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REVIEW



Adaptation to change: a meta-model of adaptation in sport

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ABSTRACT

The aim of this paper is twofold: (1) to integrate several theoretical perspectives into a novel Meta-model of Adaption in Sport (MAS model) and (2) to support the MAS model with a narrative literature review on change-provoking events and related adaptation processes, factors involved, and outcomes. The MAS model is designed to account for two potential tracks of adaptation – fast and prolonged – that are situated along the continuum of adaptation experiences in sport. In each track, sport performers experience various types of sport-related events (i.e., acute events or change events) that are associated with specific sets of demands and perceptions related to self-efficacy beliefs and challenge-threat appraisal. Accordingly, the performer responds to these events by using the mechanisms which determine his/her adaptation process and outcomes. We present a narrative review of the literature related to both adaptation tracks that provide empirical support to the MAS model and conclude by offering reflections on the MAS model and its potential applications in sport psychology research and practice.

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Athletic career; change events; coping; transitions; performance; decision-making

The Netflix sports documentary “The Last Dance” (Tollin et al., 2020) featured basketball player Michael Jordan’s career development. A red thread in Jordan’s career story was his ability to adapt to the various events he had encountered, both on and off the basketball court, such as high-school team deselection, transitions from high school to college and from college to the NBA, an injury, a change in body mass, switching coaches and team-mates, the death of his father, retirement, and returning to basketball. In several of these events, Jordan made deliberate decisions to actively adapt to new situations. For example, when asked about his college-to-pro transition, he explained that “from the first day in practice my mentality was whoever is the team leader on that team, I’m going after him and I’m not gonna do it with my voice because I had no voice. I had no status. I had to do it with the way that I play” (Episode 1). When asked how difficult this transition was, he replied: “it was easy” (Episode 1), reflecting positive adaptation.

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Jordan's story illustrates the various change events and transitions he was required to cope with to fit them into or adapt to certain stages of his career. In today's intense and dynamic life, athletes often experience several transitions concurrently, leading to added or conflicting sets of demands to deal with to maintain their career in sport and non-sport life (Stambulova & Samuel, 2020). For example, the COVID-19 pandemic as a global transition brought many changes to all sport stakeholders (athletes, coaches, managers, etc.), who required additional adaptation efforts to be able to continue their activities (Gupta & McCarthy, 2021; Samuel, Tenenbaum, et al., 2020). More than ever, the idea of human adaptation has been re-examined during this period, as the pandemic brought up a novel situation for many athletes. Adaptation, in this context, was related to both the immediate, short-term reactions of sport performers to purposefully address the stressful situations, and to their longer coping processes in which they were required to readjust their athletic engagement in a manner that ensures healthy emotional and physical functioning (Gupta & McCarthy, 2021; Stambulova et al., 2022).

In the present paper, we focus on how athletes adapt to different types of change-provoking events in their performance and careers. To complement relevant reviews (e.g., Beatty & Janelle, 2020; McEwan & Beauchamp, 2014), our aim is twofold: (1) to integrate several theoretical perspectives into a novel Meta-model of Adaption in Sport (MAS model) designed to account for the two potential tracks of adaptation, fast and prolonged and (2) to support the MAS model by a narrative literature review on change-provoking events, related adaptation processes, factors involved, and outcomes.

Introduction of the meta-model of adaption in sport (MAS model)

In this section, we first conceptualise adaptation and consider the theoretical perspectives that, when taken together, informed the MAS model. Secondly, we describe major components and structure of the model in focus.

Antecedences of the MAS model

Based on the literature (e.g., Beatty & Janelle, 2020; Lazarus, 2000; Samuel & Tenenbaum, 2011a; Schlossberg, 1981; Tenenbaum et al., 2015; Turner et al., 2020; Uphill et al., 2019), we preliminarily conceptualise adaptation as follows: The term "adaptation" is accounted for both *change processes* (e.g., emotional, cognitive, behavioural, etc.) in response to any kind of change-provoking event, and for *the outcomes* of the change processes (i.e., feeling adapted). Change-provoking events are conventionally divided into two groups: (a) acute events (mainly) during performance (e.g., training or competition) in which fast changes are expected to produce adapted response to continue performance successfully and (b) transition-type change events related to career development that imply prolonged adaptation process to successfully continue career in sport and life. These two major lines, or tracks in adaptation, are currently related to different research paradigms with different conceptual frameworks and methodologies to examine the adaptation within the sport context. The *cognitive paradigm* deals mainly with adaptation to acute events, while the *developmental paradigm* centres around career transitions requiring prolonged adaptation.

Cognitive paradigm and related frameworks

Tenenbaum et al. (2015) proposed the Two-Perception Probabilistic Conceptual framework of Adaptation (TPPCA), which accounts for adaptation processes, mainly in acute event situations, yet provides some insights related also to developmental adaptation. Within this framework, adaptation is defined as an ongoing process that reflects the athletes' evolving capacities to act and react effectively to various stressors perceived as significant, but also as a mental state of comfort and satisfaction, achieved through the application of thoughts and emotional resources. The degree of adaptation (A) is operationalised as a function of the difference between how individuals perceive the environment/task (e.g., challenging, threatening), δ_i , and how they perceive their ability/capacity (i.e., self-efficacy) to interact and cope with the environmental/task demands, β_v , to achieve a given goal. Effective adaptation is more likely to occur when individuals perceive their ability to cope as higher than the task's demands ($\beta_v - \delta_i > 0$, or $\beta_v > \delta_i$).

Within the TPPCA framework, positive adaptation is associated with expected or above-expected performance, meeting goals, making efficient adjustments, and feeling confident, in control, happy, and motivated. On the other hand, the chances of effective adaptation decrease when individuals perceive the task's demands to be superior to their coping capacity ($\beta_v - \delta_i < 0$, or $\beta_v < \delta_i$). Poor adaptation manifests in under-expected performance, failure to meet goals, problematic adjustments, and feelings of losing control, lack of confidence, anxiety, and frustration. Finally, in the case of equality between the task's demands and the person's coping capacity, adaptation may develop favourably or negatively.

Fast adaptation processes typically emerge in immediate responses, such as the self-regulatory responses the athlete is initiating just before, during, or shortly after a performance. The processes depend on the effectiveness of the perceptual-cognitive system to direct and focus attention, including the management of distractors and the production of effective decision-making. *Slow adaptation* which entails longitudinal processes, such as burnout and other transitions, is stated but not fully developed within the TPPCA, and its underlying mechanisms are not specified.

In addition, we suggest that the dual-process theory is imperative for understanding adaptation processes in the sport context. Both Stanovich (1999) and Kahneman (2011) argued that human behaviour in general operates by two systems, System 1 and System 2. System 1 operates under perception-action coupling and as spontaneous, fast, and cognitively effortless. In contrast, System 2 operates under controlled mode where information is attended, processed and decision-making is made under less restricted time constraints. To accommodate the conceptual shortcomings in the dual-processing approach, Evans and Stanovich (2013a) proposed two distinct types of processing within their default-interventionist framework instead of two separate systems (Furley et al., 2015). Initially, Evans and Stanovich (2013a) proposed two distinct types of cognitive processing: Type 1 and Type 2. Type 1 processes are autonomous; they are initiated and completed in the presence of relevant triggering conditions and do not require working memory. The response to a situation/problem has become part of its cognitive representation resulting from learning experiences. Type 1 processing efficiency stems from its fast and effortless execution of behavioural responses and the integration of a large amount of information. However, it is not an efficient solution for novel problems. Type 2

processes are controlled (i.e., effort- and time-consuming) and require working memory for hypothetical thinking and mental simulation to override a triggered response or to offer a new solution to a first-encountered problem (Furley et al., 2015).

