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The winding road to the Tokyo Olympics: A dynamic approach to the relationships between stress appraisal, coping, performance and burnout among an artistic swimming team

1. Introduction

For elite athletes, participating in the Olympic Games is the pinnacle of their sports careers. The qualification phase is thus a particularly stressful period requiring them to deal with highly challenging physical and psychological demands such as training load, performance issues, self-doubt, expectations and pressures to perform (Gould & Maynard, 2009; Nicholls & Levy, 2016). In 2020, the COVID-19 outbreak added extreme and hitherto unknown elements with major implications for Olympic athletes (e.g., postponement of the Tokyo 2020 Olympic Games, lockdown, social distancing) (Pété et al., 2022). They had to face an unprecedented situation with increased risk of exposure to additional multiple stressors and negative psychological effects (e.g., depression, loneliness, fear of the uncertain future and the alternation of the Olympic cycle) (Samuel et al., 2020). Consequently, the way they managed and adapted to the various fluctuating demands of this particular qualifying period for the Tokyo 2020 Olympic Games deserves special attention as regards their performance and mental health (Szczypińska et al., 2021). The purpose of the study was thus to provide a more detailed understanding of the psychological adaptation of elite athletes during this particular challenging period.

According to the cognitive-motivational-relational theory of emotion (CMRT; Lazarus, 1991, 1999), it is the ways in which athletes appraise the demands of their performance environment that potentially lead to stress appraisal rather than the demands themselves. Stress appraisal involves an evaluation of both the demands of the situation (i.e., primary appraisal) and the coping resources available (i.e., secondary appraisal) (Folkman, 1992). Accordingly,

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1 when an athlete undertakes primary appraisal, he or she evaluates the situation in terms of
2 personal meaning and significance based on the stakes in respect of goals, commitments, and
3 values (Lazarus, 1999). Situations appraised as stressful generally involve the perception of
4 harm/loss (i.e., damage to goals, commitments and values has occurred), threat (i.e., damage to
5 goals, commitments and values is possible), or challenge (i.e., positive perception of an obstacle
6 to achieving goals, commitments and values). Stress mindset theory offers a complementary
7 approach to primary appraisal, considering that individuals with a stress-is-enhancing mindset
8 view stress as having positive consequences on functioning, performance and health (Crum et
9 al., 2013; Hagger et al., 2020). This contrasts with a stress-is-debilitating mindset, in which
10 stress is viewed as having negative consequences on outcomes (Crum et al., 2013; Hagger et
11 al., 2020). Individuals endorsing a stress-is-enhancing mindset report better performance and
12 health than individuals endorsing a stress-is-debilitating mindset (e.g., Crum et al., 2013). When
13 an athlete undertakes secondary appraisal, he or she evaluates the availability of coping options
14 and resources for dealing with the situation, as well as the degree of control that can be exerted
15 over that situation and/or the emotions experienced (Folkman, 1992). This perception of control
16 is viewed as a strong predictor of adaptive coping responses to stressful events (Skinner &
17 Zimmer-Gembeck, 2010). Thus, the way an athlete appraises the performance environment's
18 demands can influence his or her coping response and have potential implications for
19 performance and mental health (Tamminen, 2021).

20 Coping is traditionally defined as the “constantly changing cognitive and behavioral
21 efforts to manage specific external and/or internal demands that are appraised as taxing or
22 exceeding the resources of the person” (Lazarus & Folkman, 1984, p. 141). This definition
23 outlines the dynamic and multidimensional nature of coping. As such, athletes may use a variety
24 of coping strategies that change across time and different stressful sport situations (Doron &
25 Gaudreau, 2014; Doron & Martinent, 2016, 2017, 2021; Gaudreau et al., 2010). In order to

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1 manage the overlap between the different classifications of coping and accurately compare
2 studies, Nicholls et al. (2016) devised a comprehensive coping classification by grouping
3 coping strategies into three higher-order dimensions that share similar coping functions: (1)
4 Mastery coping refers to strategies that aim to control the situation and eliminate the stressor
5 (e.g., planning actions, analysis of the situation, effort expenditure), (2) Internal regulation
6 coping includes strategies designed to manage internal responses to stress (e.g., regulation of
7 emotions, seeking support, relaxation), and (3) Goal-withdrawal coping involves athletes
8 discontinuing efforts toward goal attainment (e.g., disengagement, venting emotions).
9 Moreover, there is evidence to support the notion that coping behaviours influence elite
10 athletes' performance and mental health (e.g., Gould et al., 1993; Hooper et al., 2021). In sport
11 psychology literature, mastery coping strategies are generally associated with successful sport
12 performance and psychological well-being, while goal-withdrawal coping strategies are
13 generally associated with sport performance issues and psychological distress (for reviews, see
14 Crocker et al., 2015; Nicholls et al., 2016). Findings remain more ambiguous regarding the
15 effectiveness of internal regulation coping (Nicholls et al., 2016). In addition, according to the
16 goodness-of-fit approach, coping will be more effective when there is an appropriate match
17 between perception of control and the coping strategies used (i.e., mastery coping in
18 controllable situations *vs.* internal regulation coping in uncontrollable situations, Folkman,
19 1992). While research in sport supports the relationship between perception of control and
20 mastery coping, findings appear more equivocal regarding the relationship between perception
21 of control and internal regulation coping or goal-withdrawal coping (Poliseo & McDonough,
22 2012).

23 The ways Olympians specifically experience and cope with stress have been
24 investigated previously (for a review, see Gould & Maynard, 2009). For example, Gould et al.
25 (1993) identified the coping strategies wrestlers used to deal with the challenges related to the

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1 Seoul 1988 Olympic Games. Their research showed that elite athletes had a wide range of
2 coping strategies at their disposal for dealing with adversity, and that mastery and internal
3 regulation coping strategies (e.g., thought control, concentration on goals, following a routine,
4 relaxed breathing) were the preferred strategies. However, these studies have predominantly
5 used retrospective accounts which may provide distorted data. To the best of our knowledge,
6 only Nicholls and Levy (2016) have documented the lived emotional experiences of elite
7 athletes in regard to stressors and coping experiences in preparation and a qualifying
8 competition for the London 2012 Olympic Games. However, Nicholls and Levy (2016)
9 acknowledge that the short length of the assessment period (i.e., 28 days) and the lack of stress
10 appraisal measure may have limited the complete understanding of the psychological adaptation
11 processes involved in this particular and challenging context. Given that coping is viewed as a
12 dynamic and complex process in this context (Pensgaard & Ursin, 1998), the ways in which
13 stress appraisal and coping are intertwined need further investigation in order to better
14 understand the extent to which their dynamic relationship is associated with performance and
15 mental health.

16 The dynamic nature of the relationships between stress appraisal, coping and the extent
17 to which they are associated with variations in sport-related outcomes within highly demanding
18 sport situations have been previously examined (Doron & Gaudreau, 2014; Doron & Martinent,
19 2016, 2017, 2021; Gaudreau et al., 2010). Based on original process-oriented methods, several
20 longitudinal studies have emphasised the dynamic nature of the relationships between stress
21 appraisal and coping processes over specific periods in highly demanding environments and
22 their adaptive vs. maladaptive links to objective and subjective performance (Doron &
23 Gaudreau, 2014; Doron & Martinent, 2016, 2017, 2021; Gaudreau et al., 2010). Moreover, the
24 mediating role played by coping in the dynamic relationships between stress appraisal (e.g.,
25 challenge, threat, perceived control) and sport-related outcomes (e.g., performance) during

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1 competitive events has been highlighted at multiple points in time (Doron & Martinent, 2017,
2 2021). Given that the relationships between stress appraisal, coping processes and sport-related
3 outcomes seem to rely heavily on the specific contextual and psychological demands and
4 constraints of sporting situations (Doron & Martinent, 2021), examination of these relationships
5 over the course of an Olympic Games qualification phase is required to improve understanding
6 of how elite athletes effectively manage the demands of such periods in terms of performance
7 and mental health.

8 Due to the particular exposure to stress related to Tokyo 2020 Olympic Games
9 qualification, elite athletes may be more vulnerable to psychological distress, including non-
10 specific symptoms of stress, anxiety and depression (Hooper et al., 2021; Pété et al., 2022;
11 Szczypińska et al., 2021). Specifically, the risk of burnout may be higher for those athletes who
12 have chronic difficulties in coping with stressful situations (Gustafsson et al., 2011). Athlete
13 burnout can be defined as a cognitive–affective syndrome characterised by negative feelings
14 toward sport, physical exhaustion, and a reduced sense of accomplishment (Isoard-Gauthier et
15 al., 2018). Previous longitudinal studies have highlighted the critical role that coping plays in
16 the development of athlete burnout (Madigan et al., 2020; Martinent & Decret, 2015; Pires &
17 Ugrinowitsch, 2021; Schellenberg et al., 2013). Results showed that the use of goal-withdrawal
18 coping (e.g., disengagement-oriented coping, avoidance coping) was linked to an increase in
19 athlete burnout over time, while the use of mastery coping (e.g., problem-focused coping, task-
20 oriented coping) and/or internal regulation coping (e.g., relaxation or seeking support
21 strategies) was unrelated or negatively associated with changes in burnout over time. However,
22 while the coping–burnout relationship has already been studied longitudinally, the
23 aforementioned studies were mainly conducted with young athletes during regular sport seasons
24 that did not involve either the same stress exposure as Olympic Games qualification or the same
25 risk of developing burnout. In addition, the role of stress appraisal in the dynamic coping-

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1 burnout relationship was not taken into account in these studies. Consequently, longitudinal
2 assessment of changes in stress appraisal-coping-burnout relationships would appear important
3 in developing knowledge on how stress appraisal, coping and burnout are linked in a dynamic
4 relationship, as well as in preventing the risk of athlete burnout.

