

The differences in psychological variables between  
talented junior cyclists and (semi-) professional  
cyclists: A comparative study

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### **Abstract**

The present study investigated the differences in psychological variables between talented juniors and (semi-) professional cyclists. This study measured dominant achievement goal orientation, self-regulation and coping for talented juniors (n = 30) and (semi-) professional cyclists (n = 33). Validated questionnaires (2x2 framework (Elliot & McGregor, 2001; van Yperen, 2006); Self-Regulation of Learning Self-Report Scale (Toering et al., 2013); Athletic Coping Skills Inventory-28 (Smith et al., 1995)) were used to measure these variables. (Semi-) professional cyclists had significantly more often no dominant goal strategy, meaning they had both performance and mastery oriented goals, compared to the talented juniors. No significant difference in self-regulation was found between talented juniors and (semi-) professional cyclists. Talented juniors scored significantly lower on coping, including all sub-constructs such as peaking under pressure and freedom from worry, compared to (semi-) professional cyclists. These results suggest that the development of psychological variables should be implemented in talent development programs.

*Keywords:* Goal orientation, self-regulation, coping, talented juniors, (semi-) professional cyclists.

### **The differences in psychological variables between talented junior cyclists and (semi-) professional cyclists**

High performing professional cyclists are becoming increasingly younger. The most recent examples are Tadej Pogacar who finished second in the Vuelta a Espana at the age of 20 and won the two following editions of the Tour de France and Remco Evenepoel who, at the age of 22, won the Vuelta a Espana and became world champion in the same year. Both examples do not seem to be exceptions, but are rather part of a trend that is being set by a new generation of young high performing professional cyclists. This trend also highlights the importance of talent selection and development in the junior categories, as high performance can already be achieved in the early twenties of these athletes. With regard to talent development, talented juniors not only have to be prepared physically, but also psychologically to be able to perform at a young age as professional cyclist.

Performing at the highest level in cycling requires not only exceptional physiological capabilities, but also requires a rich psychological framework. Especially at the top level, where the variance in physiological capabilities between athletes decreases, psychological capabilities are extremely important. Numerous studies in the past have already demonstrated the influence of psychological factors on athletic performance (Bandura, 1977; Deci & Ryan, 1985; Woodman & Hardy, 2003; Silva, 2006; Andrew et al., 2007; Macnamara et al., 2010; Nicholls & Polman, 2007). Furthermore, anaerobic fitness variables alone of young cyclists do not predict the future (professional) cycling career, but can be useful to predict performance within their current age category (Menaspà et al., 2010). Nevertheless, these anaerobic fitness variables are currently being used to select young talents and are perceived as one of the most important predictors for potential performance. Physiological factors are of course really important given that cycling is predominantly an endurance sport, but keeping a holistic view is advised (Atkinson et al., 2003). In addition, MacNamara stated talent development is a complex process. It seems likely that a range of psychological factors

underpin an athlete his ability to translate potential into top-class performance (Macnamara et al., 2010). Development programs should therefore also focus on the development of psychological variables, such as self-regulation and coping. The development of athletes' psychological variables can form a foundation for future successful performance, as they will be able to better handle the increased demands as they progress (Weinberg & Gould, 2023). Therefore emphasize should also lie on the development of psychological variables, during the talent development process.

The first step in identifying key psychological variables for talent development is to determine the differences between talented juniors and (semi-) professional cyclists. This study examines three key psychological variables; goal orientation, self-regulation and coping, as these resemble key features for performance in cycling. Cycling is a sport in which the athlete needs to train many hours, often on his own. Moreover, with few exceptional cases, a cyclist tends to experience more losses than wins. Therefore, a cyclist who wants to achieve a high level of performance needs to be able to cope with these situations. This demands a high level of self-regulation and coping mechanisms, while goal orientation also plays a crucial role in this context.