Further, Evans and Stanovich (2013a, 2013b) suggested that Type 1 processing is the default mode and is always activated when the individual is confronted with a given situation or problem. In sports contexts, Type 1 processing is efficient in automatic activation of well-learned motor skills (i.e., procedural knowledge), which leads to a desired outcome. Type 2 processing is only additionally activated when Type 1 processing does not reach a solution or when there is additional contextual information. For example, a soccer defender anticipates that the right winger always feints to the outside before cutting to the centre, and therefore positions himself accordingly. Here, the attacking player will need Type 2 processing to adapt his behaviour to the demands of the situation and not rely on his habitual behaviour of cutting to the centre (Furley et al., 2015).

Cognitive processing and shifts from Type 1 to Type 2 also happen in transition-type change events. For example, upon experiencing a severe injury, an athlete might initially respond with an emotional turmoil, thereby activating Type 1 processing. However, this would not ultimately result in an effective solution and is often followed by a shift to Type 2 processing, applying conscious decision-making to initiate an effective rehabilitation process (e.g., Ivarsson et al., 2018; Samuel et al., 2015). So, the cognitive frameworks described above might also be useful when considering the developmental adaptation paradigm.

Developmental paradigm and related frameworks

The developmental paradigm is grounded in understanding an athlete as a whole person and athletes' development as holistic (Stambulova et al., 2021; Wylleman, 2019). Developmental change-provoking events of transitional nature are diverse and might be initiated in athletes' sport and non-sport life. With regard to adaptation, predictability of transitions is particularly important. Normative transitions (both athletic, e.g., junior-to-senior, and non-athletic, e.g., within-school education), as well as quasi-normative transitions (e.g., cultural transitions for transnational athletes) are rather predictable, and there is an opportunity to prepare for them in advance to facilitate relevant coping and adaptation (Drew et al., 2019; Ryba et al., 2018; Stambulova & Wylleman, 2019). On the contrary, non-normative transitions (e.g., injury, team selection, major success or failure) are less predictable and often require more adaptation efforts to feel adjusted or coming back to the status quo in life (Samuel, 2021; Stambulova & Samuel, 2020).

Schlossberg (1981) introduced the term *adaptation to transition* as "a process during which an individual moves from being totally preoccupied with the transition to integrating the transition into his or her life" (p. 7). This definition of adaptation was later applied by Taylor and Ogilvie (1994) in relation to athletic retirement (i.e., healthy or adapted transition vs. transition distress) and by Ryba et al. (2016) in relation to cultural transitions (i.e., acute adaptation right after the cultural relocation followed by socio-cultural adaptation in the new environment/context). In terms of factors influencing adaptation, these authors mentioned the situation, the self, support, and strategies (Schlossberg, 1981, 1989), reasons for retirement, athletes' resources (e.g., coping skills and support), and moderating factors (e.g., identity and control over the transition) (Taylor & Ogilvie,

1994, 2001), and processes underlying adaptation (social repositioning, negotiation of cultural practices, and meaning reconstruction), and the self (Ryba et al., 2016).

In the three frameworks introduced herein, Schlossberg (1981, 1989), Taylor and Ogilvie (2001), and Ryba et al. (2016) positioned adaptation at the centre of their attention. However, in the following transition frameworks adaptation is viewed more as a meta-term in the sense that transitions are “disruptions” in career development that athletes must cope with during the life-long adaptation process. In Stambulova’s (2003, 2016) athletic career transition model, the focus is not on the change-provoking event itself but on the set of demands that such an event (external or internal) brings to the person to cope with. All factors facilitating coping are termed resources, and factors that disturb coping are termed barriers. Transitions are conceptualised as a process of coping with the demands and dealing with the barriers in which the transition person implements coping strategies. Appraisal of demands and barriers (as challenges or threats) and the choice of coping strategies depend on how resourceful the person feels in terms of competencies, experiences, efficacy, and support available. The interplay of all these factors might construct several pathways leading to successful transition, crisis-transition, and/or negative consequences of failure to cope.

Emphasising the cognitive aspect of the transition process, the Scheme of Change for Sport Psychology Practice (SCSPP, Samuel & Tenenbaum, 2011a) proposed that when sport performers experience a change event (see Table 1 for examples) they initially engage in an appraisal process. Specifically, they consider the event’s unique characteristics in the context of their careers, their existing coping resources, and potential solutions. Subsequently, they make an initial strategic decision how to respond: (a) deny/ignore it, (b) cope independently, (c) consult with others, or (d) consult with a sport psychologist. They then make a conscious decision to avoid or make the necessary adjustments required to effectively cope with the situation. The “decision to change” is at the heart of the coping process because it reflects the performers’s active resolution to make any necessary adjustments (i.e., in attitudes and beliefs, behaviours, or relationships) required for an effective change to occur. Finally, the integrated career change and transition framework (ICCT, Samuel, Stambulova, et al., 2020) was developed to provide an integration of the SCSPP and the athletic career transition model. It portrays an interplay among perceived transition demands, resources, and barriers in the transition appraisals, decision-making and coping, and it follows the SCSPP in providing a probabilistic view on transition pathways.

A meta-model of adaption in sport (MAS model)

The MAS model (Figure 1) is considered as a meta-model because it integrates several existing conceptual frameworks (Jeusfeld, 2009) introduced herein. The model is co-constructed and relies on the expertise of the authors in the two tracks of adaptation and existing literature. The need for a new model emerged as a consequence of some limitations we have identified in the current conceptual frameworks. Specifically, the TPPCA (Tenenbaum et al., 2015) acknowledged both fast and slow adaptation processes, however, it only partially accounts for the underlying mechanisms of adaptation. For example, in competitive situations, athletes face temporal constraints which prevent them from using a conscious appraisal process (e.g., spontaneously reacting with rage

Table 1. Operational definitions and examples for the MAS-Model components.

