INTERNATIONAL JOURNAL OF SPORT AND EXERCISE PSYCHOLOGY
https://doi.org/10.1080/1612197X.2021.1940241



# Which cyclists manage to cope with the corona crisis in a resilient way? The role of motivational profiles

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**ABSTRACT**

Due to the COVID-19-pandemic, all cycling races during spring 2020 were cancelled, thus requiring cyclists to act in resilient ways. This cross-sectional study examined in a sample of 207 cyclists ($M_{age}$ = 26.81) whether different motivational profiles can be identified and whether these profile differences relate to (a) the extent to which cyclists get their basic psychological needs satisfied during this pandemic and (b) the type of self-regulation strategies cyclists use to motivate themselves to continue their training. Cluster analyses revealed four motivational profiles (i.e., a good quality, high quantity, low quantity, and poor quality profile) that differed in terms of autonomous motivation, controlled motivation, and amotivation. Results indicated that the profile characterised by autonomous motivation (i.e., good quality) yielded the most adaptive outcomes, while the profile characterised by the combination of controlled motivation and amotivation (i.e., poor quality) yielded the least optimal outcomes. This research shows that cyclists' capacity to cope with the pandemic in a resilient way depends on the presence of both a sufficient dose and high-quality motivation.

**ARTICLE HISTORY**
Received 21 October 2020
Accepted 9 May 2021

**KEYWORDS**
Athletes; motivation; COVID-19; basic psychological needs; motivational self-regulation

"All I know is that tomorrow I'll sit on my bike to train for hours … But why? For what? Do you know?" Mathieu Van der Poel, World Champion Cyclo-cross (Nieuwsblad, 14th March 2020)[1]

"Oliver Naesen shows creativity and went for a training ride in the shape of a heart to encourage all caregivers" Newspaper about a cyclist of World Team AG2R La Mondiale (Sporza, 24th March 2020)[2]

In December 2019, the first infection with SARS-CoV-2 (coronavirus, COVID-19) was reported in the Chinese city Wuhan. In the following months, the virus spread worldwide thereby affecting hundreds of thousands of people (WHO, 2020). Around the world, severe measures were introduced that heavily impacted daily life of the entire human society: people were required to stay home, teachers and students were forced to switch to online mode, and socio-cultural activities, sports events, and competitions (e.g., Olympic Games) got postponed or cancelled. Just like many other athletes, cyclists

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Supplemental data for this article can be accessed https://doi.org/10.1080/1612197X.2021.1940241.

were not spared as all cycling races in the spring of 2020 were cancelled to help curb the spread of the coronavirus. All of a sudden, cyclists did not have any race goals to strive for anymore. Some cyclists admitted that they had difficulty to motivate themselves to keep up their training routine, as exemplified in the first quote above[1]. Others managed to act in more resilient ways, for instance, by adopting effective motivational self-regulation strategies. In this study, we examine if motivation for cycling relates to cyclists' capacity to cope with the societal impact of the corona crisis in a resilient way.

## *Athletes' motivation for sport*

According to Self-Determination Theory (SDT), both the quantity and quality of athletes' motivation play a key role in predicting their resilient functioning (Ryan & Deci, 2017). Autonomous motivation represents a form of high-quality motivation because athletes experience their sport activities as self-initiated and congruent with their preferences and values (Vansteenkiste et al., 2010). When autonomously motivated, athletes are presumed to be more resilient, as they engage in sport because they find their sport truly enjoyable (i.e., intrinsic motivation) or personally relevant (i.e., identified regulation). When controlled motivated, athletes are assumed to be less resilient, as controlled motivation represents a form of low-quality motivation that originates in internal or external pressures (Vansteenkiste et al., 2010). Specifically, when controlled motivated, athletes put effort in their sport because they can only take pride in themselves when they are successful or because they experience shame and guilt when failing (i.e., introjected regulation). In addition, controlled motivated athletes may feel pressured from without, for instance by lucrative contracts, sponsor expectations or fans' admiration (i.e., external regulation), factors that were largely absent during the pandemic. When autonomously or controlled motivated, athletes' behaviour is intentional, while their behaviour lacks intentionality when they are amotivated. Athletes with high amotivation would be the least resilient, as they wonder why they keep doing sports, either because they do not feel effective to perform the activity (e.g., long training sessions) or because they believe that the behaviour will not lead to the desired outcome (e.g., Vansteenkiste et al., 2010). Studies in athletes from diverse sport disciplines have shown that autonomous motivation is associated with various adaptive outcomes such as athletes' well-being, vitality, persistence, and performance (e.g., Gillet et al., 2009; Haerens et al., 2018; Mouratidis et al., 2008; Pelletier et al., 2001). By contrast, amotivation is found to positively relate to maladaptive outcomes, such as boredom and drop-out (e.g., Amado et al., 2015; Pelletier et al., 2001), and to negatively relate to more adaptive outcomes such as enjoyment and performance (Amado et al., 2015; Haerens et al., 2018). The correlates for controlled motivation typically fall in between those observed for autonomous motivation and amotivation, with controlled motivation being unrelated to positive outcomes such as daily physical activity (e.g., Fenton et al., 2014) and positively related to negative outcomes such as antisocial behaviour towards one's opponent and drop-out (Hodge & Lonsdale, 2011; Pelletier et al., 2001).