### **Goal orientation**

Goals determine the direction, degree of effort and the perseverance of an athlete and collectively ensure that the athlete takes the necessary actions to achieve their desired performance outcomes (Gould, 1993). However, athletes differ in the type of achievement goals they strive for. According the achievement goal framework, there are three types of achievement goal standards; other-based, self-based and task-based (Elliot et al., 2011). Most individuals hold a dominant achievement goal towards one of these three. Other-based goals rely on social comparison and could be defined as the performance relative to others. In the domain of sports, one example would be winning or losing a match. Self-based goals refer to

comparing the performance to an earlier personal performance, for example a personal best time or cycling specific; an earlier set Functional Threshold Power output. Task-based goals refer the absolute demands of the task (Elliot et al., 2011; Van Yperen 2022). Self and task based goals can be described as mastery goals, while other based goals can be described as performance goals.

In addition, these performance and mastery goals can be distinguished between approach and avoidance goals. This depends on the individual's focus for competence (approach motivation), for example *doing better than before/others* or avoiding incompetence (avoidance motivation), for example *not doing worse than before/others*. Avoidance goals are negatively related to performance attainment (Van Yperen, Blaga, & Postmes, 2014), because these goals are linked to negative outcomes, including lower perceived feelings of self-efficacy, heightened levels of worry, and increased negative thoughts. These factors often result in reduced performance levels (Payne et al., 2017). It is therefore advised to aim for freely adopted approach goals (either performance or mastery), as earlier research suggests that these type of goals are associated with positive achievement outcomes, such as intrinsic motivation and better performances (Hulleman et al., 2021; Van Yperen, Blaga, & Postmes, 2014; Van Yperen, 2022). In addition, a study found that triathletes who set approach achievement goals the day before a triathlon (regardless of standard, so both mastery and performance), performed better than expected based on their season best time, controlling for performance level. (Stoeber et al., 2019)

Given the nature of human kind, there is a strong tendency to rely on social comparison (Van Yperen & Leander, 2014) and therefore hold other-based/performance achievement goals. However, given the fact that the outcome of these goals rely on other, non-controllable external factors, athletes lack control over the outcome of these type of

goals, for example winning or losing, which subsequently can harm the athletes feeling of competence (Van Yperen, 2022).

Two studies (Hardy et al., 2017; Gulich et al., 2019) found differences in goal orientation between super-elite (Olympic or world championship medallists) and elite level (professionals without Olympic or world championships medallists) athletes. The super elite athletes tend to focus on the performance outcomes, but also remained focused on the process which was needed to be able to achieve the desired performance outcome. They tend to hold both mastery and performance achievement goals. The elite athletes tend to only focus on the performance outcome and hold more performance achievement goals.

### **Self-regulation**

Self-regulation has been found, by numerous studies, to be positively related towards performance and skills in sport (Anshel & Porter, 1996; Cleary & Zimmerman, 2001; Kirschenbaum et al., 1982; Kitsantas & Zimmerman, 2002). Self-regulated learners activate and sustain behaviours, cognitions and affects that are oriented towards the achievement of their goals. Self-regulated learners are considered to be proactive learners and show initiative (Zimmerman et al., 2008). In order to improve and perform well, self-regulated learners must know which aspects of their performance they need to improve and most importantly, what they need to do to be able to achieve this (Toering et al., 2012). This goal driven-driven process consists of components of metacognition, motivation and behaviour (Jonker et al., 2015). Specifically for cycling, but also for other endurance sports, self-regulation is a crucial psychological characteristic, as it plays a key role in cycling-specific skills such as pacing (Elferink-Gemser & Hettinga, 2017). There are multiple models and theories that aim to explain the process of self-regulation, but a commonality among all of these models and theories is that evaluation, self-reflection and effort are important aspects (Bandura, 1986;

Etmer & Newby, 1996; Toering et al., 2012; Toering et al., 2013; Zimmerman, 2000; Zimmerman et al., 2008).

Evaluation involves assessing the results of a specific task by comparing them to a predefined standard. In the domain of sports, this evaluation typically pertains to the performance outcomes of training sessions or a match (Toering et al., 2012). Self-reflection is about the learning process. This extends beyond merely considering what went right or wrong, but more importantly, also how to improve (Toering et al., 2012). To achieve optimal levels of performance, athletes must be willing to invest maximal efforts over a consistent period of time (Ericsson et al., 1993).

