

*Annual Review of Psychology*The Psychology of Athletic
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**Keywords**

early specialization, athlete motivation, social cognition, stress regulation, coaching, group processes

Abstract

A considerable amount of human behavior occurs within the context of sports. In recent years there have been notable advances in psychological science research applied to understanding athletic endeavor. This work has utilized a number of novel theoretical, methodological, and data analytic approaches. We review the current evidence related to developmental considerations, intrapersonal athlete factors, group processes, and the role of the coach in explaining how athletes function within the sport domain. This body of work sheds light on the diverse ways in which psychological processes contribute to athletic strivings. It also has the potential to spark interest in domains of psychology concerned with achievement as well as to encourage cross-domain fertilization of ideas.

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INTRODUCTION

A considerable amount of human behavior takes place within the context of sports. From a developmental perspective, this involves children and adolescents developing important life skills in sports clubs and school settings (e.g., cooperation, teamwork, and perseverance) and older adults playing sports for health and psychological well-being. From an achievement striving and performance perspective, this involves elite-level athletes performing at the upper bounds of human potential. To illustrate the pervasiveness and value that sport holds across cultures and continents, one only needs to look at the extent to which societies across the globe were impacted during the first year of the COVID-19 pandemic. In the early months of this global event, governments across the planet sought to ensure that professional sports were able to resume, within prevailing health guidelines, as a means of restoring some semblance of normality and morale within society (DiFiori et al. 2021); when deemed safe, public health agencies also encouraged the resumption of sport among youth as an important means of supporting their physical and mental health (Watson & Koontz 2021). As the US President Joe Biden emphasized at the time, “What we discovered is that we need sports more than we ever realized” (Wagner 2021).

In many respects, sport can be considered a living laboratory in which the behaviors of its constituent participants are readily observable (Furley 2019). At the elite (i.e., professional) level, sport is characterized by the recording of enormous amounts of data based on objective measures (often stored in publicly accessible repositories) of adaptive (e.g., passes, assists, points scored, sports-personship) and maladaptive (e.g., aggressive behavior, fouls, cheating) human behavior. These data allow researchers to test particularly novel research questions (Grijalva et al. 2020, Mukherjee et al. 2019). As one example, Grijalva et al. (2020) sought to examine the relations between narcissism among professional athletes in the National Basketball Association (NBA), as assessed via analyses of their Twitter feeds, and subsequent team outcomes. Using game-level longitudinal data, they found that teams with high levels of athlete narcissism displayed worse coordination and subsequently performed worse than teams with low levels of narcissism. Such investigations capture human behavior in situ (i.e., with high ecological validity) in which the effective execution of tasks, roles, and responsibilities can have direct consequences for both individual athletes (e.g., contract renewals, ongoing employment, deselection) and the teams of which they are members (e.g., promotion and relegation, wins versus losses).

Almost 40 years ago, Browne & Mahoney (1984) published an overview in the *Annual Review of Psychology* of the fledgling field of sport psychology. Since then, the only other article in this journal that remotely relates to athletic endeavor is Ericsson & Lehmann's (1996) review on expertise (about a quarter of which was devoted to expertise within sports), but again that paper was published over 25 years ago. In recent years, and over the past decade in particular, there have been considerable advances in the application of psychological science to understanding human cognition, emotion, and behavior in sport. In this review, we look to chronicle these advances and explain how and why individuals and groups thrive within the athletic domain or fail to do so despite ostensibly possessing the requisite physical, psychological, and (sometimes) financial resources. We do so with a view not only to direct ongoing work in this rapidly evolving field but also to spark interest in other domains of achievement psychology and encourage cross-fertilization of ideas.

In this article, we use the term “athletic endeavor” to reflect the range of behaviors that are pursued by athletes to achieve a set of targeted outcomes (i.e., athletic performance/success) in their chosen domain. It should also be noted, however, that understanding athletic endeavor involves more than ascertaining the direct predictors/determinants of performance outcomes in sport; it also involves the intermediary mechanisms (i.e., mediators) and boundary conditions (i.e., moderators) that contribute to athletic achievement.

We structure our review by taking a socioecological approach to explicate the multiple (and often interacting) levels at which these psychological processes operate. We begin by examining some of the formative developmental processes that shape the initial sport achievement trajectories of children and youth as they track into later life, and then we delve into the various (intrapersonal) athlete and group processes that underpin athletic endeavor as well as the role of the coach as a catalyst of athlete engagement.

EARLY-LIFE DEVELOPMENTAL EXPERIENCES

Childhood and adolescence represent key periods of human development that prepare people for adulthood and a life of employment and that offer guidance to effectively enact various social roles related to friendships and family involvement. From a developmental perspective, youth involvement in sports and sport-based programs has been found to result in improvements in task persistence at school and in the home environment (Allen et al. 2015), in socioemotional well-being (Graupensperger et al. 2021, Young et al. 2019), in cardiorespiratory fitness and locomotor development (Cohen et al. 2015, Morgan et al. 2019), and in the ability to develop leadership competencies (Nathan et al. 2017). A recent systematic review and meta-analysis revealed that interventions designed to enhance positive youth development in sport resulted in small-to medium-sized effects on outcomes such as improved competence, confidence, and life skills (Bruner et al. 2021). Longitudinal analyses that tracked adolescents as they progressed to adulthood found evidence that youth involvement in team-based sports (when compared to nonsport participants or to those who discontinued team sport after adolescence) prospectively predicted lower stress and better coping levels in early adulthood (Murray et al. 2021). Some research also exists that supports the role of sport and physical activity in fostering emotional self-regulation and academic achievement among youth (Barbosa et al. 2020, Vasilopoulos & Ellefson 2021).

Balanced against the evidential benefits of youth involvement in sport, it is also critical to note that the sport context is not a developmental panacea. Among other factors, involvement in organized youth sports has been found to be associated with increased alcohol use (Kwan et al. 2014); accrual of injury, including concussion (Pfister et al. 2016); and depleted self-perceptions such as body-related concerns, especially among girls (Koulanova et al. 2021). On top of these factors, the pernicious effects of controlling and/or abusive coaching and parenting on youth athletes is well

established, with youth who are subjected to such behaviors displaying impaired mental health and quality of life (Bean et al. 2014).

Early specialization:
intensive participation
in a single sport with a
focus on achieving
high performance
standards

Diversification Versus Specialization

In recent years, research has devoted increased attention to performance attainment and early specialized practice. In a recent consensus statement by the American Medical Society for Sports Medicine, Kliethermes et al. (2021) noted that although early specialization might be beneficial for enabling youth to achieve elite status in a few technical sports (e.g., gymnastics), such early specialization does not appear to predict athletic success in the adult years in most sports.

A recent meta-analysis by Güllich et al. (2022) sheds particular, and nuanced, light on this issue by distinguishing between (relative) short- and long-term effects of early specialization versus diversification. They found that junior athletes who achieved early successes (i.e., during childhood and adolescence) were more likely to engage in early specialization by starting their main sport earlier, playing other sports to a lesser extent, and spending more time practicing their main sport in childhood/adolescence compared to those who did not perform as well during this life stage. Of particular note, however, those predictors of athletic success during youth differed markedly from the predictors of success over the long-term into adulthood. Specifically, by contrasting the life span trajectories of adult world-class athletes (i.e., those who won medals and placed among the top 10 in major international championships) with those of national-level performers (i.e., national team selection but without the same successes as the former group), they found that world-class athletes tended to engage in more multisport practice in childhood/adolescence, they started their main sport at a later time, and they initially progressed more slowly (and with less practice of their main sport) than national-level athletes. Unearthing whether early-life diversification (i.e., varied experiences of sampling different sports) protects against burnout, increases the likelihood of finding a well-suited sport, or facilitates cross-domain learning transference (Güllich et al. 2022) is a worthwhile future research endeavor. In any case, these findings have implications for talent identification and development in both sport and other occupational settings. Indeed, Güllich and coauthors concluded their meta-analysis by noting parallels with the career trajectories of Nobel Laureates (in physics, chemistry, economics, and medicine/physiology) who accrued a variety of early-life work experiences.