Although these different types of motivation can be distinguished at the theoretical level, in practice, they co-occur within a single individual. Many athletes have multiple reasons to engage in sports. Dependent on the extent to which each of these reasons are relevant for athletes (i.e., a person-centered approach), they display a different

*motivational profile* (Vansteenkiste & Mouratidis, 2016). Only a handful of SDT-grounded studies have identified such motivational profiles among adult athletes and examined their relation to external outcomes (e.g., Chu et al., 2018; Gillet et al., 2013; Gustafsson et al., 2018; Tóth-Király et al., 2020; Vlachopoulos et al., 2000). Overall, these studies showed that profiles characterised by a stronger presence of autonomous motivation relate to more adaptive scores on emotional and performance-related outcomes (e.g., Chu et al., 2018). However, the differences with profiles that combine autonomous and controlled motivation were not always outspoken, with some studies even reporting the most favourable outcomes for the latter profiles (e.g., Gustafsson et al., 2018). Profiles in which controlled motivation was combined with amotivation displayed the most maladaptive pattern of outcomes in all studies (e.g., Chu et al., 2018). During the COVID-19 pandemic, when all cycling races have been cancelled or postponed, it becomes highly relevant to examine whether motivational profiles relate to athletes' level of resilience in times of difficulty.

## *Basic psychological needs as resources of resilience*

Within SDT, the different types of motivation are assumed to be dynamically intertwined with athletes' basic psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2000; Vansteenkiste et al., 2020). The need for autonomy refers to feelings of psychological freedom and choice; the need for competence entails feeling skilled and experiencing mastery; and finally, the need for relatedness denotes the experience of mutual care and companionship in one's sport (Ryan & Deci, 2000; Vansteenkiste et al., 2020). The satisfaction of these needs is essential for athletes' mental health (e.g., Balaguer et al., 2012; Jowett et al., 2016) and serves as a key resource of resilience when people are confronted with stress and uncertainty (Weinstein & Ryan, 2011). Although it is assumed that need satisfaction fosters forms of motivation that are more autonomous, the relationship between both is considered bidirectional, with autonomous motivation feeding back into athletes' need satisfaction. As such, autonomously motivated athletes are better capable of generating their own need satisfaction as they mobilise more adaptive coping resources in times of difficulty (Smith et al., 2011). An opposing mechanism can be expected for athletes who are controlled motivated or amotivated. These more maladaptive forms of motivation have previously been associated with the frustration of athletes' basic psychological needs (Weeldenburg et al., 2020). Athletes with a high level of need frustration feel pressured during their sport participation (autonomy frustration), feel insecure about their sporting abilities (competence frustration), and feel like people in their sport environment are cold and distant towards them (relatedness frustration). Such experiences of need frustration are better avoided since they are associated with maladaptive outcomes such as athletes' feelings of negative affect and burnout (Bartholomew et al., 2011). Because controlled or amotivated athletes tend to use more maladaptive coping strategies when confronted with stressful circumstances (e.g,. Amiot et al., 2004; Mouratidis & Michou, 2011), they may experience more need frustration compared to autonomously motivated athletes.

The benefits or pitfalls of athletes' general sport motivation on athletes' need-based experiences may especially manifest themselves under exceptional circumstances like during the corona crisis, which entailed a number of threats to athletes' basic

psychological needs. For instance, the obligation to stay at home prevented cyclists from doing what they desired (autonomy) and required them to self-isolate (relatedness), while the cancellation of cycling races left them in doubt about how to continue their training routines (competence) (e.g., Schinke et al., 2020). Although *on average* the corona crisis did pose a threat to cyclists' psychological needs, cyclists may not be equally affected. Cyclists with a more adaptive motivational profile may be better capable to craft their daily activities as to optimise their level of need satisfaction, for instance, through selecting need-satisfying activities as essential resources of resilience (Laporte et al., 2021).

### *Motivational self-regulation*

In light of the cancellation of all cycling races during the pandemic, the question arises on how athletes could maintain their motivation to continue their training practices. Most studies on self-regulation in sport assume a situation in which athletes set their own (competitive) goals or endorse the goals introduced by significant others (e.g., Nicholls et al., 2016). Yet, because all cycling races were cancelled or postponed for an unspecified period during the pandemic, cyclists had no immediate goals to strive for and were facing a motivational vacuum. As a result, they no longer needed to employ self-regulating strategies to regulate their performance strivings, but rather to regulate their motivation. Motivational self-regulation strategies (MSRS) are strategies that athletes use to modify or maintain their own motivation (e.g., Engelschalk et al., 2016). While some cyclists may get discouraged, others are capable of proactively steering and uplifting their own motivation (Sheldon, 2011). Motivational self-regulation thus represents a set of active coping strategies in which athletes make cognitive and behavioural efforts to motivate themselves when facing a drop in their motivation (e.g., Wolters & Benzon, 2013).

Consistent with SDT's differentiation between autonomous and controlled motivation, MSRS can also be more autonomous or controlled in nature (Waterschoot, Soenens, et al., 2021). Autonomous self-regulation strategies refer to those strategies that cyclists use to make the activity at hand more interesting, fun, or relevant. As illustrated in the example at the beginning of the introduction[2], Oliver Naesen made his training more fun by riding his training route in the shape of a heart, as well as more meaningful by dedicating the heart to all hard-working caregivers. In the case of controlling self-regulation strategies, cyclists make use of internally or externally pressuring sources to initiate, persist at, and finish an activity. When using internally pressuring strategies, cyclists would remind themselves that "real" cyclists can do something against their will, or they may push themselves into the activity by anticipating feelings of disappointment when failing to finish the activity or contingent pride when successfully completing their training programme. One's self-pressuring and critical voice may also be directed towards external pressuring forces, thereby projecting demanding expectations of others on oneself or promising oneself a reward.