A study by Cleary and Zimmerman in 2001 found that experts and non-experts basketball players differ in self-regulatory attributions. Experts set more specific goals and displayed higher levels of self-efficacy, compared to the non-experts. In addition, Toering et al. (2009) found that high performing youth football players, aged between 11 to 17 years, had higher levels of reflection and effort compared to lower performing youth football players. They suggested that the higher performing youth players appear to be more willing to invest effort into practice and competition.

### **Coping**

Coping in general is found to be important for sport performance (Den Hartigh, Van Dijk, Steenbeek & Van Geert, 2016; Den Hartigh, Van Yperen, & Van Geert, 2017). Coping itself consists of multiple aspects, but resembles the cognitive and behavioural mechanisms used to manage internal and external stressors (Algorani & Gupta, 2021). Coping therefore consists of multiple sub-components such as; goal setting, coachability, confidence and achievement motivation, concentration, coping with adversity, peaking under pressure and freedom from worry (Smith et al., 1995). Coping with adversity, which could also be referred



to as resilience, is a dynamic process of bouncing back to normal functioning following stressors (Hill et al., 2018a; 2018b).

Athletes encounter a variety of stressors, which they have to deal with. Qualitative research from Fletcher and Sarkar (2014) found that Olympic gold medallists were all able to deal with a variety of stressors, including life changing events. In addition, Gould et al., (2002) found during interviews, with regard to coping, that Olympic champions were characterized by: confidence; resilience; coachability; the ability to control anxiety; the ability to focus and block out distractions; the ability to set and achieve goals.

A study by Kruger et al. in 2013 found that coping skills between general sport talented and less-talented adolescents, using the Australian Talent Search protocol, differ. More specifically, using the Athletic Coping Skills Inventory (ACSI-28 by Smith et al., 1995), talented adolescents scored higher on coping with adversity, peaking under pressure, goal setting, confidence and coachability compared to the less-talented adolescents. A study on the subject of rugby, also using the Athletic Coping Skills Inventory, found differences between top and lower ranked under-19 category players in coping with adversity, confidence and achievement motivation as well (Andrew et al., 2007).

### **Development of goal orientation, self-regulation and coping**

The development of athletes' psychological variables can form a foundation for future successful performance, as they will be able to better handle the increased demands as they progress (Weinberg & Gould, 2023). This foundation can provide consistency in improvement which enhances long term development (Gould et al., 2002). Goal orientation is based on the underlying individuals' competence motivation (Elliot & McGregor, 2001). Competence motivation of an athlete can change throughout his career, as self-appraisal may become more accurate and responsive to information with age (Wiegfield & Wagner, 2005). The development of self-regulation is dependent on multiple factors. One important factor

is that it requires a certain level of cognitive ability to be able to make goal setting, self-evaluations and self-corrections more elaborate (Gestsdottir & Lerner, 2008). The development of cognitive ability relates to the structural and functional changes in brain development in adolescence (Keating, 2004). The development of coping is a complex and adaptive process. According to Skinner and Zimmer-Gemback (2007), the development of coping can be best conceptualized as a multi-level adaptive system operating across time. This multi-level model conceptualizes coping as (*a*) an adaptive process across developmental time, (*b*) an episodic process across episodic time and (*c*) an interactional process across real time. This would suggest that, in general, older athletes would likely show higher levels of self-regulation and coping compared to younger athletes. In addition, it suggests that goal orientation for older athletes would differ compared to younger athletes.

### **Current research**

Within the domain of endurance sports, and specifically cycling, there is a notable deficiency in research focusing on differences in psychological variables between juniors and (semi-) professional athletes. Especially for cycling this deficiency is remarkable to say the least since at the top level in cycling, apart from a few exceptions, physiological differences are relatively small, suggesting that psychological factors may play a critical role in performance outcomes. Therefore, it is logical to also investigate psychological differences alongside physical differences. While there have been conducted some studies in other sports regarding differences between talented and non-talented athletes, with some differences in self-regulation, coping and goal orientation, no studies have been conducted between juniors and (semi-) professional athletes.