5 Furthermore, Nicholls and Levy (2016) pointed out an interesting result regarding the
6 day-to-day influence of teammate interactions on stressors, coping, and emotions during the
7 London 2012 Olympics qualification phase. This result outlined the need to also consider the
8 social nature of coping processes when athletes deal with shared challenges and demands
9 (Tamminen & Gaudreau, 2014; Tamminen & Neely, 2021). For instance, Hayward et al. (2017)
10 showed evidence of shared stress experiences within the athletic triad (parents, coaches and
11 athletes) and the capacity to influence one another's stress experiences. More recently, Pété et
12 al. (2022) highlighted the orientation of athletes toward interpersonal coping according to their
13 individual coping profile when facing the COVID-19 outbreak with their training partners or
14 teammates. It seems beneficial in terms of mental health and group functioning for members of
15 a group to coordinate and develop strategies to deal collectively with stressful circumstances
16 (Lyons et al., 1998). For example, this can foster individual post-traumatic growth and social
17 well-being of people affected by collective trauma (Włodarczyk et al., 2016). Given that the
18 qualification phase of the Tokyo 2020 Olympic Games has an inherently social context likely
19 to influence athletes' experiences of stress and coping (Nicholls & Levy, 2016), it would appear
20 important to consider interpersonal coping perspectives for a more detailed understanding of
21 psychological adaptation and its potential impact on performance and burnout. Despite this, to
22 date, the dynamics of the relationships between stress appraisal and coping and their links to
23 performance and burnout have been almost exclusively examined through an intrapersonal
24 perspective.

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1 The present study therefore aimed to better understand how stress appraisal and coping
2 processes are dynamically inter-related and the extent to which their dynamic relationship is
3 associated with performance and burnout among a sport team during the qualification phase for
4 the Tokyo 2020 Olympics. Based on an intrapersonal perspective, the first goal was to
5 investigate the dynamic relationships between stress appraisal (i.e., perceived stress, stress
6 mindset, individual perception of control), individual coping (i.e., mastery coping, internal
7 regulation coping, goal-withdrawal coping), individual subjective performance, and burnout
8 (i.e., negative feelings toward sport, physical exhaustion, reduced sense of accomplishment)
9 during the qualification phase (see Model A, Figure 1). It was hypothesised that (1) stress
10 appraisal would be associated with individual coping, (2) stress appraisal and individual coping
11 would be associated with individual subjective performance and burnout, (3) individual coping
12 would mediate the relationship between stress appraisal and individual subjective performance,
13 and (4) individual coping strategies would mediate the relationship between stress appraisal and
14 burnout. The hypotheses are specified in Figure 1 (see Model A).

15 Based on an interpersonal perspective, the second goal was to examine the dynamic
16 relationships between stress appraisal (i.e., perceived stress, stress mindset, individual and
17 collective perception of control), interpersonal coping (i.e., problem-focused interpersonal
18 efforts, interpersonal management of emotions, interpersonal-goal withdrawal, relationship-
19 focused coping), individual and collective subjective performance, and burnout over the course
20 of the qualification phase (see Model B, Figure 1). It was hypothesised that (1) stress appraisal
21 would be associated with interpersonal coping, (2) stress appraisal and interpersonal coping
22 would be associated with subjective performance and burnout, (3) interpersonal coping would
23 mediate the relationship between stress appraisal and subjective performance, and (4)
24 interpersonal coping would mediate the relationship between stress appraisal and burnout. The
25 hypotheses are specified in Figure 1 (see Model B).

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[INSERT FIGURE 1 HERE]

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24**2. Method***2.1. Participants*

Fifteen Caucasian female national team elite artistic swimmers aged between 17 and 28 years ($M_{\text{age}} = 21$ years, $SD_{\text{age}} = 3$ years) participated in this study. They had been involved in their sport for at least 10 years. They were all attempting to qualify for the Tokyo 2020 Olympic Games and practiced between 35 and 40 hours per week. Artistic swimming was chosen because swimmers expend large amounts of energy every day and train 40 hours per week on average for most of the year (Mountjoy, 2009). Given the heavy training load, these athletes are at risk of burnout (Schaal et al., 2017). Prior to participation, athletes completed a consent form specifying the criteria for free participation, anonymity, and confidentiality of responses. For athletes under 18 years old, parents signed the consent form. The protocol was approved by a local ethics committee (xxx. Ref. 20032020-2).

In view of the nature of the sample (i.e., sampling of an entire population of elite athlete), and considering that “whenever it is possible to measure the entire population, the sample size justification becomes straightforward: the researcher used all the data that is available” (Lakens, 2022, p. 3), an a posteriori power analysis was performed using Power IN Two-level design software, which is designed to estimate standard errors of regression coefficients in hierarchical linear models for power calculations (Snijders & Bosker, 1993).

If α is chosen at .05, a medium effect size of .50 is expected. In this sample of 15 participants and 19 measurement points, power is 1.00 for the present study. Given Cohen's (1988) suggestion that power is high when it is at least .80, the sample size of the present study was deemed acceptable.

2.2. Procedure and measures

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1 After obtaining the coaches' agreement for participation in the study, the purpose,
2 procedure and measures were presented to the athletes by the second author at a meeting. All
3 participants were instructed to complete an online questionnaire on their smartphones via the
4 Athlete360 application at the start of each week during their mental training session. The
5 completion of the questionnaire took approximately five minutes. The second author was
6 present each week to answer any questions athletes may have had when completing the
7 questionnaire.

8 To measure the study variables, participants were instructed to answer the questionnaire
9 regarding their weekly individual and team experiences in training. At the time of the study,
10 face-to-face practice was allowed for elite athletes. In view of the longitudinal design of this
11 study, the data collection frequency (i.e., once a week for 19 weeks), the particular data
12 collection period corresponding to the qualification phase for the Tokyo 2020 Olympic Games
13 and occurring during the COVID-19 outbreak (i.e., from 29 December 2020 to 9 June 2021),
14 as well as the intense training demands (e.g., many hours of training), the questionnaire was
15 adapted and condensed to facilitate the task for the artistic swimmers. For this purpose, single-
16 items and a definitional approach were used to measure the study variables (Allen et al., 2022;
17 Ptacek et al., 1994).

18 **Individual perception of stress.** Perceived stress was assessed using a version of the stress
19 thermometer (Kowalski & Crocker, 2001). Participants were asked to indicate the amount of
20 stress they felt at the moment of answering the questions on a visual analogue scale ranging
21 from 0 (*not at all*) to 5 (*strongly*).

22 **Individual stress mindset.** Stress mindset was assessed based on the direction scale of the
23 French version of the Competitive State Anxiety Inventory - 2 Revised (Jones & Swain, 1992;
24 Martinent et al., 2010), as this scale measures in the sport context the interpretation of symptoms
25 associated with anxiety as being facilitative or debilitating towards performance. Participants

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1 were asked to indicate their perception of the effects stress had on their optimal functioning at
2 the moment of answering the questions on a visual analogue scale ranging from -3 (*very*
3 *unfavourable*) to +3 (*very favourable*).

4 **Individual and collective perception of control.** Two single-item visual analogue scales were
5 used to measure individual and collective perception of control (Kaiseler et al., 2009).
6 Participants were asked to rate the degree of control they and their team had over stressors they
7 encountered at the moment of answering the questions from 0 (*no control*) to 5 (*full control*).

8 **Individual and interpersonal coping.** A single-item definitional approach (e.g., Doron &
9 Martinent, 2017, 2021; Ptacek et al., 1994) was used to assess individual and interpersonal
10 coping. Given the longitudinal design of the present study, this approach seemed better adapted
11 to facilitating the frequent collection of data and the involvement of elite athletes throughout
12 the protocol than lengthy multi-item scales (Doron & Martinent, 2017, 2021; Pété et al., 2022).
13 The coping variables were defined succinctly (see Table 1 for definitions) and participants had
14 to provide a single rating to measure individual (i.e., mastery coping, internal regulation coping,
15 goal-withdrawal coping) and interpersonal coping strategies (i.e., problem-focused
16 interpersonal efforts, interpersonal management of emotions, interpersonal-goal withdrawal,
17 relationship-focused coping). The definitions were based on existing theoretical definitions of
18 individual (Nicholls et al., 2016) and interpersonal (Leprince et al., 2018) coping strategies, as
19 well as previous empirical studies that have used this approach in a sport context (Doron &
20 Martinent, 2017, 2021; Pété et al., 2022). Participants were asked to indicate on visual analogue
21 scales the extent to which they and their team used each of the individual and interpersonal
22 coping strategies when facing stress at the moment of answering the questions, ranging from 0
23 (*never*) to 5 (*very often*).