Yet, not all MSRS may be equally effective. There is preliminary evidence for the differential effectiveness of people's use of autonomous and controlling self-regulation strategies. First, studies in the self-talk literature have demonstrated that the use of autonomy-supportive self-talk is related to positive outcomes such as people's emotions, interest, and task persistence (e.g., Oliver et al., 2008). Second, in a study conducted

during a 100-km walking event, walkers' use of autonomous self-regulation strategies related to decreased boredom and pain and a stronger intention to participate in a similar future walking event, whereas the use of controlling self-regulation strategies predicted increased boredom and physical pain and reduced task pleasure over time (Waterschoot, Morbée, et al., 2021). Interestingly, those walkers who were autonomously motivated to walk at baseline were more likely to use autonomous self-regulation strategies during the race, while those who were controlled motivated to walk prior to the race made use of more controlling self-regulation strategies. Such findings suggest that one's initial motivation feeds into the type of motivational strategies that one employs, thereby forming a vicious or virtuous cycle.

### *The present study*

Our first aim was to identify motivational profiles based on cyclists' autonomous motivation, controlled motivation, and amotivation for practicing their sport in general. Based on previous research in adult sports, we hypothesised to find at least four motivational profiles that differ in both the type and the amount of motivation (e.g., Chu et al., 2018) (Hypothesis 1). Our second aim was to link these motivational profiles to cyclists' resilient responses, as characterised by (a) the extent to which cyclists get their basic psychological needs satisfied rather than frustrated during the pandemic, and (b) the extent to which they used autonomous rather than controlled self-regulation strategies during this crisis to initiate and properly complete their training schedule. Here, we hypothesised that responses that are more resilient will be observed in profiles characterised by more autonomous forms of motivation (e.g., Chu et al., 2018). Conversely, we expected that profiles with athletes displaying predominantly controlled motivation or amotivation would show the least resilient responses (e.g., Gustafsson et al., 2018) (Hypothesis 2).

## Method

### *Procedure and sample*

Participants were recruited via personal contacts of the involved researchers, as well as through social media. All cyclists were asked to complete an online questionnaire, which took 10 min to complete. The research was conducted in accordance with the ethical guidelines of the General Ethical Protocol of the Faculty of Psychology and Educational Sciences of Ghent University. Before participants started the questionnaire, they actively agreed that they were informed about the purpose of the research, that their participation was voluntary and that permission was given to the researchers to use their answers for research purposes. In total, data was collected in 207 cyclists (89.4% male) with an average age of 26.81 years ($SD$ = 8.21, range = 18–73 years). They practiced cycling at a professional (46.4%), semi-professional (14%), or amateur level (39.6%). As far as the professional cyclists are concerned, 11.6% was associated with a World Team, 15.9% with a Pro Team, and 18.8% with a Continental Team. All semi-professional cyclists were associated with a Continental Team, while the amateurs were associated with an amateur cycling team, or cycled on an individual basis.

## Measures

All cyclists completed self-report questionnaires on a 5-point Likert scale (1 = "*Totally not applicable to me*"; 5 = "*Totally applicable to me*").

### General motivation

Cyclists' general motivation to engage in their sport was measured with an adapted version of the Behavioral Regulation in Sport Questionnaire (Lonsdale et al., 2008) as used in Assor et al. (2009). After the stem "I put effort into my sport … ," athletes answered to 16 items for autonomous motivation (i.e., intrinsic, identified, and integrated regulation; e.g., " … because I enjoy it"), 8 items for controlled motivation (i.e., introjected and external regulation; e.g., " … because I would feel ashamed if I didn't"), and 4 items for amotivation (e.g., " … but I actually wonder why"). The internal consistencies in this study were good ($\alpha_{autonomous}$ = .88, $\alpha_{controlled}$ = .80, and $\alpha_{amotivation}$ = .83).

### Basic psychological need satisfaction and frustration

Cyclists' momentary (i.e., during the corona crisis) psychological need satisfaction and frustration was measured with the Basic Psychological Need Satisfaction Need Frustration Scale (Chen et al., 2015). Similar to prior research (Reynders et al., 2019), the items were adapted by making them applicable for sport (i.e., cycling); with both need satisfaction and frustration being measured with three items per need. Composite scores of need satisfaction (e.g., "I currently feel a sense of choice and freedom in the things I undertake for my sport") and need frustration (e.g., "I currently feel insecure about my sporting abilities") were created. The internal consistencies in this study were acceptable ($\alpha_{satisfaction}$ = .74, $\alpha_{frustration}$ = .77).