This study aims to provide insight into the relatively underexplored area of talent development in endurance sports and specifically cycling. By comparing talented juniors to (semi-) professional cyclists, this study seeks to determine if there are differences in

psychological variables between these groups. Based on previous research, the following hypotheses are proposed: 1. (semi-) professional cyclists more often have a dominant mastery approach goal strategy compared to the talented juniors. 2. (semi-) professional cyclists have higher levels of self-regulation compared to the talented juniors. 3. (semi-) professional cyclists have higher levels of coping compared to the talented juniors.

## **Method**

### **Participants**

This study is conducted by using a pool of 30 junior prospect cyclists in a unique development program; CyclingclassNL which is a collaboration between NOC\*NSF and the Dutch world-tour team Visma Lease-a-bike (formally known as Jumbo-Visma). These cyclists were selected through annual selection days of CyclingclassNL. The inclusion criteria for the talented junior group were proficiency in Dutch and being a cyclist at the cyclingclassNL junior program. The average age of the junior group was 15.76 , with a standard deviation of 0.85 and ranged from 14 to 17 years. Within this group, 60 % was male (n=18) and 40% was female (n=12). The (semi-) professional group consists of 33 participants from different European (semi-) professional cycling teams, which were recruited through invitations being sent to continental cycling teams and individual continental cyclists. The inclusion criteria for the (semi-) professional group were language proficiency in English or Dutch and being active as a cyclist while being part of a (pro-) continental cycling team. The average age of the (semi-) professional cyclist group was 21.03 years, with a standard deviation of 3.06 and ranged from 18 to 34 years. Within this group 100% was male (n=33). The potential sample size of the (semi-) professional group consisted of 44 participants, however 11 participants were removed due not completing the full questionnaire.

### **Procedure**

Team managers of continental cycling teams were approached and invited to participate with their team in this study. In addition (semi-) professional cyclists themselves were also approached directly and were invited to participate. When accepting to participate, they received additional information about the study and a link to a digital version of the questionnaire. The questionnaire was accessible through Qualtrics. Participating teams were, in return for participation, provided with the results of the study.

The junior category cyclists were asked, during the annual selection days of cyclingclassNL, to participate. Participation to the study did not influence the selection process for cyclingclassNL and participants were also explicitly informed about this beforehand. CyclingclassNL provided the data of the juniors from the year 2022 and 2023.

### **Measurements**

The total questionnaire battery, which was available in Dutch and English, measures three main variables: goal orientation, self-regulation and coping. For goal orientation the 2x2 framework (Elliot & McGregor, 2001) adjusted by van Yperen (2006), with a total of 6 items, is being used. Each item has two options to choose from, to determine the dominant goal orientation of the participant. For example: *I prefer .. 1. to do better than most others of my level OR 2. to not do worse than most others of my level*. Participants could have either a performance approach, performance avoidance, mastery approach, mastery avoidance or no dominant goal orientation.

For self-regulation, a football specific version (Toering et al., 2013) of the original SLR-SLS (Toering et al., 2012) adjusted to the domain of cycling is used consisting of a total of 58 items with a five-point Likert scale. Football specific terms, like match, were adjusted to cycling specific terms, for example race. Furthermore this specific version of the SLR-SLS measures three sub-constructs: evaluation ( $\alpha = .80$ ) for example; *each practice session I think back and evaluate whether I did the right things to become a better cyclist*, reflection ( $\alpha =$

.85) for example; *each practice session I think about both my strengths and weaknesses and ways that I can improve them* and effort ( $\alpha = .85$ ) for example; *I keep working on an exercise during my training, even if I find the exercise difficult*. The original reliability of the used constructs of the SLR-SLS ranged between .74 and .84, meaning that all subscales had sufficient test-retest reliability.

At last, the Athletic Coping Skills Inventory 28 (ACSI-28), also adjusted to the domain of cycling, is being used to measure coping (Smith et al., 1995) and consists of 28 items with a five-point Likert scale. Furthermore, this questionnaire measures sub-constructs coachability ( $\alpha = .72$ ), for example; *When a coach criticizes me or yells at me, I correct my mistake without getting upset*. goal setting and mental preparation ( $\alpha = .71$ ) for example; *I have my race plan worked out in my head long before the race starts*, confidence and achievement motivation ( $\alpha = .66$ ) for example; *I am confident I will ride well*, peaking under pressure ( $\alpha = .78$ ) for example; *the more pressure there is during a race, the more I like it*, coping with adversity ( $\alpha = .66$ ) for example; *I remain emotionally in control no matter how bad things go for me* and freedom from worry ( $\alpha = .76$ ) for which items had to be recoded for example; *When I ride a race, I worry about making mistakes and not meeting expectations*. The total test-rest reliability of the original ASCI-28 is .87. The total questionnaire battery took approximately 10 minutes of the participant's time.