Recent longitudinal research by Rees et al. (2022) tracked elite youth cricketers for 2 years following their transition into an elite talent development program in the United Kingdom. They found that adolescents who were members of more social groups outside of cricket (involving both sport and nonsport groups) demonstrated better post-transition health measures (i.e., satisfaction with life, positive affect, and self-esteem), as well as higher levels of coach-rated performance, when compared to those with fewer group memberships. When this evidence is taken together with the meta-analytic review by Güllich et al. (2022), it seems evident that in order for developing athletes to achieve success at a high level in a particular sport and to flourish psychologically, time spent in other sport (and nonsport) activities beyond those that constitute their main sport would be a beneficial developmental investment.

Parenthetically, although such diversification would appear to support youth athletes achieving success at the elite/international levels, from a population-health perspective the existing empirical evidence also suggests that when youth sample more sports in adolescence they also tend to engage in more frequent health-enhancing exercise behavior during adulthood (Sylvester et al. 2020). Thus, it would seem that encouraging youth to engage in a variety of activities/sports during this formative stage in life is likely to result in both long-term performance outcomes and sustained involvement in health-enhancing physical activity.

Early-Life Adversity and Critical Life Events

With regard to understanding the role and contribution of early-life experiences through sport, some interesting research has taken a unique life span psychosocial-biographical approach to identify salient developmental experiences among superelite athletes. Superelite athletes are those who have won gold medals at the Olympics or in world championships (Rees et al. 2016). Given that the pool of athletes who meet this criterion is relatively very small, there are limits on the types of research designs that can be used, especially with regard to deriving inferences of causality. Working within these constraints, Hardy and colleagues (2017) conducted extensive in-depth interviews (including structured quantitative and unstructured qualitative interview sequences) with superelite athletes, their parents, and their coaches (Hardy et al. 2017). They also augmented these data with pattern recognition analyses using machine learning (Güllich et al. 2019) and compared the data with those derived from matched elite athletes who had not accrued the same degree of success. The results from content analyses of the interview data and machine learning analyses of 336 characteristics identified from the interviews revealed some noteworthy factors that appeared to discriminate between the two groups of athletes (Güllich et al. 2019, Hardy et al. 2017). In particular, superelite athletes were characterized by a greater propensity to experience a foundational negative life experience during childhood or adolescence coupled (i.e., in close temporal proximity) with a significant positive sport-related experience. Although future research is needed to examine the robustness of this interaction between negative early-life events and significant positive sport experiences, this work highlights the importance of examining the role of critical life events in contributing to personality development and goal pursuit (Kaźmierczak et al. 2022).

As a final comment on developmental processes, it is worth reflecting on recent advances in the sport domain that have the potential to support healthy adolescent development both within sport (vis-à-vis retention and engagement) and beyond (with regard to general quality of life). In particular, recent efforts have sought to examine the contributions of bio-banding, in which adolescents are grouped with others on the basis of their maturity status to account for substantive differences in size, physical strength, and power (Malina et al. 2019). Although research on the effectiveness of bio-banding is at an early stage, there is some evidence that both early- and late-maturing adolescents derive benefits from this approach (Bradley et al. 2019). In the study by Bradley and colleagues with youth soccer players, both early- and late-maturing players reported having more opportunities to participate in leadership and to contribute to gameplay in a bio-banded format. Given the well-established benefits, highlighted above, for youth who regularly participate in sport (versus those who drop out), bio-banding appears to have considerable potential to undergird the socioemotional well-being of youth, their motor skill development, and potentially their long-term achievement outcomes.

INTRAINDIVIDUAL ATHLETE PSYCHOLOGICAL PROCESSES

As distinct from work that has explicated some of the developmental processes involved in supporting athlete functioning, a growing body of work has sought to examine some of the intrapersonal psychological factors that enable athletes to flourish or, conversely, impair such flourishing within the cauldron of competition. In this section, we cover this burgeoning literature with a particular focus on sport-based research that has examined the contributions of perfectionism, goal striving and regulation, efficacy appraisals, and performing under pressure.

Perfectionism: A Double-Edged Construct

Recent evidence indicates that perfectionism has markedly increased over the past few decades, at least within the Western world, with observed increases in self-oriented perfectionism,

Perfectionism:

orientation toward, and pursuit of, very high performance standards that also involves highly critical personal appraisals

other-oriented perfectionism (i.e., individuals' demanding of others), and socially prescribed perfectionism (Curran & Hill 2019). Against this backdrop, research in the sport domain has explicated the dual, and sometimes countervailing, effects of perfectionism on athlete achievement. Specifically, perfectionism involves an orientation toward, and pursuit of, very high performance standards that also involve highly critical appraisals of one's performance accomplishments (Frost et al. 1990). While such perfectionism might foster attention toward performance optimization, for some people such efforts might also result in debilitating (and sometimes crippling) cognitions that impair long-term achievement and well-being.

In a recent analysis of the literature on perfectionism in sport, Hill et al. (2020) examined the effects of different facets of perfectionism in relation to athlete motivation, well-being, and performance. Across 63 studies, they examined the differential effects of two higher-order dimensions of perfectionism, namely, perfectionistic striving (i.e., setting high performance standards) and perfectionistic concerns (i.e., concerns over making mistakes and negative evaluations by others). Combinations of high and low levels on each dimension are reflected in a 2×2 model (Gaudreau & Thompson 2010) whereby (a) low perfectionistic striving and low perfectionist concerns are indicative of nonperfectionism, (b) high perfectionistic striving and low perfectionistic concerns reflect pure personal standards perfectionism, (c) low perfectionistic striving but high perfectionistic concerns reflect pure evaluative concerns perfectionism, and (d) a high score on both dimensions reflects mixed perfectionism. The results reported by Hill et al. (2020) revealed that when athletes displayed pure personal standards perfectionism, they reported improved well-being, self-esteem, and self-determined motivation and produced superior performance, compared to those displaying nonperfectionism, with large effects observed. The results also highlighted that when athletes displayed pure evaluative concerns perfectionism, this was frequently associated with worse outcomes, such as a greater fear of failure, amotivation, and depleted well-being, when compared to athletes who displayed nonperfectionism. When athletes scored high in both perfectionistic striving and perfectionistic concerns (i.e., mixed perfectionism), they tended to fare better (e.g., improved well-being, performance) than those with pure evaluative concerns perfectionism. Finally, pure personal standards perfectionism was associated more frequently with better outcomes than mixed perfectionism. When the results of the literature on perfectionism in sport are taken together, it appears that athlete motivation, well-being, and indeed achievement outcomes suffer when athletes display high perfectionistic concerns, regardless of whether those cognitions are accompanied by perfectionistic striving or not (Hill et al. 2020). These results also point to improved achievement outcomes (and psychological thriving as measured by well-being markers) when athletes displayed perfectionistic striving without perfectionistic concerns. Given the potential for different dimensions of perfectionism to interact and produce both adaptive and maladaptive athlete outcomes, this construct can be considered a double-edged one (Stoeber 2014), or at least a paradox worth additional investigation (Hill et al. 2020).

With regard to the etiology of perfectionism, meta-analytic evidence with youth and emerging adults suggests that excessive parental expectations and criticism exert small-to-moderate effects on self- and other-oriented perfectionism, but large effects on socially prescribed perfectionism (Curran & Hill 2022, study 1). With particular relevance to socially prescribed perfectionism, some evidence in the sport domain points to the contribution of parents to the development of perfectionism among junior athletes (Olsson et al. 2020), with other evidence suggesting that coaches may play a more influential role than parents in propagating perfectionism among youth athletes (Madigan et al. 2019). While all three dimensions of perfectionism represent risk factors for impaired mental health (Hewitt et al. 2022), the effects of socially prescribed perfectionism appear to be particularly destructive, with an increased incidence of depression, suicidal ideation, psychopathology, and debilitated interpersonal adjustment (Flett et al. 2022, Limburg et al. 2017).