### Motivational self-regulation strategies

Cyclists' strategies to self-regulate their motivation was measured by the Motivational Self-Regulation Strategies Questionnaire (MSRS-Q; Waterschoot, Soenens, et al., 2021). The stem "During this period, I motivate myself to train by … " was followed by 8 items for autonomous strategies (e.g., " … finding out how the training can be personally valuable for me") and 16 items for controlled strategies (e.g., " … reminding myself that I have to do the training at the request of others"). Given that the MSRS-Q was used for the first time in athletes, we inspected its internal validity by a principal component analysis with varimax rotation based on eigenvalues greater than 1. A clear pattern of factor loadings was obtained (Appendix A), with the items loading on five components: (a) "interest- and relevance-directed" (autonomous) strategies (8 items; e.g., " … finding out how the training can be personally valuable for me"); (b) strategies that involve motivating oneself through promising a self-reward, named "reward-directed" strategies (4 items; e.g., " … rewarding myself after I finish the training"); (c) strategies that consist of reminding oneself that one has to perform the activity because others expect it, labelled as "other-directed" strategies (4 items; e.g., " … reminding myself that I have to do the training at the request of others"); (d) strategies that involve pushing oneself into the activity through reminders of compliance, labelled "compliance-directed" strategies (4 items; e.g., " … telling myself that conscientious people need to do something they do not like"); and finally (e) items involving self-

appreciation and self-criticism being contingent upon activity completion, labelled as "self-esteem-directed" strategies (4 items; e.g., " … thinking I only can be proud of myself when I finish the training"). The internal consistencies in this study ranged from $\alpha_{\text{compliance-directed}} = .77$ to $\alpha_{\text{reward-directed}} = .93$ (see Appendix A).

## Plan of analysis

### Preliminary analyses

Given that previous studies (e.g., Ruffault et al., 2020) found background characteristics such as age to relate to key outcomes examined in the present study, we began by examining the associations between age and all study variables (i.e., three types of motivation, need satisfaction and frustration, and the six motivational self-regulation strategies) by conducting bivariate Pearson correlations. Next, a multivariate analysis of variance (MANOVA) was performed with gender and level of performance as fixed factors and all study variables as dependent variables.

### Primary analyses

To detect motivational profiles, we performed both Hierarchical and K-Means cluster analyses as complementary methods (Gore, 2000) using the statistical program R (R Core team, 2019). We began with standardising our cluster indicators (i.e., autonomous motivation, controlled motivation, and amotivation) to make them comparable and screened them for univariate outliers (based on a Median Absolute Deviation larger than 3) and multivariate outliers (i.e., values higher than a Median-based Mahalanobis distance of 22) (Leys et al., 2019). As outliers may bias the solution that emerges from the cluster analysis, all outliers were removed from the sample (e.g., Hautamäki et al., 2005). In the first step of the clustering procedure, agglomerative hierarchical cluster analysis was performed using the R-package "cluster" (Maechler et al., 2019). Based on the squared Euclidean distances, a comparison between agglomerative coefficients for different linkage methods (i.e., average, single, complete, and Ward) was made to indicate the strongest clustering structure. To determine the number of clusters the (1) dendrogram, (2) SD-index, (3) scree plot visualising the Elbow method, (4) Average silhouette method, and (5) Gap-statistic method were conducted. As an extra visual assessment of cluster behaviour to the data, the optimal number of clusters was plotted against the two biggest principal components.

In a second phase, we validated our profiles by conducting a MAN(C)OVA including the three types of motivation (i.e., autonomous motivation, controlled motivation, and amotivation) as dependent variables and the cluster solution as an independent variable to examine the amount of variance in the different types of motivation that could be explained by the obtained cluster solution. Next, we explored whether there was a different distribution across the clusters depending on cyclists' gender and level of performance through a cross-tabulation procedure. Finally, we examined whether the identified profiles were differentially related to athlete outcomes (i.e., basic psychological need satisfaction and frustration, and the five MSRS) through a MAN(C)OVA. Tukey post-hoc comparisons were used to examine whether obtained profiles differed significantly from each other on the outcomes.

## Results

### Preliminary analyses

Descriptive statistics and bivariate Pearson Correlations between all variables are presented in Table 1. Older athletes experienced less need satisfaction and made less use of autonomous, self-esteem-directed, and compliance-directed self-regulation strategies. Hence, age was included as a covariate in further analyses. A MANOVA revealed that there were no significant multivariate effects for either gender (Wilks's $\lambda = .96$, $F(10, 143) = .63$, $p = .79$, $\eta_p^2 = .04$) or level of performance (Wilks's $\lambda = .87$, $F(20, 286) = 1.06$, $p = .40$, $\eta_p^2 = .07$).

### Primary analyses

Prior to performing cluster analyses, 13 cases were identified as outliers and were removed from the sample, thereby reducing the sample size to 194 cyclists. The comparison between agglomerative coefficients for different linkage methods revealed Ward's minimum variance method to indicate the strongest clustering structure (average = .90; single = .72; complete = .94; Ward = .98).

An inspection of the dendrogram, the SD-index (1.70), the scree plot visualising the Elbow method, the Average silhouette method, and the Gap-statistic method indicated the four-cluster solution as the most optimal number of clusters (see Appendix B). As an additional visual assessment, this number of clusters was plotted against the two biggest principal components (PC1 = 44%, PC2 = 41.2%) (see Appendix B). Based on these different criteria, we decided to retain four clusters of which the distribution and standardised means are provided in Figure 1. The smallest group of cyclists was labelled as the "good quality" profile as they displayed relatively higher scores on autonomous motivation and relatively lower scores on both controlled motivation and amotivation. The second group was labelled the "high quantity" profile as they reported relatively higher scores on both autonomous and controlled motivation while displaying relatively lower scores on amotivation. The largest group showed relatively lower scores on both autonomous and controlled motivation and was therefore labelled the "low quantity" profile, while a final group presented relatively lower scores on autonomous motivation and relatively higher scores on both controlled motivation and amotivation. This group was labelled the "poor quality" profile (Hypothesis 1). It should be noted that the labels of the different profiles are based upon the relative scores (z-values) instead of the absolute scores, as the inherent goal of cluster analysis is to contrast different profiles. Yet, even the "poor quality" profile reported in absolute sense more autonomous than controlled motives and amotivation.