Component	Operational Definitions	Examples
Adaptation – fast and slow	Adaptation is an ongoing process that reflects the sport performers' evolving capacities to act and react effectively to various stressors perceived as significant, but also as a mental state of comfort and satisfaction, achieved through the application of thoughts and emotional resources. It refers to both <i>the change processes</i> and <i>the outcomes</i> of the change processes. <i>Fast adaptation</i> processes typically emerge in immediate responses, such as the self-regulatory responses the athlete is initiating just before, during, or shortly after a performance. <i>Slow adaptation</i> entails longitudinal processes, such as burnout and other transitions.	<i>Fast adaptation:</i> A soccer player is able to maintain emotional composure in response to the referee's erroneous decision and continue to play effectively or alternatively loses his composure and receives a yellow card. <i>Slow adaptation:</i> An athlete adapts successfully to a cultural transition to play in a new country through a process of integration into the new environment, both professionally and culturally. Alternatively, they may experience separation and emotional detachment that can result in crisis.
Acute event	Time-constrained discrete events typically within a competition or a match.	A competition, a match, a simulation within a training session, a scouting test, as well as a specific moment within such events (e.g., a penalty shootout in soccer or handball, free throws at the end of a basketball match, golden score in judo, shoot-off in archery).
Perception-action coupling (PAC)	The ability of the sport performer to rely on the visual attention capacity–working memory interaction delivering the information to the long-term memory storage. In such cases, the individual relies on situational awareness and appropriate visual attention, anticipate plays, and select the most relevant response (i.e., decision-making), and at the same time manages potential internal and external distractions. Type 1 processing is mostly active in executing a well-learned habituated act.	A football quarterback is identifying the wide receiver and passes a long-distance ball to achieve a touchdown under pressure.
PAC followed by cognitive processing	Conscious attempts (i.e., activation of Type 2 processing) are made to cope or resolve the situation, either by mobilising additional efforts or through applying post-error performance routines, intentional strategic plans, and decision-making.	A soccer defender who was passed twice by the opponent would make adjustment to his field positioning and anticipate the next move.
Change event	Discrete events and longitudinal processes that disrupt the athletic engagement status quo and create emotional and cognitive imbalance. Change events can be positive or negative in nature.	A transition to a higher level. Achieving a meaningful achievement. Deselection. A conflict with a coach. Transition to another team. Injuries. Changing a field position. Rules and regulations modifications.
δ_i = Perceived event + challenge / threat	How sport performers perceive the environment/task (e.g., challenging, threatening).	A soccer referee may perceive the match as too demanding in terms of decision-making and players' management and respond with anxiety. Alternatively, s/he may experience the match demands as challenging in a normal manner and feel confident.
β_v = Self-efficacy	Sport performers' perceptions concerning their ability/capacity to interact and cope with the environmental/task demands.	A long-distance runner may experience the competition demands (e.g., high temperature, a strong line-up) as threatening and respond with reduced efficacy and therefore invest less effort. Alternatively, s/he may perceive it as a challenge and feel confident and willing to invest high effort.
$P(A)$ = Probability of successful adaptation	Effective adaptation is more likely to occur when individuals perceive their ability to cope as higher than the task's demands.	

(Continued)

Table 1. Continued.

Component	Operational Definitions	Examples
Appraisal of demands	Cognitive evaluation of the challenges pertaining to athletic, psychological, social, academic/vocational, financial, and cultural aspects of the change event. Appraising the new situation, athletes consider the significance of the transition in their careers, whether the new situation is positive or negative, and their control over the situation.	During the COVID-19 pandemic, many athletes could not train regularly and thus considered this new situation as highly demanding. Some athletes, however, could continue to train and thus considered it as less demanding.
Decision-making	In response to a change event sport performers typically make an initial strategic decision how to respond: (a) deny/ignore it, (b) cope independently, (c) consult with others, or (d) consult with a sport psychologist. Subsequently, they make a conscious decision to avoid or make the necessary adjustments required to effectively cope with the situation.	A handball player is given an opportunity to join a training-abroad programme. He initially makes a strategic decision to consult with his parents, coaches, and sport psychologist, and then a subsequent decision to join the programme and invest his effort to adapt to the demands and have a positive experience.
Coping strategy usage	Adaptive (e.g., planning, investing efforts) and maladaptive (e.g., emotional disengagement, alcohol abuse) actions that sport performers adhere to in order to respond to the demands and barriers of the change event.	An injured player may decide to consult with a physician and plan her rehabilitation. Alternatively, she may avoid meeting with the physician and also excessively drink to overcome the pain and emotional turmoil involved in the injury.
Perceived control	The degree to which sport performers perceive that control is available in the event. This is related both to their ability to maintain control over their own actions as well as achieve their goals.	A basketball player who goes to the line to shoot the deciding two points at the end of a match may perceive high control over the situation as he has a well-established performance routine and feels confident in his ability to make the shots. Deliberate and planned change event, such as a transition to a higher level, or altering eating habits, are perceived as under the control of the individual. Unexpected and unplanned change event, such as injuries, a slump in performance or a dispute with a coach, are perceived as under less personal control.
Athletic identity - AI	The degree to which sport performers identify with the athletic role, strongly and exclusively.	A long-distance runner with high AI who is outrun by his opponent may better find the inner strength to increase his pace than a runner with lower AI. A jiu-jitsu fighter with a strong AI who is facing a transition to a higher weight category may be more committed to adapt to this change and modify his training and diet to meet the demands than a fighter with weaker AI.
Support resources	The degree to which sport performers perceive that they have sufficient and helpful resources of social (e.g., family, friends, and teammates), professional (e.g., coaches, physicians, trainers, and nutritionists), and mental care support in their environment that can assist in addressing an event.	A doubles-tennis player that feels a high degree of support from her partner may adapt more favourably after making several consecutive unforced errors and regain her good performance. Olympic athletes may experience high availability of professional support in the periods leading to the Games and during the Games, yet low availability following the Games.
Adaptation outcome	in the fast track, adaptive outcomes are manifested in good performance, high motivation and self-efficacy, approach behaviour, as well as other behavioural and emotional benefits. Alternatively, an unsuccessful adaptation may result in reduced performance, choking under pressure, reduced effort, and emotional and	An archer who is lagging behind 4:0 during a final of a major tournament is able to adapt to the situation by maintaining high self-efficacy and viewing the situation as a challenge for him. He is improving his external focus, modifying his bow scope to the wind conditions, and thus improving his performance. He is managing to get into a

(Continued)

Table 1. Continued.

Component	Operational Definitions	Examples
	behavioural disengagement. In the prolonged track, process outcomes (i.e., positive-adaptive or negative-maladaptive) are typically expressed in terms of feelings (e.g., confidence, satisfaction, control), high motivation, goal attainment, identity investment, performance and professional development, positive relationships, and socio-cultural adjustment. Alternatively, poor adaptation may be associated with a crisis, characterised by a set of subclinical symptoms and the athlete's perceived need for intervention.	shoot-off where he outperforms his opponent to win a gold medal in the competition. A female soccer referee who is transitioning to a higher league may experience new professional, social, financial, and mental demands. She is choosing to perceive the situation as challenging and not threatening and to maintain high self-efficacy. She is making a conscious decision to consult with professional mentors, a fitness coach, a nutritionist, and a sport psychology consultant as to the modifications required of her. She also adapts her lifestyle and makes changes to her vocation hours and family time. As a result, she adapts successfully and after several seasons becomes a highly valued figure in the higher league.

to a referee's erroneous decision), whereas in slow or prolonged adaptation (e.g., deciding whether to transition to a different team) they typically enjoy sufficient time for appraising the situation and make deliberate decision-making (Samuel, Stambulova, et al., 2020). In addition, the new model extends the cognitive mechanisms underlying the adaptation process within the career transitions and change models (i.e., SCSP, ICCT). First, it better explains the dynamic balance between athletes' perceptions of transition demands and self-efficacy in a manner that predicts the probability of a successful or unsuccessful adaptation. Secondly, we better explain the dynamics between Type 1 and Type 2 processing involved in slow adaptation.