24 [INSERT TABLE 1 HERE]

25 **Individual and collective subjective performance.** Two single-item visual analogue scales
26 were used to measure individual and collective subjective performance (Pensgaard & Duda,

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1 2003). Participants were asked to indicate how satisfactory they considered their own
2 performance and the team performance at the moment of answering the questions, ranging from
3 0 (*not at all satisfactory*) to 5 (*extremely satisfactory*).

4 **Athlete burnout.** The short version of the Athlete Burnout Scale (Isoard-Gauthier et al., 2018)
5 was used to measure the three dimensions of burnout (i.e., negative feelings towards sport,
6 physical exhaustion, reduced sense of accomplishment). Participants were asked to report how
7 they felt regarding the three dimensions of burnout at the moment of answering the questions
8 on visual analogue scales ranging from 0 (*almost never*) to 5 (*almost always*).

9 2.3. Data analysis

10 A Random Coefficient Regression Model (RCRM) approach with Maximum
11 Likelihood estimation method was used with the R package lme4 (Bates et al., 2015). Firstly,
12 intra-class correlations with null models were examined for all study variables. Secondly, as
13 time-series data violate the assumption that residual effects are independent, level-1 models
14 were developed that accounted for residual autocorrelation in the data (i.e., controlling for
15 lagged parameters, variables at t-1) (Doron & Martinent, 2017, 2021). Moreover, group mean
16 centring was used for all (Level 1) predictors based on the rationale that no centring may
17 produce biased point estimates (Doron & Martinent, 2016). Thirdly, to examine within-
18 individual (level-1) relationships between the study variables and test mediation effects, a series
19 of RCRMs was performed between stress appraisal, coping, subjective performance and
20 burnout, where (a) stress appraisal was regressed onto coping (see Figure 1), and (b) stress
21 appraisal and coping were regressed onto subjective performance and burnout (see Figure 1).
22 Results of RCRMs were adjusted for multiple comparisons with a Bonferroni adjustment ($p <$
23 $.007$ for model A, and $p < .006$ for model B). Finally, the Monte Carlo Method for Assessing
24 Mediation (MCMAM, Selig & Preacher, 2008) was used to explore the mediating effects of

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1 coping on the relationship between stress appraisal and subjective performance (see Figure 1)
2 and between stress appraisal and burnout (see Figure 1).

3 *2.4. Transparency and openness*

4 Due to the elite sport context and thus the data's confidential nature, the data is not
5 available. The codes for the RCRMs and the questionnaire used in this study are available in
6 the supplementary material and/or upon request from the corresponding author. The study was
7 not preregistered.

8 **3. Results**

9 The intra-class correlations ($ICC = \tau_{00} / (\tau_{00} + \sigma^2)$) showed that between-individual
10 variance represented 37% to 77% of total variance for all variables (see Table A in the
11 supplementary material). This indicated that within-individual variance represented 23% to
12 63% of total variance, suggesting that variables varied across weeks and thus strengthening the
13 RCRM approach adopted in this study. Lagged parameters (variables at t-1) were significant
14 predictors of perceived stress ($\gamma_{10} = .36, p < .01$), individual subjective performance ($\gamma_{10} = .23,$
15 $p < .01$), physical exhaustion ($\gamma_{10} = .30, p < .01$) and reduced sense of accomplishment ($\gamma_{10} =$
16 $.30, p < .001$) (see Table A). Although not all lagged parameters were significant predictors,
17 repeated measure designs violate the assumption that residual effects are independent. Thus, all
18 subsequent level-1 models controlled for lagged effects.

19 *3.1. Relationship between stress appraisal, individual coping, subjective performance and* 20 *burnout*

21 When stress appraisal was entered as a predictor of individual coping, stress mindset
22 (i.e., stress-is-enhancing mindset) significantly positively predicted mastery coping ($\beta = .33, p$
23 $= .000$) (see Table 2). When stress appraisal and individual coping were entered as predictors
24 of individual subjective performance and burnout, stress mindset (i.e., stress-is-enhancing
25 mindset) significantly positively predicted individual subjective performance ($\beta = .25, p = .000$)

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1 and negatively reduced sense of accomplishment ($\beta = -.20, p = .002$); in addition, goal-
2 withdrawal coping significantly positively predicted negative feelings toward sport ($\beta = .22, p$
3 $= .004$) (see Table 2). The results of the Monte Carlo Method for Assessing Mediation indicated
4 that (1) mastery coping mediated the relationship between stress mindset and reduced sense of
5 accomplishment (95% CI [-.15, -.02]), and (2) goal-withdrawal coping mediated the
6 relationship between stress mindset and negative feelings towards sport (95% CI [-.08, -.00])
7 (see Figure 2).

8 [INSERT TABLE 2 HERE]

9 *3.2. Relationship between stress appraisal, interpersonal coping, subjective performance and*
10 *burnout*

11 When stress appraisal was entered as a predictor of interpersonal coping, stress mindset
12 (i.e., stress-is-enhancing mindset) significantly positively predicted relationship-focused
13 coping ($\beta = .23, p = .001$); and collective perception of control significantly positively predicted
14 problem-focused interpersonal efforts ($\beta = .22, p = .005$) and interpersonal management of
15 emotions ($\beta = .22, p = .003$) (see Table 3). When stress appraisal and interpersonal coping were
16 entered as predictors of individual and collective subjective performance and burnout, stress
17 mindset (i.e., stress-is-enhancing mindset) significantly positively predicted individual
18 subjective performance ($\beta = .28, p = .000$), and negatively reduced sense of accomplishment (β
19 $= -.25, p = .000$) (see Table 3). The results of the Monte Carlo Method for Assessing Mediation
20 indicated that interpersonal management of emotions mediated the relationship between
21 collective perception of control and collective subjective performance (95% CI [.00, .07]) (see
22 Figure 2).

23 [INSERT TABLE 3 HERE]

24 [INSERT FIGURE 2 HERE]

25
26 **4. Discussion**

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1 The present study aimed to longitudinally track and explore the dynamic relationships
2 between stress appraisal, individual and interpersonal coping responses in relation to subjective
3 performance and burnout during the particularly stressful qualification phase for the Tokyo
4 2020 Olympics. The originality of the study stems from the implementation of methodological
5 and statistical approaches allowing the real-time capture of the psychological adaptation
6 processes and their associated outcomes among an elite artistic swimming team over the course
7 of an unprecedented stressful context of interest. Thus, the findings provide a new overview of
8 the dynamic and ongoing process-like nature of the relationships between stress appraisal,
9 individual and interpersonal coping response, subjective performance and burnout during the
10 Tokyo 2020 Olympic Games qualification phase.

11 From an intrapersonal perspective, the results of model A (see Figure 1) firstly revealed
12 a dynamic relationship between stress appraisal and individual coping (hypothesis 1, model A).
13 Results showed that stress mindset was positively related to mastery coping over the course of
14 the Olympic Games qualification phase. This result provided additional support to the positive
15 links between a stress-is-enhancing mindset and coping behaviours oriented toward the task
16 and goals, as well as new insight regarding the dynamic nature of this relationship over time
17 (e.g., Crum et al., 2013). Contrary to expectations, perceived stress was not related to individual
18 coping (Gaudreau et al., 2010). Thus, perceived stress does not appear to be the best indicator
19 in understanding the psychological adaptation of elite athletes over the course of a challenging
20 period (Crum et al., 2013). Moreover, perception of control was not associated with individual
21 coping. This unexpected result could potentially be explained by the particular context related
22 to the COVID-19 outbreak during which this study was conducted and the lack of control felt
23 by elite athletes during this unprecedented situation (Szczypińska et al., 2021).

24 Secondly, the dynamic relationships between stress appraisal, individual coping, and
25 subjective performance were examined (hypothesis 2, model A). Results showed that stress

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1 mindset (i.e., stress-is-enhancing mindset) was positively associated with individual subjective
2 performance, supporting the conclusions of previous studies conducted in the field of work
3 psychology showing that perceiving stress as favourable for performance promotes effective
4 functioning and performance (Crum et al., 2013). However, individual coping was not related
5 to individual subjective performance, and no mediational effects of coping were observed
6 between stress appraisal and individual subjective performance over the course of the qualifying
7 period (hypotheses 2 and 3, model A). This result differed from previous research emphasising
8 the mediating role played by coping in the relationship between stress appraisal and
9 performance over the course of competitive events (Doron & Martinent, 2017, 2021). This
10 could be explained by the lack of competitions due to the COVID-19 outbreak during the Tokyo
11 2020 Olympic Games qualification phase, leading swimmers to associate the notion of
12 performance with the work carried out in training, which differs from the usual challenging
13 performance environment related to sport competitions (Doron & Martinent, 2021).