The MANCOVA, with age included as a covariate, indicated differences between the four identified profiles in terms of reported motivation (Wilks's $\lambda = .08$, $F(9, 455.26) = 90.49$, $p < .001$, $\eta_p^2 = .57$) and showed that the variance in each type of motivation that could be explained by the retrieved cluster solution ranged from 50% for autonomous motivation, to 62% for controlled motivation, and 67% for amotivation (Table 2). The degree of autonomous motivation distinguished the "good quality" and "high quantity" profiles from the "low quantity" and "poor quality" profiles. Both the "high quantity" and "poor quality" profiles reported the highest scores on controlled motivation, followed by the "low quantity" profile, while the "good quality" profile reported the lowest scores.

**Table 1.** Descriptive statistics and bivariate correlations.

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Age | 26.81 | 8.21 | | | | | | | | | | |
| 2. Autonomous motivation | 4.20 | .44 | −.13 | | | | | | | | | |
| 3. Controlled motivation | 2.74 | .71 | −.09 | .25** | | | | | | | | |
| 4. Amotivation | 1.96 | .75 | −.08 | −.30** | .27** | | | | | | | |
| 5. Need satisfaction | 3.58 | .52 | −.16* | .43** | .06 | −.32** | | | | | | |
| 6. Need frustration | 2.23 | .56 | .05 | −.22** | .31** | .55** | −.33** | | | | | |
| 7. Interest- and relevance-directed MSRS | 3.69 | .61 | −.18* | .27** | .14 | .10 | .17* | .12 | | | | |
| 8. Self-esteem-directed MSRS | 3.26 | .87 | −.17* | .17* | .51** | .21** | .03 | .33** | .12 | | | |
| 9. Compliance-directed MSRS | 3.19 | .80 | −.22** | .13 | .24** | .18* | −.03 | .29** | .24** | .48** | | |
| 10. Reward-directed MSRS | 2.67 | 1.03 | −.07 | .03 | .27** | .20* | .06 | .30** | .27** | .38** | .38** | |
| 11. Other-directed MSRS | 2.01 | .83 | −.14 | −.09 | .39** | .36** | −.04 | .42** | .02 | .36** | .32** | .34** |

Note: MSRS = Motivational Self-Regulation Strategies.
*$p$<.05, **$p$<.01.

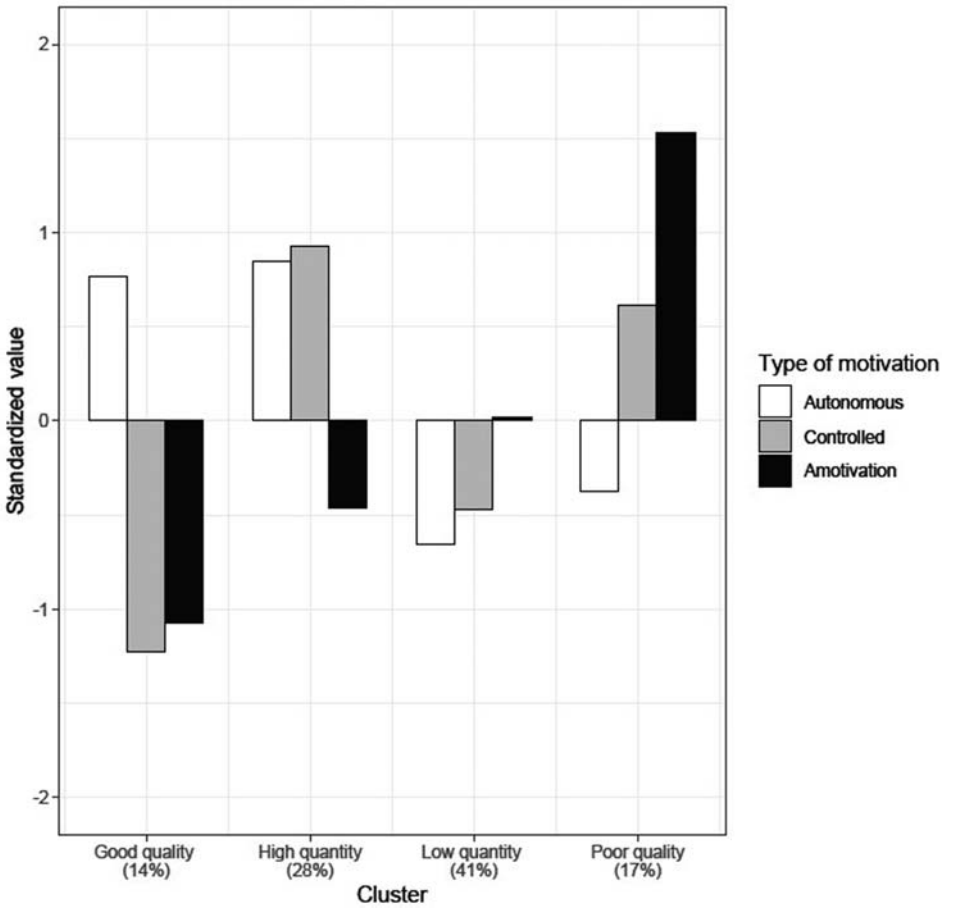


**Figure 1.** Visual Representation of the Clusters.

Finally, all profiles differed from each other in terms of amotivation, with the "good quality" profile displaying the lowest and the "poor quality" profile displaying the highest scores.