### **Data analysis**

Data analysis was done in two parts. For goal orientation a fisher's exact test using a Monte Carlo analysis was used to compare the differences of this categorical variable between the talented junior group and the continental cyclist group. The Monte Carlo analysis was used because the expected count was  $< 1$  for the performance avoidance category. A post hoc analysis, using the Bonferroni correction, was performed to determine differences in column proportions. For both self-regulation and coping a MANOVA analysis was performed to test

for differences in average scores between both groups. For the variables, self-regulation and coping their respective sub-constructs were used as dependent variables while group (either talented junior or (semi-) professional) was used as between groups factor. For both groups the Wilks' Lambda multivariate test statistic was used. Normality was assumed according to the central limit theorem, as the sample size for both groups was  $\geq 30$  (Field, 2013). At last a post hoc power analysis was performed to analyse the achieved power based on the used sample size, which is presented in the appendix.

Addition analyses were executed to account for possible gender effects, as the (semi-) professional group consisted of only males ( $n=33$ ). Therefore an additional analysis was performed to test for differences between male ( $n=18$ ) and female ( $n=12$ ) within the talented junior group. Dominant goal orientation was analysed using a chi-square analysis. For self-regulation a MANOVA test was used. Normality was assumed after significant values on the Shapiro-wilk test. Coping was analysed using a Kruskal-Wallis test, as normality could not be assumed for this construct following a Shapiro-wilk test and the relative low sample sizes.

## Results

A significant association between group (talented juniors or (semi-) professionals) and dominant goal strategy was found ( $N = 63$ ) = 9.27,  $p = .020$ , 95% CI [0.016, 0.024], based on 10.000 replications. Post hoc comparisons using the t test with Bonferroni correction found a significant difference for 'No dominant goal'. As shown in table 1, (semi-) professional cyclists were found to more often have no dominant achievement goal compared to the talented juniors. These results are not in line with the stated hypothesis: *(Semi-) professional cyclists more often have a dominant mastery approach goal strategy compared to the talented juniors.*

**Table 1.** The frequencies and the expected frequencies of each dominant achievement goal strategy for the Talented Juniors and the (Semi-) professionals.

		Dominant Goal Strategy				
		Performance	Mastery	Performance	Mastery	No dominant
		Approach	approach	avoidance	avoidance	goal
<b>Talented</b>	Count	7	20	0	2	1*
<b>Juniors</b>	Exp. Count	8.6	16.2	0	1	4.3
<b>(semi-)</b>	Count	11	14	0	0	8*
<b>Professionals</b>	Exp. Count	9.4	17.8	0	1	4.7

\*  $P < .05$ .

No statistically significant difference in self-regulation was found between the talented juniors and (semi-) professionals, following the results from a MANOVA analysis ( $F(3, 59) = 1.846, p = .149$ , Wilk's  $\Lambda = .914$ , partial  $\eta^2 = .086$ ). The results are shown in table 2. The results regarding self-regulation are not in line with the stated hypothesis: *(Semi-) professional cyclists have higher levels of self-regulation compared to the talented juniors.*

**Table 2.** Averages scores for Talented Juniors and (Semi-) professionals on Self-regulation and the sub-constructs Evaluation, Reflection and effort.

	Talented juniors		(Semi-) Professionals		$F(1,61)$
	M	SD	M	SD	
Evaluation	3.65	0.69	3.98	0.72	3.438
Reflection	3.84	0.57	4.05	0.43	2.710
Effort	4.31	0.46	4.49	0.39	2.967

\*  $P < .05$ .

