.021$, $\eta^2 = .189$). Effort did not significantly predict any of the subconstructs of coping (Appendix Table 3b).

Discussion

This study investigated how goal orientation and self-regulation relate to coping among youth cyclists. Results showed a relatively strong positive correlation between coping and goal orientation. This correlation indicates that the higher the cyclist score on goal orientation, the higher their overall score on coping. However, this does not provide any information about which goal-orientations might be associated with higher coping scores. As expected, the analyses showed that only approach-oriented goals significantly predicted higher levels of coping, while avoidance-oriented goals did not significantly predict better coping. This might indicate that approach-oriented goals might be useful for good coping abilities. This is in line with existing literature as approach-oriented goals are said to lead to more positive, goal-oriented behaviors which improves coping (Stroeber & Crombie, 2010).

An approach goal orientation significantly predicted the coping subconstructs goal setting, confidence, and peaking under pressure. Approach goal orientations allow the cyclists to regulate their emotions and cognitive processes in a stressful situation or when experiencing drawbacks, which creates a more problem-focused mindset, possibly helping them setting clearer goals and perform better in high pressure situations (Delahaij & Dam, 2016). The relation between confidence and approach-oriented goals is also something that is often seen in literature. Approach-oriented goals can have a positive influence on confidence, because the athlete is focused on improving a task or a performance and often see errors as learning opportunities, whereas people with an avoidance-oriented approach might perceive these errors as a threat (Lee et al., 2021). However, they could also influence each other the other way around. Research shows that individuals with higher self-esteem (confidence) are more likely to adopt approach-oriented goals, as they belief in their ability to achieve a desired outcome and are less focused on possible failure (Heimpel et al., 2006).

Avoidance goal orientation did not significantly predict higher coping scores, with the exception of goal setting. This may be because goal setting involves formulating specific objectives for training or competition, which can be driven by both approach- and avoidance-oriented motivations. Cyclists with a more avoidant goal approach might find it harder to stay focused on the task and regulate their emotions as they are more focussed on avoiding the negative situation (Delahaij & Dam, 2016), explaining why this doesn't predict better coping.

Interestingly positive relationship between task-based goals and other-based goals and coping where found, but not between self-based goals and coping. This may be because task-based goals promote personal improvement and preparation, which in turn promote planning and emotional control, which are important aspects of coping. Other-based goals can facilitate focused effort that is important for coping. Self-based goals, however, may create internal pressure, especially if athletes set rigid expectations or compare current performance to past results, which can hinder effective coping (Duda & Nicholls et al., 1992; van Yperen, 2006).

Further analysis revealed that only task-based goals significantly predicted confidence. This is in line with existing literature as task-oriented goals are often focused on personal improvement, which enhances an athlete's belief in their own abilities. By emphasizing effort and mastery rather than comparison with others, task-oriented athletes develop stronger perceived competence, and as a result, greater confidence (Voight et al., 2000).

A strong positive relation between coping and self-regulation was also found. Especially the subconstruct self-reflection, seems to be a strong predictor of coping. An explanation is that skills needed for self-reflection are also important for efficient coping. According to the Self-Reflection and Coping Insight Framework, self-reflective skills such as

self-awareness, trigger identification, setting objectives for personal growth, evaluating coping effectiveness, and formulating strategies for future coping are important for individuals to develop their coping abilities and improve their resilience (Falon et al., 2021). This model has been tested by military training. The results showed that self-reflection can improve understanding of stress responses and coping strategies in military (Falon et al., 2022). The results of the current study indicate that this might also be the case for cycling.

A more detailed analysis suggests that self-reflection specifically predicts goal setting, confidence and freedom, indicating that skills used in self-reflection might especially be useful for these subconstructs of coping. These findings are in line with other research in athletes. Self-reflection can enhance athletes' awareness of their current state and desired outcomes, which facilitates setting more focused, challenging, and meaningful goals (Neil et al., 2013; Tan et al., 2016). Self-reflection also enhances self-awareness, which helps athletes to recognize their strengths and areas of improvement. This improves their perception of competence and control and therefore improves confidence and intrinsic motivation. Furthermore, self-reflection enables athletes to realistically evaluate past performances, which helps build a more stable and resilient sense of confidence, even after a setback (Hanrahan et al., 2007). Self-reflection is negatively correlated with pre-competition anxiety, as athletes who engage in self-reflection develop greater understanding of their strengths and weaknesses, which enhances emotional control and problem-solving. This leads to greater self-confidence, enabling athletes to manage anxiety more effectively (Wang, 2023).