Next, we explored whether there was a different distribution across the clusters depending on cyclists' gender and level of performance. Chi-square analyses indicated that there were no significant differences between clusters in terms of cyclists' gender ($\chi^2(3) = 1.72$, $p = .63$) or level of performance ($\chi^2(6) = 6.39$, $p = .38$).

A MANCOVA, with age included as a covariate, indicated a multivariate effect of the motivational profiles when all athlete outcomes were inserted as dependent variables (Wilks's $\lambda = .60$, $F(21, 414.04) = 3.91$, $p < .001$, $\eta_p^2 = .16$). Univariate test effects showed significant differences between the four profiles in terms of need satisfaction, need frustration, and the four controlling self-regulation strategies, but not in terms of autonomous self-regulation strategies (Table 2). Post-hoc comparisons using the Tukey procedure revealed that the "good quality" motivation profile displayed in general the most resilient pattern and the "poor quality" motivation profile the least resilient pattern of outcomes (Hypothesis 2).

**Table 2.** Cluster validation and differences between profiles in athlete outcomes.

| Clustering variables | Good quality (14%) | | High quantity (28%) | | Low quantity (41%) | | Poor quality (17%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Raw means | Standardised values | Raw means | Standardised values | Raw means | Standardised values | Raw means | Standardised values | $F$ | $\eta_p^2$ |
| Autonomous motivation | $4.54_b$ | .77 | $4.58_b$ | .85 | $3.92_a$ | −.65 | $4.04_a$ | −.37 | 63.79*** | .50 |
| Controlled motivation | $1.88_a$ | −1.23 | $3.40_c$ | .93 | $2.41_b$ | −.47 | $3.18_c$ | .61 | 103.13*** | .62 |
| Amotivation | $1.15_a$ | −1.08 | $1.61_b$ | −.46 | $1.97_c$ | .02 | $3.10_d$ | 1.53 | 129.41*** | .67 |

| External outcomes | Good quality (14%) | High quantity (28%) | Low quantity (41%) | Poor quality (17%) | | |
|---|---|---|---|---|---|---|
| | $M$ | $M$ | $M$ | $M$ | $F$ | $\eta_p^2$ |
| Need-based experiences | | | | | | |
| Need satisfaction | $3.82_c$ | $3.75_{bc}$ | $3.46_{ab}$ | $3.33_a$ | 6.88*** | .12 |
| Need frustration | $1.76_a$ | $2.21_b$ | $2.25_b$ | $2.58_c$ | 10.83*** | .18 |
| Motivational self-regulation strategies | | | | | | |
| Interest- and relevance-directed MSRS | 3.69 | 3.80 | 3.55 | 3.87 | 2.31 | .04 |
| Self-esteem-directed MSRS | $2.74_a$ | $3.70_c$ | $3.03_{ab}$ | $3.48_{bc}$ | 10.45*** | .17 |
| Compliance-directed MSRS | 2.99 | 3.41 | 3.01 | 3.39 | 3.47* | .07 |
| Reward-directed MSRS | $2.17_a$ | $2.83_b$ | $2.63_{ab}$ | $3.02_b$ | 3.59* | .07 |
| Other-directed MSRS | $1.46_a$ | $2.14_b$ | $1.96_b$ | $2.43_b$ | 7.48*** | .13 |

Note: A distinct subscript means that profiles significantly differ from each other.
MSRS = Motivational Self-Regulation Strategies.
*$p$<.05, ***$p$<.001.

In terms of need-based experiences, the "good quality" profile reported more need satisfaction and less need frustration compared to both the "poor quality" and "low quantity" profiles, and reported less need frustration compared to the "high quantity" profile, hereby displaying the most resilient pattern of results. The "poor quality" profile reported less need satisfaction and more need frustration compared to the "high quantity" profile, while also experiencing more need frustration compared to the "low quantity" profile, hereby displaying the poorest pattern of results.

In terms of MSRS; reward-directed, other-directed, and self-esteem-directed strategies differed significantly between the retained clusters, while interest- and relevance-directed as well as compliance-directed strategies did not differ. Although the "good quality" profile did not use more autonomous self-regulation strategies, they did refrain more from relying on controlling self-regulation strategies when compared to the other three profiles. Differences were most obvious within the "high quantity" and "poor quality" profile, whereas differences with the "low quantity" profile were only present for the other-directed self-regulation strategies. The "poor quality" profile did not differ from the "high quantity" nor from the "low quantity" profile in the use of MSRS. As such, hypothesis 2 was only partially confirmed in terms of MSRS.