A significant difference in coping was found between the talented juniors and (semi-) professionals, following the results from a MANOVA analysis ( $F(7, 55) = 50.973, p < .001$ , Wilk's  $\Lambda = .134$ , partial  $\eta^2 = .866$ ). Table 3 shows the results of a between subjects effects test, following a MANOVA analysis. Significant effects were observed across all

subconstructs of the ACSI-28; goal setting ( $F(1,61) = 39.513$ ;  $p < .001$ ; partial  $\eta^2 = .393$ ); coachability ( $F(1,61) = 147.460$ ;  $p < .001$ ; partial  $\eta^2 = .707$ ); confidence and achievement motivation ( $F(1,61) = 78.993$ ;  $p < .001$ ; partial  $\eta^2 = .564$ ); concentration ( $F(1,61) = 26.168$ ;  $p < .001$ ; partial  $\eta^2 = .300$ ); coping with adversity ( $F(1,61) = 26.818$ ;  $p < .001$ ; partial  $\eta^2 = .305$ ); peaking under pressure ( $F(1,61) = 52.470$ ;  $p < .001$ ; partial  $\eta^2 = .462$ ); freedom from worry ( $F(1,61) = 123.052$ ;  $p < .001$ ; partial  $\eta^2 = .669$ ). (Semi-) professionals scored significantly higher on all the subsequent sub-constructs; goal setting, coachability, confidence and achievement motivation, concentration, coping with adversity, peaking under pressure and freedom from worry, compared to the talented juniors. The results are in line with the stated hypothesis: *(semi-) professional cyclists have higher levels of coping compared to the talented juniors.*

**Table 3.** Averages scores for Talented Juniors and (Semi-) professionals on Coping and the sub-constructs of the ACSI-28.

	Talented juniors		(Semi-) Professionals		F(1,61)
	M	SD	M	SD	
Goal setting and mental preparation	1.74	0.63	2.75	0.59	39.513*
Coachability	2.75	0.25	3.95	0.49	147.460*
Confidence and achievement motivation	2.44	0.35	3.34	0.44	78.993*
Concentration	2.30	0.49	2.92	0.46	26.168*
Coping with adversity	1.99	0.68	2.80	0.56	26.818*
Peaking under pressure	1.52	0.63	4.05	0.43	52.470*
Freedom from worry	2.39	0.46	4.49	0.39	123.052*

\* $P < .001$ .



### **Additional analyses**

No significant difference was found between males and females on goal orientation ( $N = 30$ ) = 5.130,  $p = .089$ , 95% CI [0.082, 0.097], based on 10.000 replications and the results are shown table 4, which is provided in the appendix. For self-regulation, no significant differences were found between males and females within the talented juniors groups ( $F(3, 26) = 0.195$ ,  $p = .899$ , Wilk's  $\Lambda = .978$ , partial  $\eta^2 = .022$ ). The results are shown in table 5 in the appendix. For coping, no significant differences were found between male and female within the talented juniors groups. The full results are shown in detail in table 6 in the appendix.

### **Discussion**

The purpose of this study was to test if there are differences in (sport-) psychological variables between talented junior cyclists and (semi-) professional cyclists. This study found a significant association between group (either Talented junior or (semi-) professional) and dominant goal orientation. No significant difference in self-regulation was found between talented juniors and (semi-) professional cyclists. At last, this study found significant differences in coping between Talented juniors and (Semi-) professional cyclists. (Semi-) professional cyclists scored significantly higher on: goal setting and mental preparation, coachability, confidence and achievement motivation, concentration, coping with adversity, peaking under pressure and freedom from worry.

A significant association was found between group and dominant goal strategy. (Semi-) professionals in this study had significantly more often no dominant achievement goal strategy compared to the talented juniors, which implies that they held both mastery and performance oriented achievement goals. These results are, to some degree, in accordance with earlier research (Hardy et al., 2017; Gulich et al., 2019). These studies found that super elite athletes tend to focus on performance outcomes, but remain focused on the process

which is needed to achieve the desired performance outcome. Mastery achievement goals can contribute to the outcome of performance achievement goals. Mastery achievement goals, which focus on the individual's performance, can be conceptualized as the building blocks of performance achievement goals. Performance achievement goals are focused on the performance outcome compared to others, for example winning or losing, or a position on a ranking (Elliot, 1997; van Yperen, 2021). A possible explanation for the observed difference between talented juniors and (semi-) professional cyclists could be that the contracts, and their renewals, for the (semi-) professional cyclists are dependent upon performance outcomes. Therefore, these athletes may inherently place a greater emphasis on performance outcomes. Concluding from the data, the hypothesis *(semi-) professional cyclists more often have a dominant mastery approach goal strategy compared to the talented juniors* is rejected.