As shown in Figure 1, adaptation in sport involves *two tracks: fast and prolonged*. In each track, athlete experience various types of *sport-related events* (i.e., acute events vs. change events) that are associated with specific sets of demands and perceptions related to self-efficacy beliefs and challenge-threat appraisal, respond to these events via *pathways*, and use relevant *mechanisms* that ultimately result in adaptation *outcomes*. While we distinguish between the two tracks and types of events, we also acknowledge that the sporting environment must be considered within a multidimensional framework and accordingly viewed on a continuum of experiences (see the double-headed arrow on the top of Figure 1). Therefore, an experience that requires fast processes may unfold into a larger scope outside of the competitive environment, and potentially become a change event. For example, an injury of a player necessitates a fast adaptation process within the match, and then, depending on its severity can be developed into a change event that requires more elaborative adaptation outside of the pitch. Likewise, a longer change event may also affect an acute event. For example, a change in a field position may impact the player's self-efficacy in the upcoming match. Moreover, while we consider the differences in these two tracks of adaptation in terms of the associated mechanisms, we maintain that adaptation in sports is a common phenomenon, manifested in the interplay between the perception of the event and the perception of one's ability to cope with it. This notion, therefore, justifies a unified model of adaptation to account for all sport experiences encountered by sport performers.

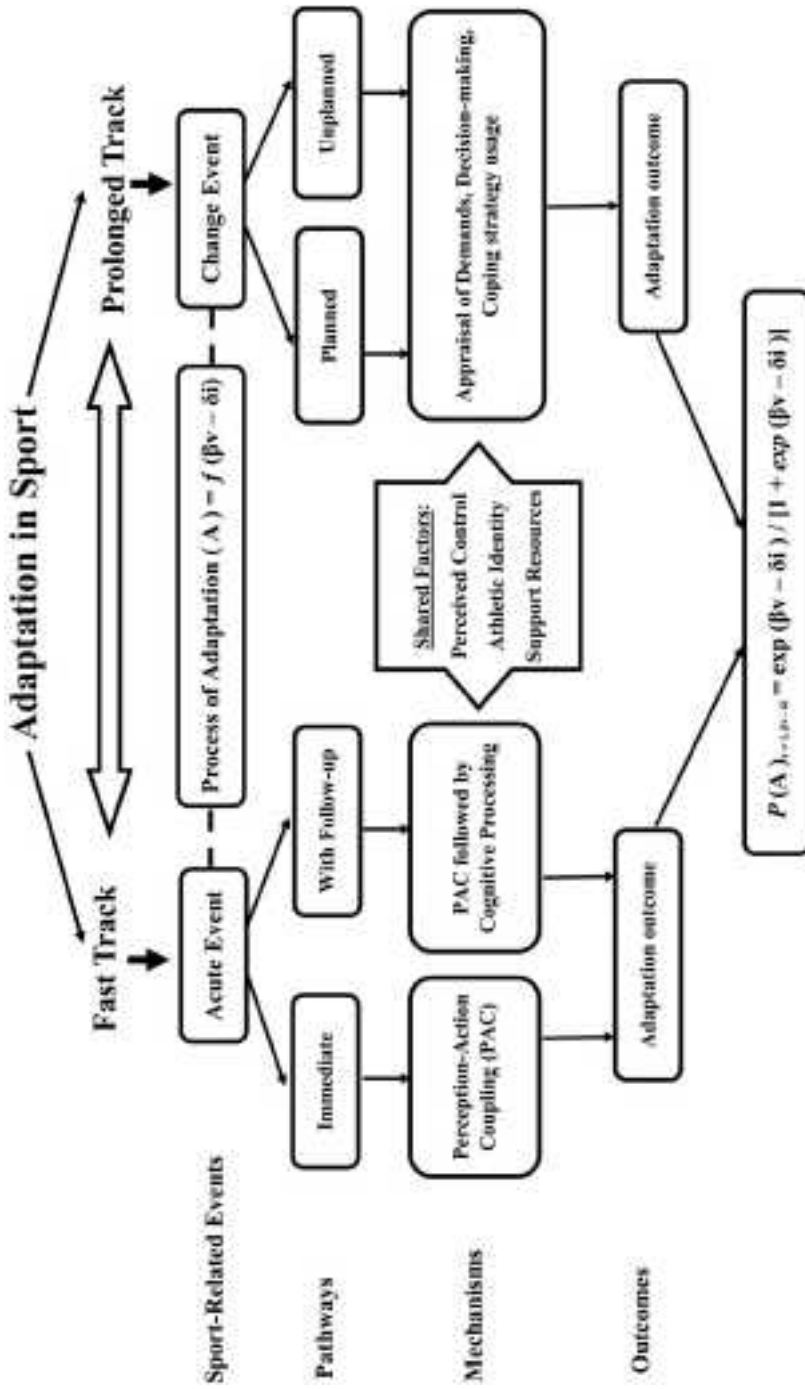


Figure 1. A meta-model of adaptation in sport (MAS model).

In addition to the two adaptation tracks, the model includes *shared factors* – perceived control, athletic identity, and support resources – that might influence the adaptation process and outcomes in both tracks (see central part of [Figure 1](#)). Finally, the MAS model promotes a *probabilistic* rather than a deterministic view of adaptation and is completed by the formula borrowed from the TPPCA (Tenenbaum et al., 2015; see bottom of [Figure 1](#)). A more detailed description of all the parts of the MAS model is provided herein. In addition, we provide operational definitions and examples for all model components in [Table 1](#).

Fast adaptation track

This track typically emerges in *acute*, time-constrained *events* within a competition or a match and may follow two *pathways*: *immediate* and *with follow-up*. In the immediate pathway, adaptation depends mainly on the *perception-action coupling (PAC)*, meaning the ability of the sport performers to rely on the visual attention capacity–working memory interaction delivering the information to the long-term memory storage. In such cases, the individual relies on situational awareness and appropriate visual attention, anticipate plays, and select the most relevant response (i.e., decision-making), and at the same time manages potential internal and external distractions. Here, Type 1 (i.e., PAC) processing is typically activated, because the sport performer is attempting to execute a well-learned habituated act. Sport performers typically use performance routines to increase the likelihood that an automatic response would emerge under stressful conditions.

The alternative (i.e., with follow up) fast adaptation pathway involves an unsuccessful initial attempt to respond to the acute event with Type 1 processing (i.e., PAC) followed by the activation of Type 2 processing. In such cases, conscious attempts will be made to cope or resolve the situation, either by mobilising additional efforts or through applying post-error performance routines, intentional strategic plans, and decision-making. Such conscious attempts might increase the likelihood of self-focus and result in poor performance. Alternatively, if the athlete maintains high self-efficacy and applies self-regulation skills, positive adaptation can still ensue. Adaptive *outcomes* in the fast-track adaptation may be manifested in good performance, high motivation and self-efficacy, approach behaviour, as well as other behavioural and emotional benefits.