Recent experimental research indicates that when athletes display self-critical perfectionism (comparable to the perfectionistic concerns described above), they might be particularly vulnerable to negative normative feedback and report substantive declines in feelings of competence (De Muynck et al. 2021). This work points to important considerations for salient social agents, such as parents and coaches, with respect to how they might best communicate with athletes who display heightened perfectionism. Among parents, this might involve efforts to dissuade them from communicating excessive (norm-related) expectations to their children (Curran & Hill 2022) regarding their sporting exploits. Among coaches, this might involve a particular emphasis on providing feedback that focuses on personal improvement rather than normative comparisons with others. We discuss the role of coaches in shaping athlete achievement below, but it is worth noting here that such an analysis also has particular implications for other domains, such as education and family counseling, where teachers and parents can be provided with the appropriate guidance to support youth, in particular those who display such perfectionistic attributes.

Efficacy Appraisals

Does it help to be supremely confident in sport or are there costs to such appraisals? On the basis of Bandura's (1986) seminal social cognitive theory, an extensive body of research accumulated over the ensuing decades focused on the relations between a person's beliefs in their capabilities, namely, self-efficacy appraisals, and achievement behaviors in sport (Beauchamp et al. 2019). This work has mirrored research taking place in a range of other settings (e.g., organizations, education, health care) that found that self-efficacy is a consistent correlate of performance in sport (Moritz et al. 2000). On the basis of this evidence, the promotion of self-efficacy is often heralded as an applied evidence-informed target for those concerned with supporting athletic achievement.

What has emerged recently, however, is a much more nuanced insight into the role of self-efficacy appraisals. This work has revealed that the nature and direction of efficacy–performance relations differ depending on whether between- or within-person effects are considered, as well as on the presence (or absence) of salient moderators (Beattie et al. 2016, Vancouver 2018). That is, while athletes who display elevated self-efficacy beliefs relative to others may be more likely to display improved achievement outcomes and performance, the nature of the efficacy–performance relationship may differ markedly when intraindividual effects are examined.

Meta-analytic evidence based on studies conducted both within the sport domain and beyond point to notable variability in the direction of within-person effects, with some studies displaying positive effects in relation to performance outcomes, others displaying negative effects, and yet others displaying null effects (Sitzmann & Yeo 2013). These mixed findings mirror those derived from computational modeling that explain self-efficacy's varied effects on performance (Vancouver & Purl 2017). Of particular note, Vancouver & Purl's (2017) computational modeling approach provides insight into the boundary conditions that might explain those different within-person trajectories. These authors found that when information and feedback related to the task are ambiguous, within-person effects tend to be negative, but when such information and feedback are unambiguous, within-person effects tend to be positive. Experimental research by Beattie et al. (2016) from the sport domain (i.e., golf putting) provides direct support for these putative moderation effects. Specifically, when participants were provided with performance feedback, elevated levels of self-efficacy were related to improved subsequent performances. However, when such feedback was not made available, the self-efficacy–performance relationship was negative. This points to a potential coasting effect, whereby individuals fail to allocate sufficient resources based on their overestimated sense of their capabilities, which thus impairs subsequent goal achievement (Yeo & Neal 2006).

Goal motives: the reasons that underlie the adoption and pursuit of a given goal

The implications of this recent body of evidence points to the catalyzing contribution of self-efficacy beliefs, provided that individuals have sufficient information on which to base their capability judgements. Without such critical information, miscalibrated appraisals of one's capabilities (e.g., overconfidence) may result in insufficient goal-directed effort (Vancouver & Purl 2017). Other research in sport points to task complexity as a moderator of the within-person self-efficacy–performance relationship, whereby positive effects are found when tasks are dynamic and challenging (as they often are in real-world sport settings) but disappear when tasks are simple and unchallenging (Beattie et al. 2014). Given the potential for self-efficacy beliefs to both enhance and impair performance (when people are devoid of high-quality feedback or information related to task execution), it would seem imperative for future self-efficacy research to test within-person associations and to examine additional moderators that might represent viable targets for intervention.

Goal Motives and Goal Regulation

The athletic domain is a ubiquitous context in which goal striving takes place, and as such it is perhaps not surprising that researchers have sought to examine ways through which goal motives and regulations support or thwart athletic endeavor. Some particularly insightful work conducted in sport, but with clear relevance for other achievement settings (e.g., education, performing arts, business), has focused on motivational factors that predict whether individuals will persist with difficult but attainable goals and whether they will disengage from the pursuit of unattainable goals (Ntoumanis et al. 2014a,b). Work by Ntoumanis et al. (2014a,b) was based on Sheldon & Elliot's (1999) self-concordance model, which has been used to study the “why” of goal striving in relation to academic, personal development, sport, and work-related goals. Specifically, research based on this model has broadly categorized the reasons underpinning goal pursuit as being autonomous/self-concordant (e.g., based on enjoyment or personal value of the goal) or controlled/nonself-concordant (e.g., driven by feelings of guilt, coercion, or the desire to gain approval and rewards from others). In general, work using this framework has shown that when goals are pursued for autonomous motives, individuals show greater persistence, goal progress and attainment, and psychological well-being compared to when goals are pursued for controlled motives (Sheldon 2014). Notably, however, this line of work has typically failed to consider how goal motives might influence the way individuals regulate their goal strivings when their goals become increasingly more difficult and potentially unattainable, as often happens in sport.

Ntoumanis et al. (2014a) addressed this issue by examining goal striving and increased goal difficulty in sport, where triumph over mounting adversity is often considered a hallmark of success. In two studies they tested how self-reported (study 1) and primed (study 2) autonomous and controlled goal motives predicted objectively assessed persistence toward a goal of increasing difficulty. The participants were British athletes who strived to attain an individually tailored goal of increasing difficulty on an electromagnetically braked cycle ergometer in a lab setting. The results revealed that autonomous goal motives predicted goal persistence and attainment (measured in terms of heart rate and number of trial minutes completed) via challenge appraisals and task-based coping (study 1). Controlled goal motives predicted increased use of threat appraisals and disengagement coping and were unrelated to goal progress and attainment. In study 2, the contrast of primed autonomous versus controlled goal motives again predicted greater goal persistence and attainment on a similar cycle ergometer task, greater changes in positive affect, and stronger future interest to participate in similar tasks. These findings are particularly pertinent for goal striving settings, such as sport (but also others, such as education and work), in which goals become harder over time, and they point to the pervasive utility of selecting goals that are personally enjoyable or important as drivers of perseverance.

It should also be noted, however, that persistence with goal pursuit might not always be the most adaptive goal regulatory response. Research in social and health psychology (e.g., Wrosch et al. 2013) has documented the various benefits of early disengagement from unattainable goals, often coupled with reengagement in alternative goals (e.g., scaled-down or compatible goals). Whereas research in those fields (e.g., Carver & Scheier 2017) has documented the negative consequences associated with pursuing unattainable goals (e.g., low self-worth, distress, future avoidance of challenging goals) and the benefits (e.g., well-being, productivity) of goal reengagement, comparatively little is known about how such self-regulation processes can be facilitated for effective goal pursuit. Sport is an ideal achievement domain to study issues related to goal reinvestment and futile persistence, given that dropout from sport has been identified as a significant problem in the literature (e.g., Quested et al. 2013).

With this in mind, Ntoumanis et al. (2014b) examined the role of autonomous and controlled motives when pursuing an unattainable goal without (study 1) or with (study 2) the opportunity for goal reengagement. Participants were British athletes who pursued an individually tailored distance-related goal on a cycle ergometer. Unbeknownst to the participants, the experiments manipulated the feedback (continuously displayed as actual distance covered versus expected distance) that participants received during the 8-min trial, so that the goal appeared unattainable. In both studies, autonomous goal motives were negative predictors of the cognitive ease of disengagement from the unattainable goal (i.e., individuals were less likely to mentally abandon unfulfilled goals), which stands to reason as such motives reflect personal investment and commitment to the pursued goal. Nevertheless, autonomous goal motives were also positively associated with greater cognitive flexibility, in the form of ease of goal reengagement, for those individuals who realized earlier in the goal pursuit the unattainability of the goal. Controlled motives predicted neither ease of disengagement nor ease of reengagement. When taken together, these findings suggest important synergies between the motivation and self-regulation literatures by identifying how autonomous motives are associated with goal flexibility or rigidity in the face of goal unattainability. In particular, the results indicate that individuals with high levels of autonomous motivation have cognitive difficulty with disengaging from unattainable goals, but the early realization of the unattainability of a goal can facilitate adaptive self-regulation responses such as letting go of cherished goals and engaging in alternative goals.