14 Thirdly, the dynamic relationships between stress appraisal, individual coping, and
15 burnout were investigated (hypothesis 2, model A). Results showed that stress mindset as stress-
16 is-enhancing was negatively related to reduced sense of accomplishment. In a similar way to
17 the relationships reported between stress mindset and well-being of workers (Crum et al., 2013),
18 the way elite athletes interpreted the effects of stress were associated with changes in the
19 dimensions of burnout during the qualification phase for the Tokyo 2020 Olympic Games.
20 Overall, this study addressed the limitations of previous studies by examining the role of stress
21 appraisal in relation to the changes in burnout dimensions over the course of Olympic
22 qualification (Madigan et al., 2020; Martinent & Decret, 2015; Pires & Ugrinowitsch, 2021;
23 Schellenberg et al., 2013).

24 Multilevel analyses also showed that goal-withdrawal coping was positively associated
25 with negative feelings toward sport. As previously shown, goal-withdrawal coping strategies

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1 were associated with burnout development (Madigan et al., 2020; Schellenberg et al., 2013).
2 Furthermore, the mediating role of coping within dynamic relationships between stress
3 appraisal and burnout was supported (hypothesis 4, model A). Two distinct patterns of
4 psychological adaptation were highlighted: one adaptive, where mastery coping mediated the
5 dynamic relationship between stress mindset (i.e., stress-is-enhancing mindset) and burnout
6 (i.e., reduced sense of accomplishment); another maladaptive, where goal-withdrawal coping
7 mediated the dynamic relationship between stress mindset (i.e., stress-is-debilitating mindset)
8 and burnout (i.e., negative feelings towards sport). These results extend previous studies by
9 highlighting the mediating role of coping in the stress appraisal-burnout relationship over time
10 (Madigan et al., 2020; Pires & Ugrinowitsch, 2021; Schellenberg et al., 2013). They also
11 support the central role of stress mindset in protecting from burnout through the differentiated
12 use of adaptive coping strategies (i.e., mastery coping) vs. maladaptive coping strategies (i.e.,
13 goal-withdrawal coping) over time and during stressful circumstances (Crum et al., 2013).

14 From an interpersonal perspective, the results of model B (see Figure 1) showed a
15 complementary overview of the dynamic relationships between psychological adaptation
16 processes, and their links with subjective performance and burnout during the Tokyo 2020
17 Olympic Games qualification. Results showed that a stress-is-enhancing mindset was positively
18 related to relationship-focused coping, and that collective perception of control was positively
19 related to problem-focused interpersonal efforts and interpersonal management of emotions
20 (hypothesis 1, model B). Accordingly, stress mindset and collective perception of control
21 appeared to play a significant role in the use of specific interpersonal coping strategies when
22 elite athletes deal with shared challenges and demands over the course of the Olympic Games
23 qualification phase. The absence of any significant links between individual perception of
24 control and interpersonal coping may reinforce the specificity of the psychological adaptation
25 patterns at interpersonal level (Tamminen & Gaudreau, 2014). Given that this study was the

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1 first to report dynamic relationships between stress appraisal and interpersonal coping during
2 an Olympic qualification phase, further investigation is needed (Nicholls & Levy, 2016;
3 Tamminen & Gaudreau, 2014).

4 Moreover, the mediating role of interpersonal coping was supported within the dynamic
5 relationship between collective perception of control and collective performance (hypothesis 3,
6 model B). While this result did not support the traditional principles of the goodness-of-fit
7 theory regarding the intrapersonal approach of stress appraisal and coping (Folkman, 1992;
8 Park et al., 2004), it showed that within the particular context of the Tokyo 2020 Olympic
9 Games team qualification, the match between collective perception of control and interpersonal
10 management of emotions appeared more effective for team performance. This result adds a
11 further equivocal result to previous research in sport regarding the relationship between
12 perception of control and forms of internal regulation coping (Poliseo & McDonough, 2012)
13 and invites researchers to reconsider the effectiveness of this relationship in specific stressful
14 contexts. Thus, this study provides new insights regarding the specificity of the psychological
15 adaptation of elite teams to the various fluctuating demands of the particularly stressful
16 qualifying period for the Tokyo 2020 Olympics (Poliseo & McDonough, 2012). This study
17 therefore extends knowledge on the dynamics of psychological adaptation processes in relation
18 to performance fluctuations from an interpersonal perspective (Nicholls & Levy, 2016;
19 Tamminen & Gaudreau, 2014). Contrary to expectations, burnout was not associated with
20 interpersonal coping, and no mediational effects of interpersonal coping were observed between
21 stress appraisal and burnout (hypotheses 2 and 4, model B). It had been expected that facing
22 stressful situations collectively could protect athletes from mental health problems such as
23 burnout (Lyons et al., 1998). However, the fact that burnout was only measured at individual
24 level may explain this result. Only collective perception of control was negatively related to

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1 reduced sense of accomplishment, suggesting, from an interpersonal perspective, that a lack of
2 control was an early symptom that could lead to burnout (Gustafsson et al., 2011).

3 Several limitations should be mentioned in this study. Firstly, this study was conducted
4 with a small sample of French elite artistic swimmers. Although these results extend knowledge
5 on the dynamic relationships between stress appraisal, coping, performance and burnout over
6 the specific course of Olympic qualification, it remains difficult to generalise these results to
7 other samples (e.g., other teams, other sports), other contexts and other countries/cultures. It
8 could be interesting to investigate these dynamic relationships with other teams from different
9 countries and in different sports over the course of an Olympic Games qualifying phase without
10 pandemic. Secondly, only one team was included in this research, inhibiting the use of
11 multilevel analyses in order to examine the sharing of psychological adaptation processes at
12 team level (i.e., collective perception of control, interpersonal coping strategies and collective
13 performance within the team) (Gaudreau et al., 2020). The inclusion of several teams in future
14 studies could confirm the shared nature of the interpersonal psychological adaptation processes.
15 Thirdly, in order to facilitate elite athletes' engagement in the protocol, especially over this
16 particular period, a single-item approach was preferred. However, it should be acknowledged
17 that this approach limits the ability to provide indicators of reliability and validity of the
18 measurement (Allen et al., 2022; Ptacek et al., 1994) and may not be sufficient, in particular, to
19 capture the complex nature of stress appraisal and coping. Future studies could use traditional
20 questionnaires for stress appraisal (e.g., Stress Mindset Measure, Crum et al., 2013) and coping
21 (see Crocker et al., 2015, for a review). Moreover, core elements linked to primary (i.e.,
22 perceptions of challenge, threat, harm/loss) and secondary (i.e., perceived coping resources)
23 appraisals were not assessed in the present study. Future studies should assess more exhaustively
24 stress appraisals (Lazarus, 1991, 1999).

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1 Despite these limitations, this study makes some new contributions regarding the
2 psychological adaptation processes of elite athletes over the course of the qualification phase
3 for the Tokyo 2020 Olympic Games, disrupted by the COVID-19 outbreak. By capturing these
4 processes and their associated outcomes (i.e., subjective performance and burnout) in real time
5 and prospectively over the course of a stressful six-month period, this study provides insights
6 into the ways elite athletes effectively managed the chronic and challenging demands associated
7 with an Olympic Games qualifying phase compounded by the additional stress of the COVID-
8 19 outbreak (e.g., uncertainty, cancellation and postponement of qualifying competitions, risk
9 of the cancellation of the Olympic Games). As such, stress mindset and mastery coping seem
10 to play key roles in athletes' psychological adaptation and help them to mitigate maladaptive
11 stress-related outcomes over time (Crum et al., 2013). This study therefore underlines the need
12 to consider stress mindset rather than stress intensity in future research on psychological
13 adaptation processes of athletes in sport performance contexts.

14 Furthermore, this study highlights the dynamic relationships between stress appraisal
15 and interpersonal coping in relation to team performance during an Olympic qualification
16 phase. Specifically, perceived control at group level and the use of interpersonal management
17 of emotions seem to help elite athletes maintain collective performance when the performance
18 environment is unusual and uncertain. These findings call for further investigation of the
19 goodness-of-fit hypothesis in the sport context, and specifically between perception of control
20 and forms of internal regulation coping of athletes at both individual and team levels (Poliseo
21 & McDonough, 2012). This new knowledge on the psychological adaptation process of elite
22 teams facing a particularly challenging period should encourage researchers to consider the
23 social context in which athletes evolve and its potential implication on stress and coping
24 processes (Nicholls & Levy, 2016; Tamminen & Gaudreau, 2014). In addition, these results
25 also provide preliminary support for an extension of the CMRT of emotions (Lazarus, 1991,

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1 1999) at the interpersonal level, taking into consideration the social context within which athlete
2 coping is embedded.