Prolonged adaptation track

Constructing the prolonged adaptation track, we relied on transition frameworks (mainly the SCSPP) and involved some ideas related to the cognitive paradigm. This track typically emerges in response to *change events* of a transitional nature. Some of them are relatively *expected* (normative and quasi-normative transitions), while others (non-normative transitions) are *unexpected*. These events can vary in their longitudinal nature (i.e., short- or long-term), emotional profile (i.e., moderate, positive, or negative), and contextual characteristics (e.g., involving only the athlete or also others, related to performance or to career development). The change events bring sets of demands, and athletes have to *appraise* the demands, make *copied related decisions* (dependent on the appraisals), and implement *copied strategies* to feel adapted.

These prolonged adaptation processes might unfold in two major *pathways*: *planned and unplanned*. The planned pathway more often unfolds in response to expected change events when athletes have an opportunity to prepare in advance and feel resourceful enough to *appraise* demands as a challenge, make a *strategic decision to change*, and implement effective *coping strategies*. Therefore, Type 2 processing dominates in the planned pathway. The unplanned pathway unfolds in response to unexpected change events and can potentially be more problematic in terms of all aspects of coping and adaptation. For example, Type 1 processing may initially be activated, involving emotional responses (i.e., positive, moderate, or negative) and cognitive concerns (i.e., low, moderate, or high), leading to appraisal of the demands as a threat and decision to ignore the change, meaning that a person needs professional help. A shift to Type 2 processing is important here to analyse the demands/barriers vs. resources balance and decide how to proceed with adaptive coping efforts.

Within the prolonged track, process *outcomes* (i.e., positive-adaptive or negative-maladaptive) are typically expressed in terms of feelings (e.g., confidence, satisfaction, and control), high motivation, goal attainment, identity investment, performance and professional development, positive relationships, and socio-cultural adjustment. Alternatively, poor adaptation may be associated with a crisis, characterised by a set of subclinical symptoms (e.g., decrease in self-esteem or lasting emotional discomfort; see more in Stambulova, 2017) and the athlete's perceived need for intervention.

Shared factors influencing adaptation and probabilistic formula

Three factors acknowledged in the MAS model – *perceived control*, *athletic identity*, and *perceived support resources* – are key factors (although not the only ones) that might influence both the fast and the prolonged adaptation tracks. Athletes who feel more in control during acute events would be able to regulate their stress more effectively and execute their habitual responses (Jones et al., 2009; Jones et al., 2019). In case they need to shift from Type 1 to Type 2 processing, athletes with higher perceived control would implement these adjustments more fluently. Likewise, the perceived control may reflect whether the event is expected and thus planned, or rather unexpected and unplanned, as well as to whether the event involves others or mainly the athlete, and consequently influences athletes' initial coping response and strategic decisions.

Athletic identity (AI, Brewer et al., 2000) may exhibit a complex relationship with fast adaptation. On one hand, it was found to be positively associated with athletic performance (Horton & Mack, 2000; Lochbaum et al., 2022), but on the other hand, athletes with a higher negative affectivity have a higher level of state anxiety (Masten et al., 2006). Therefore, it is possible that athletes who are higher in athletic identity would tend to invest more efforts during acute events and be more committed to their success, yet also experience more stress that can obscure their adaptation. With regard to the prolonged adaptation track, according to the SCSPP, athletic identity might influence the athletes' appraisal of change events significance. Specifically, it was suggested that athletes with strong and exclusive athletic identity perceive change events that affect their athletic engagement as more significant and seek adequate assistance (Samuel & Tenenbaum, 2011a).

Considering the role of support resources in fast-track adaptation, social or environmental support might mediate the adaptation process (Tenenbaum et al., 2015). Similarly, the availability of external guidance, professional and social support resources, in the sport performer's environment may influence the ways in which sport performers respond to change events (Samuel & Tenenbaum, 2011a; Stambulova et al., 2021).

Finally, as can be seen in the lower section of Figure 1, the adaptation process outcomes are probabilistic in nature. Within the equation shown, P is the probability of poor to excellent adaptation (ranging from 0–1), $\beta_v - \delta_i$ reflects the difference between the self-perception of ability and self-perception of the environmental/task demands, and in line with Rasch (1960), exp is the exponent of this difference.

Adaptation to change: a narrative literature review

In this section, we provide a narrative literature review covering the two tracks of adaptation, as depicted in the MAS model. Furley and Goldschmied (2021) commented that narrative review is (a) a valid method to establish an authoritative argument which consists of published primary evidence and to enhance understanding of a topic and theory development and (b) it may or may not use systematic search methods with fixed inclusion/exclusion criteria. Our objective, therefore, is not to present an exhaustive review of the studies in each domain, but rather, review existing research considering the potential insights provided by the MAS model and the research group's expertise in these domains. We also emphasise that in performing such a review we attempted to maintain accuracy, transparency, and remain unbiased in our analysis of the reviewed data. Considering the existing literature, we found that much less attention was given to the prolonged track, and therefore we strategically decided to point more focus to review this literature. Thus, we begin with a brief review of studies that evaluated factors that are relevant for fast adaptation pathways and then review more in depth the prolonged adaptation track.

Fast adaptation research

Several lines of studies are relevant to the fast adaptation track, including (but not limited) to: (1) impacts of failure and success on subsequent performance, (2) the influence of perceived control on anxiety and performance, and (3) clutch and choking under pressure experiences. Considering the first line, Gernigon and Delloye (2003) examined the influence of an unexpected initial 60-meter sprint performance outcome on self-efficacy and performance in a subsequent trial. They found that success and failure feedback were associated with higher and lower self-efficacy in the second trial, respectively. Performance was not influenced by feedback but was weakly predicted by self-efficacy. Therefore, in line with the MAS model, the athletes who received feedback of success shifted from $\beta_v > \delta_i$ or $\beta_v = \delta_i$ to $\beta_v \gg \delta_i$ or $\beta_v > \delta_i$, respectively. Alternatively, the athletes who received feedback of failure shifted from $\beta_v = \delta_i$ or $\beta_v < \delta_i$ to $\beta_v < \delta_i$ or $\beta_v \ll \delta_i$, respectively.

Coffee et al. (2009) found that following failure in a dart-throwing task, attributions to uncontrollable and stable causes interacted to produce significantly lower levels of self-efficacy and performance relative to conditions where attributions were made to causes that are controllable and/or unstable. In terms of the MAS model, this means

that, when assessing self-efficacy in relation to a task, the attributions made by the sport performer may influence the adaptation process, as they influence both β_v and δ_i perceptions. Coffee and Rees (2011) further showed that following an induced belief that failure was beyond control and unlikely to change, new perceptions that a repeated failure was within one's control and likely to change resulted in higher self-efficacy and improved performance. These findings have meaningful implications for the fast adaptation process postulated in the MAS model. Specifically, they demonstrate the shift advocated by Furley et al. (2015) between Type 1 and Type 2 processing, manifested in the MAS model as a shift from the immediate pathway to the follow-up one. First, maladaptive attributions following initial failure at a task influence how performers respond to attributional feedback following subsequent failure in similar situations. Second, to produce an alternative adaptive response, performers must actively use Type 2 processes to re-appraise the situation as one that is controllable and could be overcome (i.e., a shift from threat to challenge appraisal). Therefore, this indicates a deliberate shift from $\beta_v - \delta_i < 0$ to $\beta_v - \delta_i > 0$.