The studies by Ntoumanis et al. (2014a,b) examined the role of feedback and goal commitment and controlled for individual differences in goal efficacy and other goal-related variables. A recent review revealed that most goal-setting intervention studies in sport have tended to include small samples and have generally failed to examine putative moderators of the goal setting–goal effectiveness relationship (Jeong et al. 2021) such as feedback, commitment, individual differences (e.g., knowledge/skill), and situational factors (see Locke & Latham 2019). Indeed, despite the widespread use of goal setting as a mental skill in sport, research on goal setting has been less thoroughly implemented in sport than in other performance domains (Chen et al. 2021, Epton et al. 2017). Beyond the need to examine the active ingredients of goal effectiveness in sport, as well as potential boundary conditions and mediators, future work should evaluate the efficacy of unconscious goal priming (and goal motives priming, as in Ntoumanis et al. 2014a). In occupational settings, unconscious goal priming has been found to enhance task/job performance ($d = 0.44$) and need for achievement ($d = 0.69$), with particularly pronounced effects observed when those primes were context specific (versus generalized) and made use of visual (versus linguistic) primes (Chen et al. 2021). Indeed, despite the ubiquity of goal setting in sports, and in spite of some innovative work on aspects of goal setting such as goal reinvestment (e.g., Ntoumanis et al. 2014a,b), more work is clearly needed to better explicate the active ingredients of effective goal setting in sport and to examine the mechanisms that account for those putative effects.

Goal reengagement: engagement in an alternative goal following disengagement from an unattainable goal

Stress regulation:

access to and use of strategies that help athletes regulate their engagement with stressors

Attentional control:

capacity of athletes to focus on task-relevant cues and not be distracted by task-irrelevant cues

Performing Under Pressure

Understanding human endeavor within sport settings would be incomplete without an examination of the psychological processes required to perform under pressure within high-stakes settings. Sport represents a prototypical context to examine stress-response processes and human resilience that may similarly hold value in other walks of life (e.g., education, work, military). The finding that perceptual, psychomotor, and decision-making skills suffer when athletes perform under high-pressure scenarios is well established (Harris et al. 2019; Jordet et al. 2007, 2012; Parkin & Walsh 2017), although notable variability in such responses exists when examining elite athletes (Parkin et al. 2017).

Research into the mechanisms responsible for impaired performance under pressure-invoking situations, as well as strategies that mitigate those effects, has largely focused on two areas of inquiry. The first relates to the role of attention and the second corresponds to athletes' regulation of their engagement with stressors. With regard to the role of attention, there is an extensive body of lab- and field-based evidence suggesting that those engaged in motor task execution, such as athletes, perform better when they are able to focus on task-relevant cues and are not distracted by irrelevant stimuli. From a mechanistic perspective, performance suffers when athletes exhibit heightened levels of anxiety under (perceived and/or actual) pressure-invoking situations and either become distracted (i.e., a distraction explanation; Eysenck et al. 2007) or their conscious attention becomes allocated to focus on proceduralized skill execution (i.e., a self-focus explanation; Masters & Maxwell 2008). In contrast to attentional explanations for performance failure under (perceived) pressure, research on stress regulation has sought to examine the cognitive appraisals and coping strategies used by athletes to deal with stressors, and it has targeted these cognitive appraisals as a means to buffer against the potentially maladaptive effects of these stressors (Murdoch et al. 2021). From an intervention perspective, adherents to the former attentional explanations of skill deficits under pressure have primarily sought to implement strategies concerned with maintaining an optimal attentional focus while performing under pressure, but in general they have not been concerned with seeking to reduce performance-related anxiety per se (Gröpel & Mesagno 2019). In contrast, adherents to stress regulation explanations of performance deficits under pressure have generally sought to help athletes manage demands that are perceived to be stressful (Murdoch et al. 2021).

From an attentional perspective, recent research using eye-tracking technology has examined the nature of athletes' gaze prior to and during task execution. Research on the quiet eye has identified not only that experts display longer and steadier gaze prior to skill execution (e.g., basketball free throw) but also that this gaze differentiates between successful and unsuccessful performances within individuals ($d = 0.58$; Lebeau et al. 2016). The establishment of a quiet eye has been shown to relate to the experience of flow states (Harris et al. 2017), with some experimental work in tennis suggesting that attentional control training can mitigate inhibition, reduce distractibility, and improve motor performance (Ducrocq et al. 2016). Of particular note, a quiet eye can also be trained through intervention; in a recent systematic review of interventions designed to alleviate so-called choking, quiet eye training was identified as being among the most effective approaches (Gröpel & Mesagno 2019).

Other attention-related interventions identified in the review by Gröpel & Mesagno (2019) as being effective included preperformance routines (50% of experimental studies) and left-hand contractions (100% of experimental studies). While preperformance routines involve strategies to maintain task-related attention (through cue words, mental imagery, and external focus), left-hand contractions (e.g., squeezing a ball before task execution) are posited to prime visuo-spatial processing capabilities (Beckmann et al. 2013). In addition, when individuals were exposed to

acclimatization training (i.e., gradually increased exposure to pressure and its anxiety-invoking effects), self-focused acclimatization training showed positive effects when performing under pressure, whereas distraction-focused acclimatization resulted in worsened performance under pressure (Gröpel & Mesagno 2019). One of the strengths of this body of work lies in the high degree of ecological validity attached to these studies. Indeed, as Kingstone et al. (2008) note, the contrived pressurized environment created in a lab is unlikely to match that which occurs in real-world settings such as sport, in terms both of how pressure arises and of its intensity and duration.

A notable limitation of Gröpel & Mesagno's (2019) review is that in evaluating the efficacy of preperformance routines, the studies they analyzed comprised multimodal intervention components, making it difficult to discern the effects of specific subcomponents. For example, while the studies coded as utilizing preperformance routines used cue words to direct participants' attention, they also included other strategies such as relaxation. A separate, but closely related, body of research has sought to examine the efficacy of self-talk interventions to optimize athlete attention (Hardy 2006, Hatzigeorgiadis et al. 2011). The directed use of overt and covert self-statements (i.e., self-talk) has been extensively used within clinical and counseling settings. In the athletic domain, instructional self-talk is regularly used to direct performers to attend to task-relevant cues; meta-analytic evidence indicates that self-talk interventions in sport (not accompanied by other attention-regulation strategies) produce a medium-sized effect ($d = 0.48$; Hatzigeorgiadis et al. 2011) on performance outcomes. Such interventions were found to work with both beginners and experienced athletes, with no differences occurring if the self-talk was self-selected or assigned, and they worked well with both novel and well-learned tasks (although the effects were more pronounced when undertaking novel tasks; $d = 0.73$). Of note, those interventions were more efficacious when participants received some training in self-talk ($d = 0.80$) in comparison to when no training was provided ($d = 0.37$; Hatzigeorgiadis et al. 2011). Despite evidence for the effectiveness of self-talk in sport settings, much more work is needed to elucidate explanatory mechanisms that account for, and mediate, those effects (Galanis et al. 2016).