3 From an applied perspective, stress management intervention could be oriented toward
4 the development of a stress mindset and mastery coping strategies in order to improve
5 performance and protect athletes from symptoms of burnout (Crum et al., 2013). Elite athletes
6 could be taught to develop a stress-is-enhancing mindset, in which stress can be viewed as
7 having positive consequences on their performance or mental health, as well as to use adaptive
8 coping strategies such as mastery coping (e.g., planification, effort expenditure). These
9 interventions may offer effective ways to manage chronic stress and prevent negative effects
10 on athletes' mental health (Hagger et al., 2020).

11 At the team level, these interventions could also integrate content related to the
12 development of a collective perception of control and collective coping strategies such as
13 interpersonal management of emotions in order to enhance team performance. Team athletes
14 could be taught to recognise their emotions and those of others, and to regulate them (Campo
15 et al., 2016). Given that the Tokyo 2020 Olympics qualification phase was unprecedented, with
16 high levels of uncertainty for athletes, focusing on regulation of emotions would seem to be the
17 most effective team's coping strategy to maintain team performance.

18 Finally, it may be worthwhile to monitor the psychological adaptation processes closely
19 in relation to the development of burnout among groups of elite athletes at risk, such as artistic
20 swimmers, and specifically over the course of a particular period of stress. In this way, from a
21 practical perspective, sport psychologists and coaches could be made aware in real time of
22 changes in the psychological adaptation processes, burnout and performance of their athletes or
23 teams, allowing them to adapt training and improve individual and team resources.

24 **5. Conclusion**

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1 To conclude, the present study provides a more detailed understanding of the
2 psychological adaptation of elite athletes during the qualification for the Tokyo 2020 Olympic
3 Games. This study highlights different patterns of psychological adaptation processes at
4 individual and interpersonal levels: adaptive (i.e., between stress mindset and mastery coping;
5 and between collective control and interpersonal management of emotions) and maladaptive
6 (i.e., between stress mindset and goal-withdrawal coping) as regards performance and burnout
7 in this unprecedented stressful context. Consequently, frequent longitudinal assessment of
8 changes in psychological adaptation processes in relation to burnout and performance
9 fluctuations appears important in preventing elite athletes from developing burnout and a
10 deterioration in individual or team performance, especially in chronic and challenging situations
11 of stress. Furthermore, the present study is the first to investigate interpersonal coping
12 dynamically, and thus provides the first empirical evidence of the importance of others in
13 dealing with stressful situations (Tamminen & Neely, 2021). This study therefore underlines
14 the need to consider the social nature of the psychological adaptation processes when elite
15 athletes deal with shared demands and challenges.

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ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

References

- 1
2 Allen, M. S., Iliescu, D., & Greiff, S. (2022). Single item measures in psychological science:
3 A call to action. *European Journal of Psychological Assessment*, 38(1), 1–5.
4 <https://doi.org/10.1027/1015-5759/a000699>
- 5 Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models
6 using **lme4**. *Journal of Statistical Software*, 67(1).
7 <https://doi.org/10.18637/jss.v067.i01>
- 8 Campo, M., Laborde, S., & Mosley, E. (2016). Emotional intelligence training in team sports:
9 The influence of a season long intervention program on trait emotional intelligence.
10 *Journal of Individual Differences*, 37(3), 152–158. [https://doi.org/10.1027/1614-](https://doi.org/10.1027/1614-0001/a000201)
11 [0001/a000201](https://doi.org/10.1027/1614-0001/a000201)
- 12 Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed). L. Erlbaum
13 Associates.
- 14 Crocker, P. R. E., Tamminen, K. A., & Gaudreau, P. (2015). Coping in sport. In S. D.
15 Mellalieu & S. Hanton (Eds.), *Contemporary advances in sport psychology: A review*
16 (pp. 28–67). New York: Routledge.
- 17 Crum, A. J., Salovey, P., & Achor, S. (2013). Rethinking stress: The role of mindsets in
18 determining the stress response. *Journal of Personality and Social Psychology*, 104(4),
19 716–733. <https://doi.org/10.1037/a0031201>
- 20 Doron, J., & Gaudreau, P. (2014). A point-by-point analysis of performance in a fencing
21 match: Psychological processes associated with winning and losing streaks. *Journal of*
22 *Sport and Exercise Psychology*, 36(1), 3–13. <https://doi.org/10.1123/jsep.2013-0043>
- 23 Doron, J., & Martinent, G. (2016). Trajectories of psychological states of women elite fencers
24 during the final stages of international matches. *Journal of Sports Sciences*, 34(9),
25 836–842. <https://doi.org/10.1080/02640414.2015.1075056>

ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

- 1 Doron, J., & Martinent, G. (2017). Appraisal, coping, emotion, and performance during elite
2 fencing matches: A random coefficient regression model approach. *Scandinavian*
3 *Journal of Medicine & Science in Sports*, 27(9), 1015–1025.
4 <https://doi.org/10.1111/sms.12711>
- 5 Doron, J., & Martinent, G. (2021). Dealing with elite sport competition demands: An
6 exploration of the dynamic relationships between stress appraisal, coping, emotion,
7 and performance during fencing matches. *Cognition and Emotion*, 35(7), 1365–1381.
8 <https://doi.org/10.1080/02699931.2021.1960800>
- 9 Folkman, S. (1992). Making the case for coping. In B. N. Carpenter (Ed.), *Personal coping:*
10 *Theory, research, and application* (pp. 31–46). Praeger Publishers/Greenwood
11 Publishing Group.
- 12 Gaudreau, P., Nicholls, A., & Levy, A. R. (2010). The ups and downs of coping and sport
13 achievement: An episodic process analysis of within-person associations. *Journal of*
14 *Sport and Exercise Psychology*, 32(3), 298–311. <https://doi.org/10.1123/jsep.32.3.298>
- 15 Gaudreau, P., Schellenberg, B., & Gareau, A. (2020). Multilevel designs and modeling in
16 sport and exercise psychology: Riding the current wave and looking beyond at the
17 horizon. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology* (1st
18 ed., pp. 1074–1096). Wiley. <https://doi.org/10.1002/9781119568124.ch52>
- 19 Gould, D., Eklund, R. C., & Jackson, S. A. (1993). Coping strategies used by U.S. Olympic
20 wrestlers. *Research Quarterly for Exercise and Sport*, 64(1), 83–93.
21 <https://doi.org/10.1080/02701367.1993.10608782>
- 22 Gould, D., & Maynard, I. (2009). Psychological preparation for the Olympic Games. *Journal*
23 *of Sports Sciences*, 27(13), 1393–1408. <https://doi.org/10.1080/02640410903081845>

ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

- 1 Gustafsson, H., Kenttä, G., & Hassmén, P. (2011). Athlete burnout: An integrated model and
2 future research directions. *International Review of Sport and Exercise Psychology*,
3 4(1), 3–24. <https://doi.org/10.1080/1750984X.2010.541927>
- 4 Hagger, M. S., Keech, J. J., & Hamilton, K. (2020). Managing stress during the coronavirus
5 disease 2019 pandemic and beyond: Reappraisal and mindset approaches. *Stress and*
6 *Health*, 36(3), 396–401. <https://doi.org/10.1002/smi.2969>
- 7 Hayward, F. P. I., Knight, C. J., & Mellalieu, S. D. (2017). A longitudinal examination of
8 stressors, appraisals, and coping in youth swimming. *Psychology of Sport and*
9 *Exercise*, 29, 56–68. <https://doi.org/10.1016/j.psychsport.2016.12.002>
- 10 Hooper, N., Reiber, C., Cheatham, S., & Johnson, T. (2021). Psychological distress and
11 maladaptive coping in Olympic-level swimmers following postponement of the 2020
12 Olympic Games due to COVID-19. *Poster Presentations*, A58.2-A58.
13 <https://doi.org/10.1136/bjsports-2021-IOC.136>
- 14 Isoard-Gauthier, S., Martinet, G., Guillet-Descas, E., Trouilloud, D., Cece, V., & Mente, A.
15 (2018). Development and evaluation of the psychometric properties of a new measure
16 of athlete burnout: The Athlete Burnout Scale. *International Journal of Stress*
17 *Management*, 25(S1), 108–123. <https://doi.org/10.1037/str0000083>
- 18 Jones, G., & Swain, A. (1992). Intensity and direction as dimensions of competitive state
19 anxiety and relationships with competitiveness. *Perceptual and Motor Skills*, 74(2),
20 467–472. <https://doi.org/10.2466/pms.1992.74.2.467>
- 21 Kaiseler, M., Polman, R., & Nicholls, A. (2009). Mental toughness, stress, stress appraisal,
22 coping and coping effectiveness in sport. *Personality and Individual Differences*,
23 47(7), 728–733. <https://doi.org/10.1016/j.paid.2009.06.012>

ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

- 1 Kowalski, K. C., & Crocker, P. R. E. (2001). Development and validation of the Coping
2 Function Questionnaire for adolescents in sport. *Journal of Sport and Exercise*
3 *Psychology*, 23(2), 136–155. <https://doi.org/10.1123/jsep.23.2.136>
- 4 Lakens, D. (2022). Sample Size Justification. *Collabra: Psychology*, 8(1), 33267.
5 <https://doi.org/10.1525/collabra.33267>
- 6 Lazarus, R. S. (1991). *Emotion and adaptation*. Oxford University Press.
- 7 Lazarus, R. S. (1999). *Stress and emotion: A new synthesis*. Springer Publishing Company.
- 8 Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing.
- 9 Leprince, C., D'Arripe-Longueville, F., & Doron, J. (2018). Coping in teams: Exploring
10 athletes' communal coping strategies to deal with shared stressors. *Frontiers in*
11 *Psychology*, 9, 1908. <https://doi.org/10.3389/fpsyg.2018.01908>
- 12 Lyons, R. F., Mickelson, K. D., Sullivan, M. J. L., & Coyne, J. C. (1998). Coping as a
13 Communal Process. *Journal of Social and Personal Relationships*, 15(5), 579–605.
14 <https://doi.org/10.1177/0265407598155001>
- 15 Madigan, D. J., Rumbold, J. L., Gerber, M., & Nicholls, A. R. (2020). Coping tendencies and
16 changes in athlete burnout over time. *Psychology of Sport and Exercise*, 48, 101666.
17 <https://doi.org/10.1016/j.psychsport.2020.101666>
- 18 Martinent, G., & Decret, J.-C. (2015). Coping profiles of young Athletes in their everyday
19 life: A three-wave two-month study. *European Journal of Sport Science*, 15(8), 736–
20 747. <https://doi.org/10.1080/17461391.2015.1051131>
- 21 Martinent, G., Ferrand, C., Guillet, E., & Gauthier, S. (2010). Validation of the French
22 version of the Competitive State Anxiety Inventory-2 Revised (CSAI-2R) including
23 frequency and direction scales. *Psychology of Sport and Exercise*, 11(1), 51–57.
24 <https://doi.org/10.1016/j.psychsport.2009.05.001>

ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

- 1 Mountjoy, M. (2009). Injuries and medical issues in synchronized olympic sports. *Current*
2 *Sports Medicine Reports*, 8(5), 255–261.
3 <https://doi.org/10.1249/JSR.0b013e3181b84a09>
- 4 Nicholls, A. R., & Levy, A. R. (2016). The road to London 2012: The lived stressor, emotion,
5 and coping experiences of gymnasts preparing for and competing at the world
6 championships. *International Journal of Sport and Exercise Psychology*, 14(3), 255–
7 267. <https://doi.org/10.1080/1612197X.2015.1020664>
- 8 Nicholls, A. R., Taylor, N. J., Carroll, S., & Perry, J. L. (2016). The development of a new
9 sport-specific classification of coping and a meta-analysis of the relationship between
10 different coping strategies and moderators on sporting outcomes. *Frontiers in*
11 *Psychology*, 7. <https://doi.org/10.3389/fpsyg.2016.01674>
- 12 Park, C. L., Armeli, S., & Tennen, H. (2004). Appraisal-coping goodness of fit: A daily
13 internet study. *Personality and Social Psychology Bulletin*, 30(5), 558–569.
14 <https://doi.org/10.1177/0146167203262855>
- 15 Pensgaard, A. M., & Duda, J. L. (2003). Sydney 2000: The interplay between emotions,
16 coping, and the performance of Olympic-level athletes. *The Sport Psychologist*, 17(3),
17 253–267. <https://doi.org/10.1123/tsp.17.3.253>
- 18 Pensgaard, A. M., & Ursin, H. (1998). Stress, control, and coping in elite athletes.
19 *Scandinavian Journal of Medicine & Science in Sports*, 8(3), 183–189.
20 <https://doi.org/10.1111/j.1600-0838.1998.tb00190.x>
- 21 Pété, E., Leprince, C., Lienhart, N., & Doron, J. (2022). Dealing with the impact of the
22 COVID-19 outbreak: Are some athletes' coping profiles more adaptive than others?
23 *European Journal of Sport Science*, 1–11.
24 <https://doi.org/10.1080/17461391.2021.1873422>

ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

- 1 Pires, D. A., & Ugrinowitsch, H. (2021). Burnout and coping perceptions of volleyball
2 players throughout an annual sport season. *Journal of Human Kinetics*, 79(1), 249–
3 257. <https://doi.org/10.2478/hukin-2021-0078>
- 4 Poliseo, J. M., & McDonough, M. H. (2012). Coping effectiveness in competitive sport:
5 Linking goodness of fit and coping outcomes. *Sport, Exercise, and Performance*
6 *Psychology*, 1(2), 106–119. <https://doi.org/10.1037/a0026382>
- 7 Ptacek, J. T., Smith, R. E., Espe, K., & Raffety, B. (1994). Limited correspondence between
8 daily coping reports and retrospective coping recall. *Psychological Assessment*, 6(1),
9 41–49. <https://doi.org/10.1037/1040-3590.6.1.41>
- 10 Samuel, R. D., Tenenbaum, G., & Galily, Y. (2020). The 2020 coronavirus pandemic as a
11 change-event in sport performers' careers: Conceptual and applied practice
12 considerations. *Frontiers in Psychology*, 11, 567966.
13 <https://doi.org/10.3389/fpsyg.2020.567966>
- 14 Schaal, K., Tiollier, E., Le Meur, Y., Casazza, G., & Hauswirth, C. (2017). Elite
15 synchronized swimmers display decreased energy availability during intensified
16 training. *Scandinavian Journal of Medicine & Science in Sports*, 27(9), 925–934.
17 <https://doi.org/10.1111/sms.12716>
- 18 Schellenberg, B. J. I., Gaudreau, P., & Crocker, P. R. E. (2013). Passion and coping:
19 Relationships with changes in burnout and goal attainment in collegiate volleyball
20 players. *Journal of Sport and Exercise Psychology*, 35(3), 270–280.
21 <https://doi.org/10.1123/jsep.35.3.270>
- 22 Selig, J. P., & Preacher, K. J. (2008). *Monte Carlo method for assessing mediation: An*
23 *interactive tool for creating confidence intervals for indirect effects* [Computer
24 software]. Available from <http://quantpsy.org/>

ADAPTATION PROCESSES IN ELITE ARTISTIC SWIMMING TEAM

- 1 Skinner, E. A., & Zimmer-Gembeck, M. J. (2010). *Perceived Control and the Development of*
2 *Coping*. Oxford University Press.
3 <https://doi.org/10.1093/oxfordhb/9780195375343.013.0003>
- 4 Snijders, T. A. B., & Bosker, R. J. (1993). Standard errors and sample sizes for two-level
5 research. *Journal of Educational Statistics*, 18(3), 237–259.
6 <https://doi.org/10.3102/10769986018003237>
- 7 Szczypińska, M., Samełko, A., & Guskowska, M. (2021). What predicts the mood of athletes
8 involved in preparations for Tokyo 2020/2021 Olympic Games during the Covid–19
9 pandemic? The role of sense of coherence, hope for success and coping strategies.
10 *Journal of Sports Science and Medicine*, 421–430.
11 <https://doi.org/10.52082/jssm.2021.421>
- 12 Tamminen, K. A. (2021). Coping. In R. Arnold & D. Fletcher (Eds.), *Stress, Well-Being, and*
13 *Performance in Sport* (pp. 78–94). Routledge.
- 14 Tamminen, K. A., & Gaudreau, P. (2014). Coping, social support, and emotion regulation in
15 teams. In M. Beauchamps & M. Eys (Eds.), *Group Dynamics in Exercise and Sport*
16 *Psychology: Contemporary Themes* (2nd ed., pp. 222–239). Routledge.
- 17 Tamminen, K. A., & Neely, K. C. (2021). We're in this together: Dyadic and interpersonal
18 aspects of emotions, coping, and emotion regulation in sport. In M. C. Ruiz & C.
19 Robazza (Eds.), *Feelings in sport: Theory, research, and practical implications for*
20 *performance and well-being* (pp. 58–69). Routledge.
- 21 Włodarczyk, A., Basabe, N., Páez, D., Amutio, A., García, F. E., Reyes, C., & Villagrán, L.
22 (2016). Positive effects of communal coping in the aftermath of a collective trauma:
23 The case of the 2010 Chilean earthquake. *European Journal of Education and*
24 *Psychology*, 9(1), 9–19. <https://doi.org/10.1016/j.ejeps.2015.08.001>
25

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Table 1

Definitions of the study variables using a definitional approach.