Considering the second line of research, Cheng et al. (2011) demonstrated the adaptive role of the perceived control in the anxiety-performance relationship among taekwondo competitors. Specifically, perceived control accounted for a significant proportion of the performance variance. Performance was better under high than low perceived control, and best vs. worst performance was associated with highest vs. lowest perceived control, respectively. The authors suggested that the addition of a regulatory dimension and the interaction between the quantitative (intensity) and qualitative (adaptability) characteristics of anxiety facilitates the prediction of sports performance. As perceived control is considered Type 2 processing, the present study supports the idea that adaptive responses (such as increased performance) might be enhanced by the shift from Type 1 (e.g., the immediate experience of anxiety) to Type 2 processing (i.e., maintaining control and efficacy).

The third line of research is related to experiences of clutch and choking under pressure. For example, Schweickle et al. (2021) interviewed 16 athletes who experienced clutch performances (i.e., successful performances during pressurised circumstances). The findings indicated that the awareness and appraisal of the heightened pressure fluctuated throughout the event, and while they mainly appeared during breaks or situational changes, the athletes also felt them during the performance. In contrast, a number of participants reported feeling that they were performing automatically, with little awareness and appraisal of pressure during the performance itself. Moreover, some performers attempted to perceive the pressure as facilitative to their performance and some tried to actively manage the influence of pressure to avoid reduced performance. Within the MAS model, these findings indicate that, for some athletes, crucial moments within an acute event may be associated with an adaptive shift from the immediate to the follow-up pathway. This is manifested in a mobilisation of Type 2 processing that can either result in reduced performance (e.g., if self-awareness disrupts effective PAC) or be overruled by applying additional self-regulatory efforts. Still, some performers can maintain their Type 1 habitual performance while under meaningful stress (i.e., immediate pathway).

Sides et al. (2017) reported a single study that directly examined the TPPCA propositions (Tenenbaum et al., 2015) in relation to fast adaptation. Performers completed a

handgrip and indoor golf putting tasks at three difficulty levels in a randomised manner. The proposition that increases in task difficulty will result in a decrease of self-efficacy ($\beta v < \delta i$) was confirmed for both the handgrip and putting tasks. The other hypothesis that increased task difficulty ($\beta v < \delta i$) results in decreased approach motivation and increased avoidance motivation was not supported for the putting task, but the difference between δi and βv tended to alter the motivational resources needed for the handgrip task. Therefore, there was no clear evidence that motivational adaptations were congruent with the TPPCA. The performers potentially preferred a dominant goal orientation (i.e., approach motivation) that was not influenced by the situational demands. Finally, as the perceived task difficulty increased, the performers experienced higher arousal and lower pleasantness. Thus, when performers made appraisals of $\beta v < \delta i$, they experienced unpleasant affect as an adaptational response to insufficient coping strategies. This study's findings exemplified the notion of perceived task difficulty and self-efficacy discrepancy, which provokes cognitive appraisals and emotional resources to produce an adaptation response.

Prolonged adaptation research

Samuel and Tenenbaum (2011b) initially examined the conceptual tenants of the SCSPP by developing the Change Event Inventory (CEI), consisting of 15 types of change events. Other than the normative transition to a higher-level team or club, the other types of transitions were classified as non-normative (e.g., major accomplishment, injuries, deselection, a change in field position, a dispute with a coach) or quasi-normative (e.g., an equipment change, changes in eating habits or in body mass/weight) (see Stambulova & Samuel, 2020). Testing the CEI with a heterogeneous sample of athletes indicated that, on average, athletes reported on experiencing nine types of change events in their careers, suggesting that athletes tend to experience various and multiple change events in their careers, many of which are non-normative (i.e., unexpected).

In the last decade, the research focused on a range of change events, including athletes' career retirement and transition out of sport (Knights et al., 2016; Park et al., 2013), junior-to-senior transition (e.g., Drew et al., 2019; Pehrson et al., 2017; Stambulova et al., 2017), injuries (e.g., Ivarsson et al., 2018; Knowles & Lorimer, 2014; Samuel et al., 2015), deselection (Blakelock et al., 2016; Brown & Potrac, 2009; McEwen et al., 2018; Wippert & Wippert, 2010), transitioning to the residential Olympic training centre (Poczwardowski et al., 2014), transitioning from amateur to professional sport (Sanders & Winter, 2016), club-to-international transition (Edwards & Brannagan, 2022; McKay et al., 2021), participating in a long-term training-abroad programme (Samuel, Stambulova, et al., 2020), participating in the World Junior Championships (Hollings et al., 2014), the Olympic Games transition (e.g., Debois et al., 2012; Howells & Lucassen, 2018; Mitchell et al., 2021; Schinke et al., 2015; Samuel et al., 2016; Stambulova, Stambulov, et al., 2012; Wylleman et al., 2012), cultural transitions (Ryba et al., 2012; 2016), change of a coach (Forsythe et al., 2019), change of sport disciplines (Knowles & Lorimer, 2014), changes in rules and refereeing regulations (Samuel, Basevitch, et al., 2020), and, recently, the COVID-19 pandemic as a change event (e.g., Garver et al., 2021; Gupta & McCarthy, 2021; Leisterer & Lautenbach, 2022; Samuel, Tenenbaum, et al., 2020; Woodford & Bussey, 2021; Woods et al., 2022).

Research has indicated that change events differ in how they are initially appraised by athletes, in terms of perceived significance, emotional severity (i.e., positive or negative), and perceived control over the situation. Certain events are perceived as more positive, such as a transition to a higher level, achieving an accomplishment, and the Olympic Games experience, whereas others are perceived as more negative, such as injuries, reduction in motivation, and dispute with a coach. Certain events are perceived as moderate-neutral, such as a change in field position, change of teams, and modifications of rules and regulations (Samuel et al., 2016; Samuel, Basevitch, et al., 2020; Samuel & Tenenbaum, 2011b). Furthermore, as proposed by the MAS model, there are three moderating factors of the adaptation process. These may influence the initial appraisal of the event as well as sport performers' decision-making and active coping efforts. We elaborate on each of these factors below in light of the research on change events.

Research to date has indicated that injuries, a dispute with a coach, a change in field position, a change in rules and refereeing regulations, and deselection were associated with lower perceived control (Blakelock et al., 2016; Samuel, Basevitch, et al., 2020; Samuel & Tenenbaum, 2011b). On the other hand, achieving a high accomplishment, a transition to a higher level, a transition to a training-abroad programme, and the Olympic Games experience were associated with relatively high perceived control (Drew et al., 2019; Samuel et al., 2016; Samuel, Stambulova, et al., 2020; Samuel & Tenenbaum, 2011b). Also, the degree of perceived control was found to be related to the effectiveness of coping (Knowles & Lorimer, 2014; Samuel & Tenenbaum, 2011b), and both of these factors predicted the athletes' perceived outcome of their change events (Samuel et al., 2016; Samuel & Tenenbaum, 2013). The role of perceived control was also demonstrated in selection-related studies (Blakelock et al., 2016; McEwen et al., 2018; Wippert & Wippert, 2010). For example, Blakelock et al.'s (2016) study on the deselection experiences of 91 elite youth soccer players showed that the degree of perceived control over the event (in interaction with additional factors) influenced whether deselection was appraised as harmful, threatening, or challenging, and whether the players perceived they maintained coping strategies and resources to meet this change event's demands.