While the above research points to the efficacy of attention-directed strategies to optimize performance while under pressure, a separate body of work has sought to examine the efficacy of stress regulation strategies as a means of supporting athlete functioning. In a recent meta-analysis of interventions that were evaluated in sport settings using randomized controlled trial designs, Murdoch et al. (2021) found that stress regulation interventions resulted in a significant medium-sized effect ($g = 0.52$) on performance outcomes. The review included controlled experimental studies that used biofeedback, cognitive strategies designed to regulate athletes' interpretations of stressors (e.g., reappraisal of symptoms), mindfulness/meditation, multimodal strategies, and relaxation training. The results of moderation analyses revealed medium-to-large and large effects, respectively, for multimodal ($g = 0.67$) and biofeedback ($g = 1.05$) approaches, although the authors also noted that the nonsignificant effects for the remaining strategies were likely a result of the analyses being underpowered. Although much more work is clearly needed to examine the robustness of these effects, and in particular the psychological mechanisms that might account for these performance improvements, it appears that stress regulation interventions represent a promising means of supporting athletes when confronted with performance-related stressors. Such findings would also appear to have practical relevance for those involved in the performing arts (dance, theater) or public speaking, where performers are frequently confronted with (perceived) performance-related stressors.

As a final observation, although research shows that efforts to help athletes regulate their engagement with stressors (e.g., cognitive reappraisals) appear to be beneficial (Murdoch et al. 2021), there is also insightful evidence that some of the most successful performers actually seek out, and thrive on, anxiety-invoking contexts offered by high-pressure sport. In their Great

British medalists project, Hardy et al. (2017) found that over half of the superelite athletes that comprised their study displayed a counter-phobic attitude, whereby they reported actively seeking out, and being drawn toward, anxiety-provoking situations. It remains to be seen how prevalent the existence of counter-phobic attitudes might be within competitive sport, whether such attitudes causally contribute to athletic achievement, and whether (if found to be facilitative) they can be developed through intervention.

GROUP PROCESSES AND ATHLETIC ACHIEVEMENT

In sports, human behavior involves a considerable degree of interdependent and conjoint interaction, which allows researchers to examine how teams can optimize their pooled/collective resources and the mechanisms that drive individual and collective achievement. A foundational question that has beset researchers with an interest in sport performance (as well as those from the field of organizational psychology) is how to build successful teams by selecting and then training team members to become cohesive and effective units. Recently, researchers have sought to ascertain whether the accumulation of talent within sports teams is beneficial, or whether at some point the addition of more talent might have adverse effects on team performance (Gula et al. 2021, Swaab et al. 2014). That is, can there be too much talent on a given team? With this in mind, Swaab et al. (2014) presented a series of studies involving international soccer teams qualifying for the 2010 and 2014 FIFA World Cups, teams in the National Basketball Association (NBA), and teams in Major League Baseball (MLB), and they examined the nonlinear relations between intra-team talent and team performance. They found that for interdependent teams (basketball and soccer), performances increased to a certain point with more talent, but then the marginal benefits of intra-team talent decreased and, in a curvilinear manner, turned negative. They also examined team coordination as a mechanism that might explain those effects, using the NBA data, and reported evidence for mediation. That is, teams with high levels of talent underperformed due to depleted coordination. No support was found for the too-much-talent effect among baseball teams, which the authors explained with the fact that those teams require less interdependence and coordination among members.

These findings received notable attention, even leading some to suggest that they could inform (interdependent) team selection in workplace settings, as they highlighted the downside of building teams with too many stars (Galinsky & Schweitzer 2015, May 2014). Against this backdrop, and other too-much-of-a-good-thing arguments in several areas of psychology (Busse et al. 2016, Stavrova & Ren 2021), Gula et al. (2021) reexamined the too-much-talent effect using (but also extending) the original data set of Swaab et al. (2014) across 64 seasons in the NBA, and they found that the original conclusions of Swaab and colleagues likely reflected a methodological artifact associated with modeling quadratic functions (rather than operationalizing log functions) when the data are sparse beyond the apex of a curve. Gula et al. (2021) pointed out that, although the relation between intra-team talent and team performance was curvilinear in nature, the analyses did not support the contention that the existence of more intra-team talent has a negative effect on coordination or team success. Of relevance to other disciplines (e.g., organizational psychology), the authors concluded that the too-much-of-a-good-thing phenomena in other contexts involving human behavior might be underpinned by the same methodological confound.

Beyond the methodological contributions of this work, the curvilinear effects reported by Gula et al. (2021) between intra-team talent composition and team performance (albeit with notable heterogeneity) also point to other interpersonal and team factors, beyond member talent, that might contribute to team success. The study of intra-team coordination and of the motivation losses (e.g., social loafing) and gains derived from competing in groups has a rich history in sport

settings, the origins of which can be traced to the early work of Triplett (1898) with cyclists. Although evidence has emerged showing effort losses when athletes compete with others (e.g., in relay teams) compared to competing on their own (Neugart & Richardi 2013), more nuanced insight has emerged related to the boundary conditions that might differentially explain both effort losses and effort gains within (sport) teams.

In one study that comprised 302,576 individual and relay swimming races, Hüffmeier et al. (2017, study 1) compared relay swimming efforts relative to individual swimming performances at elite levels (e.g., Olympics, world championships, European championships) and subelite levels (e.g., national or local championships), controlling for whether teams had a likely high expectation for a particular outcome in a given race (operationalized as finishing in the top four versus the fifth place or lower). What they found at the elite level (operationalized as a high valence condition) was that, among teams with a likely high expectation of success, the relay member in position 1 performed worse (relative to their individual performance), the team members in positions 2 and 3 displayed small improvements, and the team member in position 4 displayed marked improvements in performance (even after controlling for reaction time differences between individual and relay competitions). In contrast, among teams with lower likelihood of a successful outcome at the elite levels (high valence condition), athletes in the starting relay position swam comparable times to those of their individual performances, whereas the remaining swimmers performed worse than in their individual swims. Hüffmeier et al. (2017) concluded that working in action teams (especially those in which performance occurs within a short time frame) can be highly motivating, provided that there is a reasonable chance of achieving positive team outcomes.

In addition to the insights derived from examining intra-team talent composition and the potential synergistic effects among members of sports teams, research in sport settings has yielded notable perspectives on how athlete leaders can foster the confidence and embodied performance of other athletes by building a sense of shared identity. In two experimental studies, Fransen et al. (2015, 2016) sought to examine the efficacy contagion effects that occur when athlete leaders display confidence in their teammates. In a basketball (Fransen et al. 2015) and a soccer (Fransen et al. 2016) setting, the researchers had athlete leaders (as confederates in the studies) display either high or low confidence in the capabilities of their teammates, who formed four-member teams. In the basketball study, performance was operationalized in terms of team members' performance on a free-throw shooting competition (which was presented to participants as a national competition). In the soccer study, performance was operationalized via a dribbling and shooting task. Teams in which the athlete leader displayed confidence in the team subsequently displayed improved collective efficacy, via a confidence contagion effect, as well as improved athletic performance. In addition, the extent to which team members socially identified with the team (by expressing a sense of "us") mediated the effects of leaders' confidence in the team on collective efficacy. When one thinks of the most influential social agents that operate within sport settings, one invariably thinks of the role of the coach. What these data indicate is that athlete leaders are able to substantively foster confidence in other team members and to nurture the performances of team members by encouraging them to identify strongly with the team.

Whereas the body of work described above centers on the bright side of group processes that can facilitate athletic motivation and behavior, other noteworthy work points to the potentially deleterious, or the dark side, of team and cultural factors in sport. Research using archival data of mountaineering teams revealed that cultural factors related to status hierarchies can explain both success and adverse events in these high-stakes teams (Anicich et al. 2015, study 2). Specifically, teams (but not solo expeditions) from countries with hierarchical cultural values had more climbers reach the summit of Himalayan expeditions than teams from countries with egalitarian values, but in so doing they also exhibited greater mortality levels. Comparable experimental data

Efficacy contagion effect: transmission of efficacy beliefs from one social agent to another through interpersonal cues and communication

(Anicich et al. 2015, study 1) with expert climbers from 27 countries indicated that hierarchical team cultures can improve intra-team coordination but also thwart psychological safety and intra-team communication processes when compared to egalitarian team cultures.