Another interesting finding regarding goal orientation is that the talented juniors most often held a mastery approach goal. Given that the talented juniors are in their adolescence, it might have been expected that they would be more inclined to compare themselves to others, such as peers from the same age, rather than themselves (Perkins & Noam, 2007). However, the talented junior group instead more often held a dominant mastery approach goal, which means that they focused more on their own development, by focussing on their own performance instead of comparing themselves with others. A mastery approach goal is, in general, a positive achievement goal strategy to strive for, especially for athletes who focus on developing their skills and competence. The outcomes of mastery goals tend to rely on internal and controllable factors, as the outcome of the self-based goals rely only on the performance of the athlete. This could also help the athlete focus on specific aspects of their own performance that need to be improved, which could subsequently lead to improvement of their development. The problem with performance oriented goals is that athletes lack control over the outcome, as the performance outcome is dependent on other athletes, which are

external non-controllable factors (van Yperen, 2021). As a consequence an athlete who has performance oriented achievement goals may perform better than before, but can still be harmed in their feeling of competence while losing to others.

No significant differences were found on the subconstructs of self-reflection: reflection, evaluation and effort. It was expected that the (semi-) professionals would score higher on self-regulation, since self-regulation is found to be an important characteristic for endurance sports, and specifically cycling, as it plays a key role in cycling-specific skills such as pacing (Elferink-Gemser & Hettinga, 2017). However, since the results suggests that there are no significant differences on reflection, evaluation and effort, it could imply that the talented juniors are, at a young age, already highly committed to improve their performance. This is in line with the trend that juniors are already trying to opt for a higher level of professionalism within their training. The absolute scores for reflection, evaluation and effort in this study, were approximately the same for talented footballers around the same age found in another study (Toering et al., 2013). The hypothesis *(semi-) professional cyclists have higher levels of self-regulation compared to the talented juniors* is rejected.

The current study found significant differences in coping between the talented juniors and (semi-) professionals. The (semi-) professionals scored significantly higher on all subsequent sub-constructs of coping. What has to be kept in mind is that, even though the questionnaire was not used for selection purposes, the talented juniors filled in the questionnaire during a selection period, which could be perceived as stressful, given that the outcome of the selection procedure could help them to achieve their dream of becoming a professional cyclist. However, the results of the talented juniors on coping from the ACSI-28 do seem to be complaint with results from recent research with talented junior tennis players (Kramer et al., 2017). This might suggest that the timing of conducting the questionnaire did not significantly influence the final scores. The differences between the two groups could be

explained by the fact that coping can be conceptualized by the normative development of emotional, attentional, and behavioural self-regulation (Skinner & Zimmer-Gemback, 2007). Skinner and Zimmer-geback (2007) suggested that the development of coping is a complex process and that the appraisal of a certain situation depends multiple factors, such as: behaviour, emotion, physiology, attention, cognition and motivation. The differences in coping could therefore be explained by difference in experience and stress encountered, as the (semi-) professional cyclists likely encountered more adverse events, not only just in cycling, compared to the talented juniors. The hypothesis *(semi-) professional cyclists have higher levels of coping compared to the talented junior* is accepted.

The differences in coping are quite interesting, as the (semi-) professional cyclist scored significantly higher on all subconstructs. The majority of the talented juniors used in this research are expected to become (semi-) professional cyclists themselves within a time span of 2 to 4 years. Therefore, talent development programs should, concluding the results, actively lay emphasis on the development of athletes' psychological variables. Specifically, athletes should be informed about the performance enhancing effects of specific psychological variables. As both self-regulation and coping consist of a broad integrative framework, emphasis should be led on the underlying mechanisms and subcomponents of both variables. Especially for coping, as the talented juniors scored significantly lower on all subconstructs, emphasis should be placed on the development of these variables. Specifically for peaking under pressure and freedom from worry, as the difference on these subconstructs are most evident. Talented juniors should be provided with mental tools to prepare them in the case of adverse events which they may encounter within their careers and daily lives, as coping skills can be effective across multiple domains (Lazarus & Folkman, 1984; Park & Folkman, 1997).