While coping is often seen as a characteristic that improves with time and experience (Skinner & Zimmer-Gemback, 2017), the findings of this study suggest that it may also be influenced by other psychological variables that might be trainable. For example, an intervention exposing students to a mastery-approach climate in the classroom showed that students scored significantly higher on mastery goal orientation, and was maintained over

time (Edwards et al., 2023). Similarly, self-reflection can be systematically trained with, for example self-reflective writing training, which is found to have a positive and sustainable impact on coping and resilience (Bucknell et al., 2023). Implementing similar interventions in the cycling context might help enhance cyclists' goal orientations and self-reflection, thereby indirectly improving their coping.

It is important to note that subcategories that did not show any significant relations might be influence by a so-called ceiling effect. Participants scored overall very high on some of the subvariables, making it hard to make distinctions. For example, for the subvariable effort almost all participants had a maximal score. This phenomenon is found in other research on effort in high performing athletes (Raya-González & Castillo, 2020; Halperin & Vigotsky, 2024).

Limitations

This research has some limitations that should be considered when interpreting the findings. First, the sample size of this study was relatively small, which may reduce the statistical power of the analyses and makes it harder to generalize the results to a broader population of young cyclists.

Another important point to consider is that the answers the respondents gave, might be biased. Even though it is clearly stated that answers are not used in the selection procedure, the respondents might still give the socially desired answers, instead of answering honestly influencing the research findings. Giving honest answers on some of the questions might also be quite hard, as some of the questions are specifically about match situations or training situations. This requires a high sense of self-reflection and self-awarenesses. This can cause inconsistent answers reducing reliability or can lead to lower construct validity.

Lastly, by gathering data from participants only once, the study aims to identify patterns and correlations that might inform future research or interventions but does not infer causal relationships due to the inherent limitations of cross-sectional data. This limits the ability to draw conclusions about causality or underlying mechanisms that might explain the found relations.

Future research

This research only focused on how goal orientation and self-regulation predict coping. In future research it would be interesting to look at underlying mechanisms that could explain the found relations and how the different constructs might influence each other. Knowing these underlying mechanisms can help practitioners to develop more targeted interventions to help optimize coping in cyclists. It might also be valuable to examine the development of these psychological constructs in a longitudinal study, particularly to examine the relation between these constructs and the cyclists' future performance. This may offer important insights for talent selection and talent development.

Furthermore, the current study did not specifically examine gender differences, however exploring potential variations between male and female cyclists in coping, self-regulation, or goal orientation could provide valuable insights. Given that some research suggests that psychological development and stress responses may differ by gender (Tameres et al., 2002), future research could benefit from investigating whether such differences exist and how they may influence talent development strategies.

Conclusion/practical implications

The results of this study suggest that coping in young cyclists is strongly related to both goal orientation and self-regulation. Approach-oriented goals, especially task-based, are associated with better coping, mostly for the subconstructs confidence and goal setting and

peaking under pressure. Similarly, results showed that self-reflection was positively associated with key aspects of coping, such as confidence, freedom of worry and goal setting, suggesting that athletes who engage more in self-reflection may be better able to cope in a difficult situation. However, more research is needed to get a better understanding of how the different constructs might influence each other. The findings of this research highlight the potential value of promoting approach-oriented goals and self-reflection in young cyclists to enhance their coping capacities.

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Appendices

Appendix 1 multivariate tests coping and goal direction (approach/avoidance)

Table 1a Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.843	16.164[b]	7.000	21.000	<,001	.843
	Wilks' Lambda	.157	16.164[b]	7.000	21.000	<,001	.843
	Hotelling's Trace	5.388	16.164[b]	7.000	21.000	<,001	.843
	Roy's Largest Root	5.388	16.164[b]	7.000	21.000	<,001	.843
approach_goal	Pillai's Trace	.552	3.701[b]	7.000	21.000	.009	.552
	Wilks' Lambda	.448	3.701[b]	7.000	21.000	.009	.552
	Hotelling's Trace	1.234	3.701[b]	7.000	21.000	.009	.552
	Roy's Largest Root	1.234	3.701[b]	7.000	21.000	.009	.552
avoidance_goal	Pillai's Trace	.283	1.184[b]	7.000	21.000	.354	.283
	Wilks' Lambda	.717	1.184[b]	7.000	21.000	.354	.283
	Hotelling's Trace	.395	1.184[b]	7.000	21.000	.354	.283
	Roy's Largest Root	.395	1.184[b]	7.000	21.000	.354	.283

Table 1a results of the multivariate test, shows a significant effect for only approach goals on the total of all constructs of coping.