In relation to sports characterized by intergroup competition, Christie & Barling (2010) examined how team status hierarchies affected individual performance and health outcomes among NBA players over a 6-year period. Athlete status was operationalized using five indicators in each season (salary, games started, tenure, awards/recognitions, and celebrity status) and was modeled in relation to objective measures of athlete performance (player's efficiency and player's contribution to team wins). Those performance measures comprised established performance indicators such as points scored, rebounds, assists, blocked shots, steals, and free throws. Status inequality was assessed via the dispersion of status indicators on each team. Christie & Barling (2010) also assessed the extent to which players accumulated suspensions and game ejections as an indicator of player transgressions (i.e., uncooperative behavior). Several findings are of note. In particular, after controlling for relevant covariates (e.g., past performances), low-status athletes who were on teams that displayed high status inequalities displayed depleted performance over time. Interestingly, on teams that had low status inequalities, performance levels did not suffer among those in low-status positions. In addition, the relations between athlete status, intra-team status distributions, and personal performance outcomes were moderated by whether athletes engaged in transgressive/uncooperative behaviors. Specifically, when low-status members engaged in more transgressive/uncooperative behaviors (e.g., they received more suspensions), the effects on depleting their performance levels were more pronounced when they were on teams with high intra-team status inequalities (i.e., greater dispersion of inequalities among members) than when they were on teams with lower inequalities. The finding was also augmented by additional analyses, which found that low-status athletes were absent more often (due to illness and injury) when they engaged in transgressive behaviors in teams with greater inequalities than when they were part of teams with fewer inequalities. These findings, using objective performance and health data (based on multiple indicators), reveal how low-status members suffer on teams characterized by greater inequalities. While these data explain how intra-group status inequalities might impair both task performance and member health among high-performing teams, they also point to potential ways in which such disparities might affect the daily functioning and well-being of minority group members within other action teams (e.g., medical units). Such issues are certainly worthy of future investigation.

COACHES AS CATALYZING AGENTS OF ATHLETE ENGAGEMENT

Perhaps unsurprisingly, the study of coaches and coaching behaviors has received notable attention with regard to their capacity to support or undermine the healthy psychological functioning of athletes under their guidance. Jowett (2017) has argued that the quality of the coach-athlete relationship is the defining characteristic of coaching effectiveness and proposed a 4C model that identifies four key components of such a relationship: closeness (affective bonds), commitment (intention to remain in the partnership), complementarity (behavioral displays of cooperation and reciprocity), and co-orientation (alignment/similarity between coach and athlete in their perceptions of closeness, commitment, and complementarity). In reviewing an extensive line of research using the Coach-Athlete Relationship Questionnaire (Jowett & Ntoumanis 2004), Jowett (2017) reported that athletes who experience better-quality relationships with their coaches tend to receive better-quality coaching, are more motivated, and tend to display improved physical self-concept; at the group level, they display enhanced team cohesion and collective efficacy. This finding holds direct parallels with research in organizational settings, which suggests that the quality of leader-follower relations provides important cues to followers about both person-organization fit and person-job

fit, which in turn catalyze improved occupational work behaviors and performance (Badawy et al. 2019).

Research based on achievement goal theory (Ames 1992, Nicholls 1989) has shown that when coaches emphasize self-referent improvement among their athletes by developing task-involving climates, those athletes tend to exhibit adaptive developmental behaviors (e.g., behavioral investment) when compared to athletes whose coaches emphasize norm-referent comparisons (i.e., being better than other athletes). As one illustration, Ntoumanis et al. (2012) found that when coaches created task-involving climates within their teams, this was prospectively related to intraindividual change in prosocial attitudes over the course of a year and also explained between-athlete differences. That is, the effects of task-involving coaching not only accounted for differences between athletes on different teams but also explained changes in prosocial attitudes that developed among athletes over the course of a season. The development of task-involving coaching climates also predicted reduced athlete burnout, whereas ego-involving coach climates (i.e., emphasis on normative superiority) predicted increased adolescent athlete burnout (Ntoumanis et al. 2012).

Consistent with evidence from these observational longitudinal studies, experimental research underpinned by achievement goal theory has demonstrated that when coaches promote athlete mastery, this results in lower levels of athlete (cognitive and somatic) performance-anxiety indicators at the end of the season compared to preseason levels and to control athletes (Smith et al. 2007). A more recent experimental study by Fransen et al. (2018), combining social theory identity (Haslam et al. 2011) and self-determination theory (SDT) (Ryan & Deci 2017) perspectives, examined the effects of motivational feedback in relation to psychological needs satisfaction and task execution among adolescent athletes engaged in a highly interactive basketball task. Participants were randomized to a control condition or one of three experimental conditions in which a coach (research confederate), athlete leader (via instructions from the coach), or both coach and athlete leader provided motivational feedback to team members. When athletes were provided with feedback by the coach or the athlete leader, this resulted in increased psychological need satisfaction (competence), self-determined motivation, and improved objective measures of performance. Interestingly, objective performance was optimized when both coaches and athlete leaders provided motivational feedback (i.e., through an augmentation effect).

In contrast to this work that points to some of the ways in which coaches can catalyze and support athlete achievement, objective behavioral data from professional sports also illustrate how coaches can markedly impede successful athlete functioning. For example, consistent with a social learning perspective (Bandura 1986), Carleton et al. (2016) sought to examine whether displays of abusive leadership by NBA coaches were mirrored in athletes' own displays of aggressive behavior (assessed through technical fouls) and resulted in depleted performance among athletes. Performance was assessed using the same objective performance indicators as in Christie & Barling's (2010) study described earlier, with aggressive behavior assessed via technical fouls and abusive leadership operationalized via analyses of coach biographies. Using multilevel longitudinal modeling, Carleton et al. (2016) found that after controlling for covariates (e.g., tenure, salary, team winning percentage, absence due to injuries), when athletes were exposed to abusive leadership, this was associated with increased displays of athlete aggression and lowered task performance that persisted across the span of players' careers. Much of the previous work on abusive leadership within organizational settings has been based on self-report measures of leader behavior and used cross-sectional research designs (Martinko et al. 2013). This work thus provides evidence that the pernicious effects of abusive leadership on salient athlete outcomes (including performance) may be long-lasting in nature.

SDT: self-determination theory

Interpersonal style of communication:

verbalizations and behaviors that are supportive, thwarting, or indifferent to athletes' psychological needs

Research on coaching influences in sport has also drawn from SDT to examine how coaches' interpersonal styles of communication influence athlete motivation and well-being. Early work in the wider SDT literature distinguished between autonomy-supportive (similar to democratic) and controlling (similar to autocratic) interpersonal communication styles (Deci & Ryan 1985). Often the two styles were treated as opposite ends of the same continuum, with high scores of autonomy support treated as indicative of low controlling style. Bartholomew et al. (2010) argued that coaches may use both controlling and autonomy-supportive communication to different degrees (for example, a coach may use intimidation techniques but may also provide a clear rationale for their demands, which is a facet of autonomy support). Bartholomew and colleagues showed that a controlling coaching style is multidimensional, and they developed a questionnaire to assesses four dimensions: controlling use of rewards, conditional regard, intimidation, and excessive personal control. They demonstrated that these dimensions were only moderately correlated with autonomy support (with r ranging from -0.18 to -0.50). Curran et al. (2016) showed that perceptions of coach autonomy support and control had implications for athlete engagement. Testing a three-wave model with data collected at the beginning, middle, and end of a competitive soccer season, they found that perceived coach autonomy support at the beginning of a season predicted increases in athletes' end-of-season behavioral engagement, via the mediation of mid-season psychological need satisfaction. In contrast, perceived beginning-of-season coach control predicted reductions in end-of-season athlete engagement via reduced mid-season psychological need satisfaction. In a field experiment, Cheon et al. (2015) assigned 33 coaches and their 64 athletes from 10 sports, who were preparing for the September 2012 London Paralympic Games, into either an autonomy-supportive or a control group. Athletes in the intervention group reported stable scores on motivation, engagement, and functioning from mid-June to early August 2012 (in contrast to those in the control group, who experienced significant reductions in these measures) and won significantly more Olympic medals.

This work in sport influenced subsequent research in the SDT literature in other life domains (e.g., teaching, Amoura et al. 2015; parenting, Laurin & Joussemet 2017), which has operationalized autonomy support and control as orthogonal constructs. More recently, the labels of these two constructs have been changed to need support and need thwarting, respectively (Ryan & Deci 2017), as these styles are purported to influence individuals' basic psychological needs for competence and relatedness, not just for autonomy.