Variables	Definitions	Examples
Mastery coping	These strategies aim to take control of a stressful situation and eliminate the stressor.	I analyse the situation to find solutions to the problem. I focus on what I have to do.
Internal regulation coping	These strategies aim to manage internal responses to stress.	I accept my thoughts, emotions and sensations. I seek support from others.
Goal-withdrawal coping	These strategies aim to cease efforts to achieve a goal.	I get discouraged. I reduce my efforts.
Problem-focused interpersonal efforts	These strategies aim to implement actions, generate efforts, and/or increase own resources to collectively deal with a stressful situation.	We think of solutions to solve the problem. We redouble our efforts.
Interpersonal management of emotions	These strategies aim to collectively manage the emotions, thoughts and feelings induced by a source of stress when they interfere with the performance or optimal functioning of a group/team.	We talk to each other to reassure each other. We laugh to play down the situation.
Interpersonal-goal withdrawal	These strategies aim at withdrawal from a stressful situation. They are observed in collective behaviours in which the stressful situation is avoided and, consequently, involve disengagement from the task and a move away from the group/team objective.	We give up. We get angry and express our frustrations.
Relationship-focused coping	These strategies aim to maintain relationships between members of the same group/team during a stressful situation.	We motivate ourselves. We encourage each other. We gather.

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Table 2

Random-coefficient regression models of individual coping, subjective performance, and burnout controlling for lagged effects.

Model equations	Fixed effect								Random effects		-2* loglikelihood
	γ_{00} (SE)	γ_{10} (SE)	γ_{20} (SE)	γ_{30} (SE)	γ_{40} (SE)	γ_{50} (SE)	γ_{60} (SE)	γ_{70} (SE)	σ^2 (SD)	τ_{00} (SD)	
$MC_{ij} = \beta_{0j} + \beta_{1j}(MC_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + r_{ij}$	3.31** (.21)	-.10 (.06)	.02 (.04)	.33** (.04)	.01 (.05)	- (.05)	- (.05)	- (.05)	.63 (.80)	.21 (.46)	324.9
$IRC_{ij} = \beta_{0j} + \beta_{1j}(IRC_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + r_{ij}$	3.13** (.19)	-.07 (.07)	-.04 (.06)	.06 (.06)	.16* (.07)	- (.07)	- (.07)	- (.07)	.49 (.70)	.45 (.67)	464.9
$GWC_{ij} = \beta_{0j} + \beta_{1j}(GWC_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + r_{ij}$	1.51** (.36)	.17* (.07)	.08 (.06)	-.15* (.06)	.11 (.07)	- (.07)	- (.07)	- (.07)	1.85 (1.36)	.50 (.71)	505.6
$\text{Individual performance}_{ij} = \beta_{0j} + \beta_{1j}(\text{Individual performance}_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + \beta_{5j}(MC_{ij}) + \beta_{6j}(IRC_{ij}) + \beta_{7j}(GWC_{ij}) + r_{ij}$	2.38** (.21)	.15* (.07)	-.00 (.05)	.25** (.07)	.03 (.06)	.12 (.10)	-.00 (.07)	.00 (.06)	.60 (.78)	.39 (.62)	439.5
$\text{Negative feelings}_{ij} = \beta_{0j} + \beta_{1j}(\text{Negative feelings}_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + \beta_{5j}(MC_{ij}) + \beta_{6j}(IRC_{ij}) + \beta_{7j}(GWC_{ij}) + r_{ij}$	2.43** (.40)	.11 (.07)	-.16* (.06)	-.10 (.08)	-.01 (.08)	-.22 (.12)	-.15 (.08)	.22** (.08)	2.40 (1.55)	.56 (.75)	531.1
$\text{Physical exhaustion}_{ij} = \beta_{0j} + \beta_{1j}(\text{Physical exhaustion}_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + \beta_{5j}(MC_{ij}) + \beta_{6j}(IRC_{ij}) + \beta_{7j}(GWC_{ij}) + r_{ij}$	3.10** (.29)	.31** (.07)	.13* (.06)	-.00 (.08)	.05 (.07)	.07 (.16)	.16* (.08)	.03 (.07)	1.17 (1.08)	.53 (.73)	507.9
$\text{Reduced accomplishment}_{ij} = \beta_{0j} + \beta_{1j}(\text{Reduced accomplishment}_{ij,t-1}) + \beta_{2j}(\text{Perceived stress}_{ij}) + \beta_{3j}(\text{Stress mindset}_{ij}) + \beta_{4j}(\text{Individual control}_{ij}) + \beta_{5j}(MC_{ij}) + \beta_{6j}(IRC_{ij}) + \beta_{7j}(GWC_{ij}) + r_{ij}$	2.82** (.24)	.22** (.06)	.05 (.05)	-.20** (.06)	-.03 (.06)	-.24* (.10)	.10 (.07)	.00 (.06)	.80 (.89)	.37 (.61)	431.9

$$\beta_{0j} = \gamma_{00} + U_{0j}; \beta_{1j} = \gamma_{10} \text{ or } \beta_{1j} = \gamma_{10} + U_{1j}; \beta_{2j} = \gamma_{20} + U_{2j}; \beta_{2j} = \gamma_{20} + U_{2j}; \beta_{3j} = \gamma_{30} + U_{3j}; \beta_{4j} = \gamma_{40} + U_{4j}; \beta_{5j} = \gamma_{50} + U_{5j}; \beta_{6j} = \gamma_{60} + U_{6j}; \beta_{7j} = \gamma_{70} + U_{7j}$$

Note. MC = Mastery coping; IRC = Internal regulation coping; GWC = Goal-withdrawal coping; SE = Standard error; SD = Standard deviation; γ_{00} = intercept of level-2 regression predicting β_{0j} ; γ_{10} , γ_{20} , γ_{30} , γ_{40} , γ_{50} , γ_{60} and γ_{70} = intercept of level-2 regression predicting β_{1j} , β_{2j} , β_{3j} , β_{4j} , β_{5j} , β_{6j} and β_{7j} ; $\sigma^2 = \text{var}(r_{ij})$ variance in level-1 residual (i.e., variance in r_{ij}); $\tau_{00} = \text{var}(U_{0j})$ variance in level-2 residual (i.e., variance in U_{0j}); * $p < .05$, ** $p < .007$ (Bonferroni adjustment)

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Table 3*Random-coefficient regression models of interpersonal coping, subjective performance, and burnout controlling for lagged effects.*

Model equations	Fixed effect										Random effects		-2* Loglike- lihood
	γ_{00} (SE)	γ_{10} (SE)	γ_{20} (SE)	γ_{30} (SE)	γ_{40} (SE)	γ_{50} (SE)	γ_{60} (SE)	γ_{70} (SE)	γ_{80} (SE)	γ_{90} (SE)	σ^2 (SD)	τ_{00} (SD)	
PFIE _{ij} = $\beta_{0j} + \beta_{1j}$ (PFIE _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + r _{ij}	3.27** (.19)	.23** (.07)	.02 (.05)	.13* (.06)	-.07 (.07)	.22** (.08)	- (.08)	- (.08)	- (.08)	- (.08)	.48 (.69)	.44 (.66)	459.9
IME _{ij} = $\beta_{0j} + \beta_{1j}$ (IME _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + r _{ij}	3.13** (.19)	.04 (.07)	-.03 (.05)	.02 (.06)	-.12 (.07)	.22** (.07)	- (.07)	- (.07)	- (.07)	- (.07)	.51 (.72)	.40 (.63)	441.2
IGW _{ij} = $\beta_{0j} + \beta_{1j}$ (IGW _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + r _{ij}	1.39** (.35)	.09 (.06)	.02 (.05)	-.10 (.06)	.08 (.07)	.02 (.07)	- (.07)	- (.07)	- (.07)	- (.07)	1.76 (1.3 3)	.38 (.62)	452.9
RFC _{ij} = $\beta_{0j} + \beta_{1j}$ (RFC _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + r _{ij}	3.32** (.22)	-.01 (.07)	.06 (.06)	.23** (.07)	.04 (.08)	.13 (.09)	- (.09)	- (.09)	- (.09)	- (.09)	.68 (.83)	.55 (.74)	508.3
Individual performance _{ij} = $\beta_{0j} + \beta_{1j}$ (Individual performance _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + β_{6j} (PFIE _{ij}) + β_{7j} (IME _{ij}) + β_{8j} (IGW _{ij}) + β_{9j} (RFC _{ij}) + r _{ij}	2.38** (.21)	.16* (.07)	-.00 (.05)	.28** (.06)	.01 (.07)	.06 (.07)	.01 (.07)	.10 (.08)	-.03 (.07)	.00 (.06)	.60 (.77)	.39 (.62)	437.7
Collective performance _{ij} = $\beta_{0j} + \beta_{1j}$ (Collective performance _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + β_{6j} (PFIE _{ij}) + β_{7j} (IME _{ij}) + β_{8j} (IGW _{ij}) + β_{9j} (RFC _{ij}) + r _{ij}	3.07** (.12)	.13 (.07)	-.05 (.04)	.03 (.05)	-.02 (.06)	.02 (.06)	.05 (.06)	.13* (.06)	.03 (.06)	.09 (.05)	.18 (.43)	.24 (.49)	327.5
Negative feelings _{ij} = $\beta_{0j} + \beta_{1j}$ (Negative feelings _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + β_{6j} (PFIE _{ij}) + β_{7j} (IME _{ij}) + β_{8j} (IGW _{ij}) + β_{9j} (RFC _{ij}) + r _{ij}	2.44** (.40)	.14 (.07)	-.14* (.06)	-.18* (.07)	-.01 (.09)	-.03 (.09)	.03 (.09)	-.09 (.09)	.12 (.09)	-.07 (.08)	2.39 (1.5 5)	.60 (.77)	542.8
Physical exhaustion _{ij} = $\beta_{0j} + \beta_{1j}$ (Physical exhaustion _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + β_{6j} (PFIE _{ij}) + β_{7j} (IME _{ij}) + β_{8j} (IGW _{ij}) + β_{9j} (RFC _{ij}) + r _{ij}	3.10** (.29)	.30** (.07)	.12 (.06)	.01 (.07)	.08 (.08)	-.02 (.09)	.07 (.08)	-.07 (.09)	.02 (.09)	.04 (.07)	1.19 (1.0 9)	.54 (.73)	511.7