Table 1b Test of Between-Subjects Effects

Source	Dependent Variable	F	Sig.	Partial Eta Squared
Corrected Model	goalsetting	6.237	.006	.316
	confidence	5.441	.010	.287
	coachability	1.577	.225	.105
	concentration	1.409	.262	.094
	coping_with_adversity	.068	.935	.005
	peaking_under_pressure	6.662	.004	.330
	freedom_of_worry	.046	.956	.003
Intercept	goalsetting	.797	.380	.029
	confidence	3.401	.076	.112
	coachability	71.403	<,001	.726
	concentration	20.097	<,001	.427
	coping_with_adversity	26.988	<,001	.500
	peaking_under_pressure	.842	.367	.030
	freedom_of_worry	13.517	.001	.334
approach_goal	goalsetting	12.397	.002	.315
	confidence	6.006	.021	.182
	coachability	1.786	.193	.062
	concentration	1.177	.288	.042
	coping_with_adversity	.128	.723	.005
	peaking_under_pressure	12.617	.001	.318

	freedom_of_worry	.076	.785	.003
avoidance_goal	goalsetting	4.963	.034	.155
	confidence	.181	.674	.007
	coachability	.042	.840	.002
	concentration	.192	.665	.007
	coping_with_adversity	.018	.895	.001
	peaking_under_pressure	1.756	.196	.061
	freedom_of_worry	.003	.957	.000

Table 1b the results of approach and avoidance goals on each of the subconstructs of coping

Appendix 2 multivariate tests coping and goal-orientation

Table 2a Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.848	15.953[b]	7.000	20.000	<,001	.848
	Wilks' Lambda	.152	15.953[b]	7.000	20.000	<,001	.848
	Hotelling's Trace	5.584	15.953[b]	7.000	20.000	<,001	.848
	Roy's Largest Root	5.584	15.953[b]	7.000	20.000	<,001	.848
task_goal	Pillai's Trace	.236	.881[b]	7.000	20.000	.539	.236
	Wilks' Lambda	.764	.881[b]	7.000	20.000	.539	.236
	Hotelling's Trace	.308	.881[b]	7.000	20.000	.539	.236
	Roy's Largest Root	.308	.881[b]	7.000	20.000	.539	.236
self_goal	Pillai's Trace	.334	1.433[b]	7.000	20.000	.247	.334
	Wilks' Lambda	.666	1.433[b]	7.000	20.000	.247	.334
	Hotelling's Trace	.502	1.433[b]	7.000	20.000	.247	.334
	Roy's Largest Root	.502	1.433[b]	7.000	20.000	.247	.334
other_goal	Pillai's Trace	.232	.864[b]	7.000	20.000	.550	.232
	Wilks' Lambda	.768	.864[b]	7.000	20.000	.550	.232
	Hotelling's Trace	.303	.864[b]	7.000	20.000	.550	.232
	Roy's Largest Root	.303	.864[b]	7.000	20.000	.550	.232

Table 2a results of the multivariate test, shows a significant effect for only approach goals on the total of all constructs of coping.

Table 2b Test of Between-Subjects effects

Source	Dependent Variable	F	Sig.	Partial Eta Squared
Corrected Model	goalsetting	1.063	.382	.109
	confidence	4.450	.012	.339
	coachability	1.764	.179	.169
	concentration	1.193	.332	.121
	coping_with_adversity	.899	.455	.094
	peaking_under_pressure	1.137	.353	.116
	freedom_of_worry	1.662	.200	.161
Intercept	goalsetting	6.424	.018	.198
	confidence	10.602	.003	.290
	coachability	67.701	<,001	.723
	concentration	18.368	<,001	.414
	coping_with_adversity	35.606	<,001	.578
	peaking_under_pressure	3.539	.071	.120
	freedom_of_worry	23.027	<,001	.470
task_goal	goalsetting	1.943	.175	.070
	confidence	4.732	.039	.154
	coachability	.066	.800	.003
	concentration	.619	.438	.023
	coping_with_adversity	1.825	.188	.066
	peaking_under_pressure	.153	.699	.006
	freedom_of_worry	.011	.917	.000