## Discussion

The global outbreak of COVID-19 posed considerable psychological challenges to the entire human society, including athletes (e.g., Costa et al., 2020; di Fronso et al., 2020). Among others, both professional and recreational cyclists needed to display resilience to handle the uncertainty, take care of their well-being, and engage in motivational self-regulation strategies to keep up their training routines (Bertollo et al., 2021; Samuel et al., 2020). The present study sheds a unique light on this topic by relating cyclists' motivation for cycling to their resilience in times of uncertainty and distress. Although self-regulation and coping strategies have received considerable attention within the sport literature (e.g., Nicholls et al., 2016), previous studies examining self-regulating strategies addressed cyclists' way of regulating their performance rather than their motivation per se. However, a highly relevant question during the corona-dominated times was which strategies athletes used to regulate their own motivation, since cyclists' motivation to initiate and complete their daily training routine was considerably challenged due to the cancellation of all competitive events. From an SDT-perspective, the vast majority of studies focused on how coaches can increase athletes' motivation, whereas little, if any, consideration is given to how athletes can actively regulate their own motivation. This study therefore extends prior work by examining whether cyclists' use of different types of MSRS (i.e., autonomous or controlled) varies as a function of their motivational profile.

### *Characteristics of the motivational profiles*

The vast majority of prior studies in the sport motivation literature have made use of a dimensional approach, thus relating motivational dimensions to outcomes (e.g., Mouratidis et al., 2008). Yet, in reality, every athlete combines different motives resulting in a particular motivational profile (Vansteenkiste & Mouratidis, 2016). The first aim of the present

study was therefore to identify a minimal number of motivational profiles that could explain a maximum amount of variance in cyclists' motivation for partaking in their sport.

Congruent with previous studies that used a person-centred approach in athletes, we found four different profiles that differed in terms of quality and quantity of motivation (e.g., Chu et al., 2018). We identified two profiles of cyclists that scored higher on autonomous motivation for practicing their sport, the one scoring exclusively higher on this motive ("good quality" profile) and the other combining higher levels of both autonomous and controlled motivation ("high quantity" profile). One other profile reported relatively little motivation to engage in their sport, thereby scoring the lowest on any motivational dimension ("low quantity" profile). Finally, we identified a profile that was characterised by a combination of controlled motivation and amotivation to engage in sport ("poor quality" profile). The four motivational profiles were equally distributed across athletes, both in terms of gender and level of performance (i.e., recreational and [semi-]professional).

### *Resilience to cope with the corona crisis*

The second aim of this study was to examine which of the motivational profiles reacted most resiliently during the pandemic. The global corona measures, such as the cancellation of sport events, represented a threat to cyclists' basic psychological needs for autonomy, competence, and relatedness. Therefore, we looked at the extent to which cyclists' basic psychological needs were satisfied rather than frustrated during this period as a first indicator of resilience. As a second indicator, we examined an understudied, yet in these corona-dominated times highly critical factor, that is, cyclists' self-regulatory capacity to motivate themselves to initiate and properly complete their training routine during the pandemic. A distinction was made between autonomous (i.e., interest- and relevance-directed) and controlling (i.e., compliance-directed, self-esteem-directed, reward-directed, and other-directed) self-regulation strategies. Autonomous strategies aim at initiating the activity by arousing interest and reminding oneself of its relevance. Controlling strategies involve athletes' tendency to put pressure on themselves to initiate, persist, and finish their training. They do so by reminding themselves that it is their responsibility to keep up their training routine, or by buttressing the successful completion of the training with feelings of proudness or self-aggrandisement. Previous research has shown that the use of such controlling self-regulation strategies results in increased boredom and physical pain and decreased task pleasure (Waterschoot, Morbée, et al., 2021).

### *The benefits of autonomous motivation*

The results showed that cyclists who are, relatively speaking, more autonomously motivated to engage in their sport, experienced the highest level of need satisfaction and the lowest level of need frustration. Similarly, the profile that practices sport for both autonomous and controlled reasons reported higher need satisfaction and lower need frustration compared to the profile that scored low on both. The presence of autonomous motivation may allow cyclists to preserve their need-based experiences better because of three reasons. First, autonomously motivated cyclists may consider the corona crisis as a challenge instead of a threat to their psychological needs (Lazarus & Folkman,

1984). Second, they may be more aware of which activities best satisfy their basic psychological needs and therefore may be better capable to select their own need-satisfying activities despite the constraints imposed by the corona measures (Laporte et al., 2021). Finally, during activity engagement, they may evoke more need-supportive reactions from others (Rocchi et al., 2013). In this respect, autonomous motivation can be seen as a protective source that sought to sustain athletes' capacities to cope with the corona crisis in a resilient way.

The benefits of autonomous motivation were also evident for the use of controlling self-regulation strategies. The "good quality" profile, which distinguishes itself from the "low quantity" profile by higher scores on autonomous motivation, less frequently used strategies with a stronger external focus (i.e., reminding themselves that others expect them to complete their training correctly). In this respect, autonomous motivation seems to play a protective role against the use of such adverse self-regulation strategies.