Finally, in Drew et al.'s (2019) meta-analysis study on 27 qualitative studies that examined the junior-to-senior transition in sports, the athlete's perception of the transition was identified as a key individual factor. While some studies found the junior-to-senior transition to be associated with a lack of control over the transition process and/or demands (e.g., Pummell et al., 2008), others reported a positive transitional experience (e.g., Morris et al., 2015). When athletes perceive the transition to be more difficult than it is (i.e., $\beta_v \ll \delta_i$) or underestimate the events' demands (i.e., $\beta_v \ll \delta_i$), they are likely to experience a more challenging process, as shown in the MAS model.

Considering the role of athletic identity (AI, Brewer et al., 2000) in athletes' prolonged adaptation, a moderate correlation between AI and perceived significance was found in various change events (Samuel & Tenenbaum, 2011b). In the context of adaptation, AI presents mixed research results. On one hand, athletes with a strong and exclusive AI perceive change events as more significant, and consequently adhere to consult with others, thereby facilitating adaptation (Samuel & Tenenbaum, 2013). Also, in the case of severe injuries, maintaining strong AI throughout the rehabilitation process might be advantageous (Samuel et al., 2015). On the other hand, results from studies on the junior-to-senior transition (see Drew et al., 2019), deselection (e.g., Brown & Potrac, 2009), and

athletic retirement (see Park et al., 2013) indicated a debilitating effect on adaptation for athletes with AI foreclosure. Sanders and Winter (2016) explored the self-identity of seven adult triathletes who transitioned to elite sport. Each athlete's transition experience was strongly influenced by his or her own sense of identity and their ability to rely on several self-identities. The formation of identity and self-concept is also important for transnational athletes who undergo cultural adaptation (Richardson et al., 2012; Ryba et al., 2016). These findings suggest that the role of AI in prolonged adaptation to change events is complex and varies in relation to the initial appraisal and the actual coping, as proposed in the MAS model.

In addition, support resources are an important factor facilitating the adaptation process (Drew et al., 2019). Athletes reported a moderate availability of professional resources when adapting to a change event, and they were three times more likely to consult with others than to ignore a change event if professional support was available; as part of their strategic decision, athletes mainly consulted with family, team-mates, and a coach, and only few consulted with a sport psychologist (Samuel & Tenenbaum, 2011b, 2013). A positive example is presented by Knowles and Lorimer (2014) in a case study of a female athlete who underwent multiple change events, transitioning between rugby and weightlifting following an injury. During her adaptation process, she was supported by a sport psychologist and her significant others and was able to reach a decision to change; she decided to take a year out of higher education to focus on her rehabilitation as well as commenced a strength and conditioning degree, thereby initiating a transition to weightlifting.

Decisions are at the heart of the prolonged adaptation process. Samuel and Tenenbaum (2013) found that, in response to various types of change events, most athletes made a strategic decision to consult with others, and most athletes subsequently made a deliberate decision to change. A significant association was noted between these two decisions in that those athletes who consulted with others also tended to make a decision to change. Within the MAS model, the adaptation to change process is characterised by the initial estimation of $\beta v < \delta i$ (i.e., feeling of threat and potentially low motivation) or $\beta v = \delta i$ (i.e., doubt) which may later shift to $\beta v \gg \delta i$ (i.e., challenge and motivation for change). Also, athletes were more likely to initiate change than refrain from initiating a change if motivation for change was higher, and if they accepted that a change event had occurred (i.e., an adaptive coping strategy, Carver, 1997). On the other hand, it was also found that athletes who decided to ignore their change event tended to refrain from initiating a change process. This route typically reflected athletes' attributions of the situation as either insignificant or positive, and therefore requiring no active coping (Samuel, 2009), which is represented in the MAS model as $\beta v \gg \delta i$ (disregard/contempt). Finally, athletes who coped independently also frequently tended to decide to change. This route typically reflected athletes' feelings of self-efficacy and perceived control in dealing with the change event, and their wish to cope by themselves – represented as $\beta v \gg \delta i$ (Samuel, 2009). These findings were further supported in other studies, including a change of sport disciplines (Knowles & Lorimer, 2014), a severe injury (Samuel et al., 2015), and transition into elite sport (Sanders & Winter, 2016).

Upon qualifying for the London 2012 Olympic Games, most Israeli athletes initially decided to cope independently (46.4%) or to ignore the new situation (32.1%). Those who consulted with others (21.4%) perceived this event more negatively. Also, the

athletes who ignored this change event reported having more available professional resources of support at that period of time. Still, a large majority of participants (80.4%) made a subsequent decision to change (Samuel et al., 2016). These findings emphasised the idea that sport performers' initial strategic decision is largely dependent on their appraisal of the new situation. If they felt efficacious in the new situation or received sufficient support, they refrained from making a strategic decision to consult with others and attempted to self-cope or ignore the new situation. However, they still required to decide to change for effective adaptation process.

Studies on elite athletes who were unable to train or compete due to government-imposed COVID-19-related lockdowns provide further support for the importance of a deliberate decision to change (e.g., Gupta & McCarthy, 2021; Woodford & Bussey, 2021). For example, in Gupta and McCarthy's (2021) study, athletes initially responded to the pandemic through incongruence. This manifested in the feeling of impotence that has surged into psychological distress, ruminations, negative emotions, and loss of motivation, constituting a major adversity. Subsequently, they initiated their resilience by accepting the unnatural reality and the various adversities it presented. The athletes acknowledged that this adversity was global and used social support in an innovative manner. They also engaged in learning and taking action and gaining a sense of mastery over the new environmental demands, indicative of positive adaptation as postulated by the MAS model.

Studies on the junior-to-senior transition focused on coping strategies as the eminent underlying adaptation catalysts (see Drew et al., 2019). For example, Stambulova, Franck, et al. (2012) reported that to cope successfully with this transition, athletes from various sports most often implemented the coping strategies such as "I try to give 100 percent in each practice or competition," "I try to maintain good relationships with people around me," "I try to learn from others," and "I persist in my task, in spite of fatigue, pain, or failure." Coping strategy usage did not predict the athletes' perceived degree of adjustment at the senior level in their sports but predicted the athletes' sport satisfaction.

Within the MAS model, adaptation (i.e., $\beta_v - \delta_i > 0$) and maladaptation (i.e., $\beta_v - \delta_i < 0$) are determined by the individualistic balance created between the sport performers' internal notion/feeling of being skilled and efficacious and the event's demands. Adapted sport performers are motivated, confident, less anxious, and focused towards implementing changes in their attitudes, behaviours, and environments (Samuel & Tenenbaum, 2011a). The perception of the outcome of a change event reflects whether effective adaptation has occurred or not. Research mostly indicated moderate-to-positive change event outcome perceptions, suggesting that sport performers adapt relatively well to change events they encounter (e.g., Samuel et al., 2015, 2016; Samuel, Basevitch, et al., 2020; Samuel, Stambulova, et al., 2020; Samuel & Tenenbaum, 2011b). In line with the MAS model, it was reported that the effectiveness of coping and feelings of control predict change event outcomes, whereas satisfaction of coping is a good predictor of post-event motivation (Samuel et al., 2016; Samuel & Tenenbaum, 2013).