self_goal	goalsetting	1.397	.248	.051
	confidence	1.491	.233	.054
	coachability	3.212	.085	.110
	concentration	.905	.350	.034
	coping_with_adversity	2.036	.166	.073
	peaking_under_pressure	.270	.608	.010
	freedom_of_worry	3.234	.084	.111
other_goal	goalsetting	.252	.620	.010
	confidence	2.591	.120	.091
	coachability	.276	.604	.011
	concentration	.102	.752	.004
	coping_with_adversity	.012	.913	.000
	peaking_under_pressure	.586	.451	.022
	freedom_of_worry	2.724	.111	.095

Table 2b the results task, self, and other based goals on each of the subconstructs of coping

Appendix 3 multivariate tests coping and self-regulation

Table 3a Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.713	7.089[b]	7.000	20.000	<,001	.713
	Wilks' Lambda	.287	7.089[b]	7.000	20.000	<,001	.713
	Hotelling's Trace	2.481	7.089[b]	7.000	20.000	<,001	.713
	Roy's Largest Root	2.481	7.089[b]	7.000	20.000	<,001	.713
reflection	Pillai's Trace	.644	5.171[b]	7.000	20.000	.002	.644
	Wilks' Lambda	.356	5.171[b]	7.000	20.000	.002	.644
	Hotelling's Trace	1.810	5.171[b]	7.000	20.000	.002	.644
	Roy's Largest Root	1.810	5.171[b]	7.000	20.000	.002	.644
evaluation	Pillai's Trace	.319	1.338[b]	7.000	20.000	.284	.319
	Wilks' Lambda	.681	1.338[b]	7.000	20.000	.284	.319
	Hotelling's Trace	.468	1.338[b]	7.000	20.000	.284	.319
	Roy's Largest Root	.468	1.338[b]	7.000	20.000	.284	.319
effort	Pillai's Trace	.413	2.013[b]	7.000	20.000	.104	.413
	Wilks' Lambda	.587	2.013[b]	7.000	20.000	.104	.413
	Hotelling's Trace	.704	2.013[b]	7.000	20.000	.104	.413
	Roy's Largest Root	.704	2.013[b]	7.000	20.000	.104	.413

Table 3a results of the multivariate test, shows a significant effect for only the subconstruct self-reflection for the total of all subconstructs of coping

Table 3b Test of Between-Subjects Effects

Source	Dependent Variable	F	Sig.	Partial Eta Squared
Corrected Model	goalsetting	10.453	<,001	.547
	confidence	12.017	<,001	.581
	coachability	.483	.697	.053
	concentration	2.270	.104	.208
	coping_with_adversity	.987	.414	.102
	peaking_under_pressure	.553	.651	.060
	freedom_of_worry	3.142	.042	.266
Intercept	goalsetting	2.676	.114	.093
	confidence	.158	.694	.006
	coachability	33.436	<,001	.563
	concentration	19.235	<,001	.425
	coping_with_adversity	4.406	.046	.145
	peaking_under_pressure	1.494	.233	.054
	freedom_of_worry	1.999	.169	.071
reflection	goalsetting	9.029	.006	.258
	confidence	6.527	.017	.201
	coachability	.002	.963	.000
	concentration	.878	.357	.033
	coping_with_adversity	.277	.603	.011

	peaking_under_pressure	.452	.507	.017
	freedom_of_worry	7.390	.012	.221
evaluation	goalsetting	.241	.627	.009
	confidence	.001	.978	.000
	coachability	.312	.581	.012
	concentration	.694	.413	.026
	coping_with_adversity	.093	.762	.004
	peaking_under_pressure	.460	.504	.017
	freedom_of_worry	6.045	.021	.189
effort	goalsetting	3.878	.060	.130
	confidence	1.027	.320	.038
	coachability	.002	.967	.000
	concentration	2.462	.129	.086
	coping_with_adversity	1.942	.175	.070
	peaking_under_pressure	.740	.397	.028
	freedom_of_worry	.889	.354	.033

3b the results of self-reflection, evaluation and effort on each of the subconstructs of coping