More recently, evidence has emerged in the sport domain that a third type of communication style should be assessed, which is neither supporting nor thwarting of the three psychological needs identified in the SDT literature. Bhavsar et al. (2019) advocated for and provided empirical evidence for an interpersonal style that is need indifferent. These authors argued that conceptualizations and measurements of interpersonal styles in the wider SDT literature did not distinguish between styles that suppress others' psychological needs (e.g., coaches punishing athletes) and styles that are passive or indifferent to those needs (e.g., coaches being emotionally distant). As an example, Bhavsar et al. (2019) referred to the construct of chaos, which has been regarded in the parenting literature as a facet of need thwarting (Skinner et al. 2005). A chaotic style is unstructured and inconsistent; although it might slow down skill development, it is not a style that actively undermines others' psychological needs. Hence, a chaotic style is more representative of a need-indifferent than of a need-thwarting communication. Expanding theory and measurement in the SDT literature, Bhavsar et al. (2019) argued that interpersonal styles can be distinguished in terms of their function (support, thwarting, indifference).

In a series of three studies, Bhavsar et al. (2019) provided validity evidence for scores derived from a scale that assesses athletes' perceptions of overall need-supportive, -indifferent, and -thwarting coach styles. Bhavsar and colleagues also showed that a need-indifferent style is likely

to be less motivationally damaging than a thwarting style but more detrimental than a supportive style (e.g., in terms of cognitive interference and dedication to sport). This is because a need-indifferent style does not actively undermine athletes' psychological needs as a need-thwarting style does, but at the same time it does not foster those athlete needs to the degree that a need-supportive style does. Evidence for the role of a need-indifferent style is also emerging in other life domains. For instance, as in Bhavsar et al.'s (2019) study, a three-factor (need-supportive, -thwarting, and -indifferent) model structure was the best fit to the data provided by several samples of English- and French-speaking employees who rated their supervisors' communication styles (Huyghebaert-Zouaghi et al. 2022).

A related line of work in the SDT literature in the sport domain has focused on the satisfaction and frustration of athletes' psychological needs. Similar to the aforementioned work on the distinction between autonomy support and control, Bartholomew et al. (2011b) argued that the satisfaction and frustration of the three psychological needs discussed in the wider SDT literature (autonomy, competence, and relatedness) should be measured as independent constructs. Up to that time, the measurement of the three needs was confined to items that tapped their satisfaction only, with the assumption being that low scores on these items are indicative of need frustration. Bartholomew and colleagues provided empirical evidence that the frustration of each of the three needs can be measured independently of their satisfaction. Consequently, Bartholomew et al. (2011a) provided evidence for "bright" and "dark" motivational pathways. Specifically, athletes' perceptions of coach autonomy support predicted athletes' psychological need satisfaction, which in turn was associated with positive outcomes such as vitality and positive affect. In contrast, perceptions of controlling coaching predicted athletes' need frustration, which in turn was associated with maladaptive outcomes, namely feelings of burnout, disordered eating patterns, depression, negative affect, and immunological markers of elevated arousal. The distinction between the bright and dark sides of psychological needs now features prominently in the SDT literature (e.g., Ryan & Deci 2017), with applications in education, parenting, work, and interpersonal relationships (e.g., Longo et al. 2016, Vanhee et al. 2018, Vansteenkiste et al. 2020).

CONCLUSION

Sport pervades cultures, continents, and indeed many facets of daily life. Although the study of athletic endeavor has accelerated in recent years, much remains to be understood. In this review, we began with an analysis of early-life experiences, with one of the most telling (and practical) findings relating to the role of sport diversification in supporting both athletic excellence and the adoption and maintenance of health-enhancing physical activity at a population level. Indeed, if one is concerned with supporting the long-term development of youth, there appear to be no substantive advantages associated with encouraging early specialization. What is less clear are the exact mechanisms (i.e., mediators) responsible for these effects. While involvement in a variety of activities appears to be the psychological spice for a healthy and successful (sporting) life, it would seem important to ascertain whether multidomain involvement fosters cross-domain (visuo-spatial, motor skill, and social) learning, protects against burnout, or supports long-term achievement via other intermediary processes. Such insights would have important implications for talent development in sport and, more broadly, child development.

From an intrapersonal perspective, there appear to be a cluster of psychological processes that allow athletes to thrive. These include striving for excellence, provided that such pursuits are not accompanied by perfectionistic concerns, and holding firm efficacy beliefs, provided that individuals have sufficient information to ensure those beliefs are well grounded. There also exist a range of psychological strategies that allow athletes to perform under the glare of competition.

Intensive longitudinal method (ILM): the collection of many repeated observations from the same participant(s) to examine within-person processes in everyday settings

Just-in-time adaptive intervention (JITAI): an intervention that involves providing the right support at an optimal time to derive a desired effect

Some appear to be widely used, such as preperformance routines, but others, such as quiet eye training, would appear more novel. Nevertheless, given the efficacy of these strategies to buffer against choking (Gröpel & Mesagno 2019), they have the potential to be applicable in a range of performative settings where motor skill failure occurs when under pressure. The reviewed work on motivational regulations also points to some of the motivational processes needed to succeed when performers are confronted with goals of increased difficulty. It should also be noted that work on goals in the athletic domain is surprisingly underdeveloped, with most field-based experimental studies suffering from small sample sizes and failing to examine the active ingredients of effective goal setting (via moderator analyses).

The highlighted research on groups provides useful insights, using big data based on objective measures from professional sports, to illustrate how status inequalities in relation to other group members can impair both athletes' day-to-day functioning and their well-being (Christie & Barling 2010), as well as how prior conclusions related to intra-team talent dispersion might be misplaced (Gula et al. 2021). This work also highlights the utility of shared/distributed leadership as being advantageous for group achievement, which would appear to have clear relevance for many occupational/work settings (Fransen et al. 2015, 2016, 2018). Finally, with regard to the role of the coach, the evidence points to the capacity of coaches to shape prosocial attitudes among athletes (Ntoumanis et al. 2012) and support their basic psychological needs (Bartholomew et al. 2011a) as well as athlete engagement (Curran et al. 2016). Against this backdrop, evidence from the coaching realm in youth and professional sports points to the capacity of abusive coaches to impair the long-term health and functioning of the athletes under their charge (Carleton et al. 2016).

Notwithstanding the insights derived from this body of work, a number of methodological challenges confront researchers interested in studying the psychology of athletic endeavor. Below we discuss some of these challenges, identify potential solutions, and also provide an overview of pressing directions for future research. From a methodological perspective, many of the psychological processes involved in athletic pursuits fluctuate over relatively short time periods (within and across training periods as well as prior to, during, and following competition), and yet the field has largely been slow to examine micro-temporal psychological processes and how these relate to discrete athletic behaviors (Reifsteck et al. 2021). Recent advances in the use of intensive longitudinal methods (ILMs) have considerable potential to enable researchers to better understand how dynamic psychological processes emerge, change, and/or relate to one another over time (Ryan et al. 2018). Some recent research from the field of health psychology, for example, has examined the nature and direction of various psychological processes, such as affective states, in relation to the pursuit of moderate-to-vigorous-intensity physical activity using continuous-time modeling. This work has revealed that when data are collected using ILMs, and subjected to continuous-time modeling, incidental affect (i.e., affect experienced prior to, or following, a bout of exercise, but not affect experienced during exercise) may be a stronger predictor of physical activity than physical activity is a predictor of subsequent incidental affect (Ruissen et al. 2022). Using ILMs, research can shed light on any temporally lagged effects (and feedback loops) in the relations between psychological experiences and behavioral responses, and it can examine the trajectories of psychological processes during training and/or competition in sport as well as the cross-lagged effects (and feedback loops) of those psychological processes in relation to engagement behaviors (Ruissen et al. 2021).