While the presence of autonomous motivation yielded need-related benefits and prevented cyclists from using controlling self-regulation strategies, such advantages were not observed for the use of adaptive strategies. Profiles characterised by higher levels of autonomous motivation did not rely more frequently on interest- and relevance-directed strategies. This unexpected finding may be explained in different ways. First, although profiles do differ in a relative sense, cyclists in all profiles were in the *absolute* sense highly autonomously motivated. Possibly, once a specific absolute threshold for autonomous motivation is displayed, cyclists may routinely use interest- and relevance-based strategies. Secondly, it may be not the degree to which athletes use these strategies, but rather the timing and the way of using these strategies that are different across profiles. Since our measurements took place at the start of the pandemic, it is possible that at that time all athletes were still fully committed to their sports, thereby making primarily use of autonomous self-regulation strategies. It is likely that the longer the crisis lasted, the more pronounced initially small differences among profiles may have become.

### *The pitfalls of controlled motivation*

The profile characterised by a combination of controlled motivation and amotivation (i.e., "poor quality") appeared to be the least adaptive of all profiles, with lower scores on need satisfaction and higher scores on need frustration compared to the profiles characterised by higher scores on autonomous motivation (i.e., "good quality" and "high quantity" profiles). The comparison in need frustration between the "poor quality" and the "low quantity" profiles revealed that it is not necessarily better to have more motivation when the additional motivation is of poor quality.

In terms of MSRS, significant differences among profiles were found for the use of controlling self-regulation strategies, with these strategies being less frequently used by the "good quality" profile compared to the profiles in which controlled motivation was more prevalent (i.e., "poor quality" and "high quantity" profiles). It seems that cyclists who score relatively high on controlled motivation are most likely to turn to controlling self-regulation strategies to remain motivated. Since controlled motivated athletes are most at risk for exhaustion, burnout, and eventual drop out (e.g., Lonsdale & Hodge, 2011; Pelletier et al., 2001), it is to be expected that they deploy all possible strategies to stay motivated and avoid drop out.

Although not documented in all previous studies (e.g., Gustafsson et al., 2018), the "good quality" profile in the current study responded more resiliently than the "high quantity" profile. The differences were mainly noticeable in the negative outcomes (i.e., need frustration and controlling self-regulation strategies). With respect to the positive outcomes (i.e., need satisfaction and autonomous self-regulation strategies), both profiles did not differ from one another. These findings suggest that two pathways might operate in the "high quantity" profile: the presence of autonomous motivation may activate a resilience-enhancing pathway (as reflected by relatively high scores on need satisfaction and autonomous strategies) while the additional presence of controlled motivation and amotivation possibly denotes psychological vulnerabilities (as reflected by the presence of need frustration and controlling strategies; Haerens et al., 2018). Overall, the fact that the "high quantity" profile does not do better than the "good quality" profile, but if anything does worse, confirms the idea that more motivation is not necessarily better (Vansteenkiste et al., 2006).

### *Limitations and future directions*

A first limitation encompasses the cross-sectional design, which does not allow drawing causal conclusions. Longitudinal studies could investigate whether cyclists with different motivational profiles eventually rely on different MSRS or whether the use of MSRS feeds back onto athletes' motivation. In addition, longitudinal research would allow us to determine whether more pronounced differences among profiles would manifest themselves the longer the crisis lasted.

Second, as we recruited participants through social media, we may have collected a rather selective and, therefore, biased sample. Possibly, mainly the motivated cyclists participated in our survey. This convenience sampling strategy also helps to explain why background characteristics such as gender and performance level were not equally distributed in our sample. Also, because cyclists of different gender and performance levels (i.e., professional, semi-professional, and amateur) were not matched, those differences in profiles could only be examined exploratively. Future research should therefore aim to recruit more women, and provide matched samples across the different levels of performance. Female and non-professional cyclists often have an additional job on top of their (professional) career as a cyclist for financial reasons, which may reduce, or at least influence the impact of the cancellation of race goals on their lives as athletes.

Third, although previously validated (Waterschoot, Soenens, et al., 2021), the autonomous and compliance-directed self-regulation strategies did not differ across motivational profiles. Whereas the autonomous and compliance-directed strategies may be used *prior* to activity engagement; the reward-, self-esteem-, and other-directed strategies may be used more frequently *during* activity engagement. The effect of cyclists' motivational profile may especially surface during activity engagement, that is, when cyclists face a motivational dip and get fatigued. Future research may monitor cyclists' use of MSRS over time (e.g., through a thinking-aloud procedure; De Muynck et al., 2020), for instance when they engage in a cycling task with increasing difficulty. Moreover, such a study would allow linking the use of MSRS to objective outcomes.

Finally, it is recommended for future studies to include a broader range of (mal)adaptive outcomes. This study focused on two outcomes that seemed most relevant in times

of the corona crisis, these are, basic psychological needs and MSRS. However, it is recommended for future research to include both emotional (e.g., anxiety), behavioural (e.g., training hours), and performance outcomes to get a broader and more detailed view on the role of motivational profiles.

## Conclusion

The current study is unique, as it has successfully examined cyclists' resilience in an unprecedented population of cyclists in times of a global pandemic. Four different motivational profiles of cyclists were identified that differed in terms of both quantity and quality of motivation. Results suggest that cyclists with a motivational profile that is characterised by autonomous motivation to engage in sport managed to handle the uncertain situation evoked by the pandemic in a more resilient way. These athletes reported the highest level of need satisfaction, the lowest level of need frustration, and made the least use of controlling self-regulation strategies.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This work was supported by Research Foundation Flanders (FWO) [grant number 3F023819]; Fonds Wetenschappelijk Onderzoek.

## Data availability statement

The deidentified participant data that support the findings of this study are available from the corresponding author upon reasonable request.

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