One limitation that has to be taken into account is that the (semi-) professionals were all males, while the talented juniors group consisted of 40% females. While there have been invitations send to (semi-) professional women teams, unfortunately no respondents followed. Earlier studies found some small differences between male and female athletes in peaking under pressure, as boys scored higher compared to girls (Kramer et al., 2017). However, within this sample no significant differences were found between male and female. The relatively small sample size of both groups, respectively 18 and 12, may potentially play an effect in these results. Therefore future research should also try and include female (semi-) professionals. Another limitation of this study is that the results are all based on self-report. Self-report measures rely on the subjective interpretation of the participant (Paulhus & Vazire, 2007). Participants may have an inadequate self-image of themselves. Regarding goal orientation, only performance and mastery oriented achievement goals have been included. Future research could also include more specifically task-, self- and other-based achievement goals (Elliot et al., 2011). In addition, only dominant goal orientation was used in this study. Future research could also measure the different types of goal orientation on a continuum scale to analyse the differences in strength between these goals.

### **Conclusion**

Differences in goal orientation and coping were found between talented junior cyclists and (semi-) professional cyclists. (Semi-) professional cyclists seem to have more often both performance and mastery oriented goals and scored higher on all levels of coping. (Semi-) professional cyclists did not significantly differ in self-regulation compared to talented juniors. Concluding the results, talent developmental programs should actively lay emphasis on the development of psychological variables of talented junior athletes, so they are well prepared for adverse events which they may encounter, not only in their careers, but also their daily lives.

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### Appendix

**Table 4.** The frequencies and the expected frequencies of each dominant achievement goal strategy for male and female within the Talented Juniors group.

		Dominant Goal Strategy				
		Performance	Mastery	Performance	Mastery	No dominant
		Approach	approach	avoidance	avoidance	goal
<b>Male</b> (n=18)	Count	6	11	0	0	1
	Exp. Count	4.2	12	0	1.2	0.6
<b>Female</b> (n=12)	Count	1	9	0	2	0
	Exp. Count	2.8	8	0	0.8	0.4

**Table 5.** Averages scores for male and female within Talented Juniors on the sub-constructs for Self-regulation.

	Male (n =18)		Female (n =12)		<i>F</i> (1,28)	<i>p</i>
	M	SD	M	SD		
Evaluation	3.58	0.72	3.75	0.65	0.409	.409
Reflection	3.79	0.57	3.92	0.53	0.342	.563
Effort	4.28	0.49	4.34	0.42	0.115	.737

**Table 6.** Averages scores for male and females within Talented on the sub-constructs of the ACSI-28.

	Male (n =18)		Female (n =12)			<i>H(1)</i>	<i>p</i>	
	M	SD	Mean	M	SD			Mean
			Rank					Rank
Goal setting and mental preparation	1.74	0.67	15.69	1.75	0.58	15.21	0.023	.879
Coachability	2.75	0.27	15.67	2.75	0.24	15.25	0.018	.894
Confidence and achievement Motivation	2.40	0.38	14.67	2.50	0.30	16.75	0.422	.516
Concentration	2.39	0.51	16.94	2.19	0.47	13.33	1.239	.266
Coping with adversity	1.92	0.66	14.47	2.10	0.73	17.04	0.626	.429
Peaking under pressure	1.68	0.62	17.58	1.27	0.58	12.38	2.595	.107
Freedom from worry	2.28	0.43	13.06	2.56	0.47	19.17	3.598	.058

**Power analysis***Self-regulation*

A post hoc power analysis was conducted using SPSS to test the difference between the two means of the talented juniors and (semi-) professional cyclists, using a one-sided test. The analysis showed that a power of .862 was achieved based on the current sample size of 30 and 33.

*Cop*

A post hoc power analysis was conducted using SPSS to test the difference between the two means of the talented juniors and (semi-) professional cyclists, using a one-sided test. The analysis showed that a power of .729 was achieved based on the current sample size of 30 and 33.