Concluding remarks

The two objectives of this article were: (1) to integrate several theoretical perspectives into a novel Meta-model of Adaption in Sport (MAS model) and (2) to support the MAS

model by a narrative literature review on change-provoking events and related adaptation processes, factors involved, and outcomes.

Considering the first objective, we advocate that the MAS model is in line with Cramer's (2013) six criteria to evaluate a theory by showing comprehensiveness, precision and testability, parsimony, empirical validity, heuristic, and applied value. We must emphasise here that we present a model and not a comprehensive theory. Models are schematic representations of reality or of one's view of a phenomenon, constructed to improve the understanding of this phenomenon and/or to make predictions. Theories are plausible explanatory propositions devised to link possible causes to their effects (Wunsch, 1994). Specifically, the MAS model indicates *comprehensiveness* by explaining both fast and prolonged adaptation processes using a limited set of well-defined constructs that can be operationalised and measured. It provides clarification of how adaptation develops in the face of event's demands, sport performers' individual perceptions of the event, resources and barriers, and deliberate decision-making. Therefore, the MAS model indicates a progress from previous models in the sports literature that focused either on adaptation in response to performance-related stressors (e.g., Beatty & Janelle, 2020; Lazarus, 2000) or adaptation in response to transitions and change events (e.g., Ryba et al., 2012; Samuel, Stambulova, et al., 2020; Samuel & Tenenbaum, 2011a). It also complements Lazarus and Folkman's (1984) transactional framework by accounting for sport-specific mechanisms inherited in fast adaptation (e.g., perception-action coupling) or prolonged adaptation (e.g., deliberate decision-making) as inferred by current empirical research.

The MAS model was also designed to be *parsimonious* while accounting for a large human phenomenon. The constructs presented are clearly defined and empirically evaluated using the narrative review, thus demonstrating *precision and testability*. As the model was developed in line with two substantiated paradigms, the cognitive and the developmental, we believe in its *heuristic value* and potential meaning for other areas of human behaviour.

We believe the MAS model has high value and *usefulness for both researchers and practitioners*. From a research perspective, this model clearly indicates the two adaptation tracks and the associated pathways, mechanisms, outcomes, and related factors, thereby allowing researchers to be more concise and focused when designing empirical studies in this domain. We encourage researchers to adopt this sport-specific model to guide novel analyses in this domain including adaptation of coaches, referees, managers, and other sport stakeholders. In addition, we believe the MAS model has meaningful *applied value* through its useful directions for practitioners, such as establishing psychological preparation and effective routines to facilitate fast adaptation (e.g., Schinke et al., 2010), or facilitating athletes' decisions in prolonged adaptation (e.g., Samuel, 2013), or using [Figure 1](#) and the " $\beta_v - \delta_i$ " concept to discuss with athletes the two tracks of adaptation and how they can adapt via their coping mechanisms in various events. Also, the MAS model is beneficial for guiding governing bodies in supporting sport performers' adaptation in various sport events (e.g., modifications in sport regulations; see Samuel, Basevitch, et al., 2020).

The second objective was to provide a narrative review of the literature on the two tracks of adaptation, in light of the MAS model propositions. The review on acute events demonstrated the imperative role of self-efficacy in performers' appraisal of a

task, as much as they can attribute it to their own skills (i.e., under their control). Also, during acute events, shifts from the immediate to the follow-up pathway of fast adaptation are prevalent. The review on change events indicated that (a) change events and within-career transitions are prevalent aspect of sport performers' dynamic careers; (b) perceived control, athletic identity, and perceived available support are imperative to sport performers' appraisals of change events; the role of athletic identity in adaptation is complex and dynamic; and (c) deliberate decision-making stands at the heart of the adaptation process with most sport performers making a decision to change that is associated with active coping.

In reviewing the relevant literature, we adopted a narrative approach. We acknowledge the advantages of using meta-analytic, systematic, or scope review of the literature, that consist of reproducible search criteria and can potentially return more objective findings. However, researchers must not conflate "systematic" with superior quality and "narrative" with inferior quality (Greenhalgh et al., 2018). We believe that the implementation of a narrative review allowed us to support the new model by the existing research (Furley & Goldschmied, 2021). Meanwhile, our review indicates several limitations calling for future research. Considering the fast adaptation track, it is challenging to measure cognitive and affective mechanisms in situ to determine how and when sport performers shift from the immediate to the follow-up pathway. Regarding the prolonged track, while many studies focused on athletes' career retirement and transition out of sport (Knights et al., 2016; Park et al., 2013) and on the junior-to-senior transition (e.g., Drew et al., 2019), fewer studies centred on each of the non-normative transitions and change events, thereby limiting the general conclusions. Moreover, much of the studies conducted in this area are qualitative in nature and more quantitative or mixed-methods designs are needed to better establish associations among factors. Also, cross-cultural studies (e.g., Samuel et al., 2023) are particularly valuable as they also incorporate the cultural context and provide a more comprehensive account of how sport performers from different backgrounds adapt.

As final reflections, we think that the structure of the paper helped the readers to understand the rationale for the MAS model, its antecedents, the model itself, and to acquaint with related empirical research. It was impossible to systematically analyse all the literature related to such a broad area in a single paper (which is a limitation), but we perceived our task just to provide an empirical support for the main propositions of the MAS model. While the MAS model offers a comprehensive account of athletes' adaptation, there are additional factors that are not fully specified in the model (and the literature) that require empirical examination, particularly with regard to prolonged adaptation. For example, adaptive processes occur within specific contexts that may influence sport performers' responses and outcomes (Schinke & Stambulova, 2017). The age of the athlete may emerge as a factor that influence adaptation. In adolescence, young athletes' cognitive skills may affect deliberate decisions in response to change events (Hartley & Somerville, 2015). Also, youth athletes' self-identity may play a role in their career development (e.g., Houle et al., 2010; Ronkainen et al., 2019). Aging perceptions and self-identity may influence sport performers' decisions in late adulthood (e.g., Martin et al., 2013; Silver, 2021). Therefore, adaptation and professional support associated with change events must consider age and identity as part of the process. Further, social media use may influence the adaptation of sport performers to change

events such as major competitions and injuries (Samuel, 2021). For example, professional Australian Football League (AFL) players used social media to seek social support from their followers after sustaining a severe injury (Nankervis et al., 2018). The length of the adaptation process is another factor worth investigating. Because adaptation is a dynamic process, the interplay between appraisals, decision-making and active coping may change depending on the course of the transition. The COVID-19 pandemic is a good example because athletes can show different adaptive responses depending on the time period, they face this change (Samuel, Tenenbaum, et al., 2020; Stambulova et al., 2022). Therefore, longitudinal studies must be applied to examine adaptation over time. Finally, the interplay between fast and prolonged adaptation tracks in sports remains unclear. Specifically, are sport performers who prevail in acute events also adaptive in change events, perhaps because of personal characteristics, or are these two processes independent? These questions require empirical examination to further reveal the significant role of adaptation in sport and guiding value of the MAS model.

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No potential conflict of interest was reported by the authors.

Data availability statement

Data sharing is not applicable to this article as no new data were created in this study.

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