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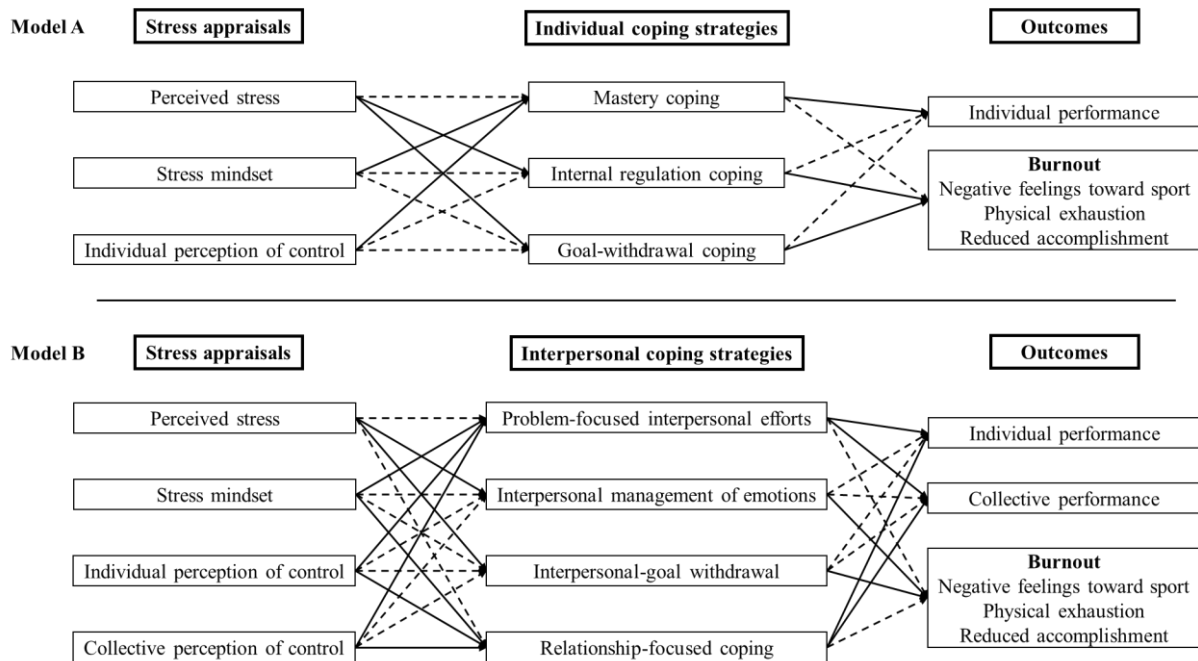
Reduced accomplishment _{ij} = $\beta_{0j} + \beta_{1j}$ (Reduced accomplishment _{ij,t-1}) + β_{2j} (Perceived stress _{ij}) + β_{3j} (Stress mindset _{ij}) + β_{4j} (Individual control _{ij}) + β_{5j} (Collective control _{ij}) + β_{6j} (PFIE _{ij}) + β_{7j} (IME _{ij}) + β_{8j} (IGW _{ij}) + β_{9j} (RFC _{ij}) + r_{ij}	2.81**	.23**	.05	-.25**	.08	-.19*	-.05	.06	.04	.02	.79	.36	430.6
	(.23)	(.06)	(.05)	(.06)	(.07)	(.07)	(.07)	(.07)	(.07)	(.06)	(.89)	(.60)	
$\beta_{0j} = \gamma_{00} + U_{0j}; \beta_{1j} = \gamma_{10}$ or $\beta_{1j} = \gamma_{10} + U_{1j}; \beta_{2j} = \gamma_{20} + U_{2j}; \beta_{3j} = \gamma_{30} + U_{3j}; \beta_{4j} = \gamma_{40} + U_{4j}; \beta_{5j} = \gamma_{50} + U_{5j}; \beta_{6j} = \gamma_{60} + U_{6j}; \beta_{7j} = \gamma_{70} + U_{7j}; \beta_{8j} = \gamma_{80} + U_{8j}; \beta_{9j} = \gamma_{90} + U_{9j}$													

Note. PFIE = Problem-focused interpersonal efforts; IME = Interpersonal management of emotions; IGW = Interpersonal goal-withdrawal; RFC = Relationship-focused coping; SE = Standard error; SD = Standard deviation; γ_{00} = intercept of level-2 regression predicting β_{0j} ; γ_{10} , γ_{20} , γ_{30} , γ_{40} , γ_{50} , γ_{60} , γ_{70} , γ_{80} and γ_{90} = intercept of level-2 regression predicting β_{1j} , β_{2j} , β_{3j} , β_{4j} , β_{5j} , β_{6j} , β_{7j} , β_{8j} and β_{9j} ; $\sigma^2 = \text{var}(r_{ij})$ variance in level-1 residual (i.e., variance in r_{ij}); $\tau_{00} = \text{var}(U_{0j})$ variance in level-2 residual (i.e., variance in U_{0j}); * $p < .05$, ** $p < .006$ (Bonferroni adjustment)

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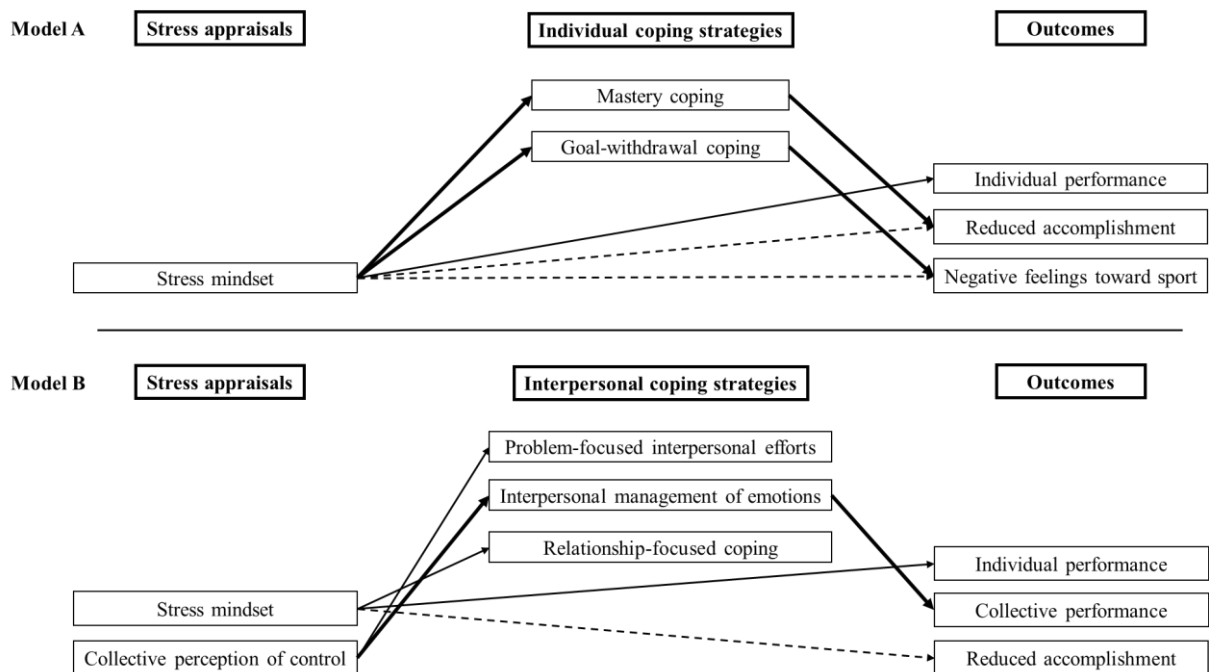
Figure 1

Representation of the hypothesised models.



Note. These models were tested through a longitudinal design. Expected positive links are reported as full lines, and expected negative links as dotted lines.

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Figure 2*Representation of the significant results*

Note. Positive links are reported as full lines, negative links as dotted lines, and mediations as bold lines.