Relatedly, the use of ILMs also has the potential to substantively inform the delivery, and evaluation, of more targeted person-centered interventions (Ryan & Hamaker 2022). As one example, just-in-time adaptive interventions (JITAI) have emerged in recent years, primarily within the field of precision medicine, as a way to deliver behavioral change techniques and to support the specific needs of the recipient at the most optimal time (Hekler et al. 2020). In a practical sense,

sport coaches often deliver messages to their athletes during training and competition, on an ongoing basis, with a goal of influencing athlete cognition, emotion, and behavior. Yet limited research has sought to explicate the effects of such JITAIs on salient athlete outcomes. Although logistical, design, and analytic challenges will invariably confront researchers interested in evaluating the micro-temporal effects of JITAIs in supporting athletic endeavor, by fully embracing these challenges research in the field has considerable potential to inform a better understanding of what (intervention) works, under which conditions, and for whom (Nahum-Shani et al. 2018).

A final example of the substantive methodological challenges that confront researchers interested in the psychology of athletic endeavor concerns the adversarial nature of competition, something that does not exist (at least to the same extent) in other achievement settings. Of course, considerable research on teamwork has been conducted in occupational settings, including education (Rosenfield et al. 2018), health care (Rosen et al. 2018), and emergency response teams (Power 2018), yet those teams do not directly compete against other teams. In contrast, in sport, those opposing teams typically change from one week to the next. This often requires the pursuit of different strategies (or teamwork execution processes) in order for teams to effectively compete against a changing opposition. Interestingly, at the athlete level, some evidence (using data from the NBA, National Hockey League, and major European soccer leagues) indicates that professional players tend to perform better against their former clubs (Assanskiy et al. 2022), with the authors speculating that emotion and motivational factors might account for these effects. At a minimum, this suggests that psychological factors related to athlete engagement might vary depending on the nature of one's opposition. Although researchers interested in isolating the effects of psychological processes on athlete behavior often effectively account for the effects of physical capabilities and skills (e.g., Mukherjee et al. 2019), few studies account for the dynamic and changeable nature of the opposition when operationalizing a study's dependent measures (e.g., athletic motivation, performance).

As a complement to considering (and addressing) the methodological challenges described above, we highlight some pressing lines of research that have the potential to further the field's understanding of the psychology of athletic endeavor. Previous research in the health domain has sought to directly compare multiple, and potentially competing, interventions in relation to promoting behavior change (Milkman et al. 2021). In a similar regard, research on supporting athletic endeavor would appear well placed to directly compare competing/alternate theories and intervention strategies. A notable example corresponds to the distinct mechanisms, and corresponding interventions, purported to explain how athletes can function optimally under pressure. As highlighted earlier, some evidence exists for the role of attentional processes and interventions to prevent athletes from choking (Gröpel & Mesagno 2019), while a separate body of work points to the utility of athletes' regulation of their engagement with stressors to support performance (Murdoch et al. 2021). With this in mind, it would seem particularly worthwhile to compare directly the efficacy of these separate approaches and potentially combine them by both harnessing stress regulation strategies and utilizing attention control strategies.

In addition, sport is often used as a metaphor for other life contexts (especially within the field of organizational psychology), and yet the transference effects derived from sport are often not evaluated in those comparative domains. While we would agree that sport represents a viable "living laboratory" (Furley 2019) through which human behavior can be studied, it is critical that phenomena examined in sport be directly studied *in situ* in those other contexts. In addition, sport is a domain in which ideas, theories, and models from psychology could be blended with those from other disciplines such as anthropology, sociology/cultural studies, history, marketing (e.g., soccer as a global brand), and even criminology (e.g., illegal sports betting). As one example, the gesture of Colin Kaepernick taking a knee in protest against police brutality in the United States played

a prominent role in shaping public opinion (Stepp & Castle 2021). From an athlete development perspective, it would seem worthwhile to examine the extent to which actions by prominent role models such as Colin Kaepernick contribute to athletes' social justice discourse/activism within the domain of sport itself but also more broadly, across society, in relation to child/youth development. In a similar regard, in recent years there have been several high-profile cases of athletes dealing with, and talking about, their mental health challenges (e.g., Longman 2021, Newberry 2018), with several promotional campaigns drawing directly from athletes' voices to normalize help-seeking behaviors among the general public (Bell Can. 2020). With this in mind, it would seem valuable to examine the extent to which norms related to the evolving landscape of mental health in Olympic and professional sports might translate into improving help-seeking efforts both within and outside of the sports.

On a directly related note, given the pervasive impact of the COVID-19 pandemic on the health and well-being of societies across the globe, it would be remiss not to reflect on how this global event has revealed insights into the psychology of athletic endeavor. Initial evidence from the pandemic pointed to the depleted mental health of athletes during this period, mirroring what was being observed among nonathlete populations (McGinty et al. 2020), with athletes reporting increases in negative emotions (e.g., depression) and impaired sleep quality (Jurecka et al. 2021, Roche et al. 2022). By the middle of 2020, many (professional) sports implemented the use of biologically secure environments to enable athletes to compete by restricting them from interactions with the outside world (to prevent virus contagion). Early reports emerged of athletes displaying impaired mental health when confined to such "bio-bubbles," with the prominent basketball player LeBron James commenting that "I would be lying if I sat up here and [said I] knew that everything inside the bubble, the toll that it would take on your mind and your body and everything else, because it's been extremely tough" (Tennery 2020). Although some evidence exists that coaches were able to play an important role in buffering against intrusive (pandemic-related) cognitions in relation to mental health outcomes (Sun et al. 2022), the COVID-19 pandemic notably revealed that the effects of social isolation on depleted mental health previously found among nonathlete populations (Holt-Lunstad et al. 2015) can also emerge among otherwise healthy professional athletes (Roche et al. 2022). This finding also reinforces the notion that factors outside of sport can have notable effects on the psychology of athletes within the sport arena. Whether this relates to examining the effects of the pandemic on athlete functioning or other extraneous variables, future research is warranted that examines how various life events outside of sport affect the psychological functioning of athletes in training and competition.

Another worthwhile direction for future research is examining the psychological processes involved in e-sports. By 2023 it is estimated that there will be over 3 billion gamers (Statista 2022), which is over a third of the global population. Some highly innovative work has started to emerge in relation to the psychological factors implicated in e-gaming (Mukherjee et al. 2019, Trotter et al. 2021). For example, Mukherjee et al. (2019) found across multiple professional sports (basketball in the NBA, soccer in the English Premier League, cricket in the Indian Premier League, baseball in the MLB, and the e-sport called Defense of the Ancients) that after controlling for the skills of individual members, the act of sharing in prior success among members of sports teams contributed to subsequent success. This study provided comparable evidence in an e-sport setting to that derived from other professional sports, and it highlighted the potential viability of expanding the study of human behavior in competitive settings to e-sports and of sampling a demographic who may be less interested in traditional sports.

Finally, given its widespread appeal, sport has the potential to derive positive change at the societal level. For example, in a particularly innovative study, Mousa (2020) randomized Iraqi Christians displaced by the Islamic State to either an all-Christian soccer team or a team mixed

with Muslims. She found that a soccer-based intervention improved Christians' behaviors and attitudes toward their Muslim peers. Although those prosocial behaviors and attitudes did not transfer to other social settings outside of the soccer context, the results suggest that competitive sport settings could be structured to mitigate divisions between otherwise adversarial groups. Given the increased divisiveness that appears to have emerged in recent years, especially across North America (Rathje et al. 2021), sport may have the potential to foster achievement behavior and health as well as to facilitate greater empathy and understanding among those with distinct social identities. Addressing such a pressing issue would certainly seem to be a challenge worth pursuing by those interested in sport and/or in enhancing societal cohesion.

SUMMARY POINTS

1. This review synthesizes research on the developmental, intraindividual, coach-related, and group-based psychological factors that contribute to athlete functioning in sport.
2. Competitive sport frequently allows for the collection of vast amounts of behavioral data, based on objective measures, that can be used to facilitate a greater understanding of psychological factors that contribute to athletic endeavor and, potentially, human behavior more generally.
3. From a developmental perspective, early-life experiences play an important role in supporting athletic achievement, with long-term success underpinned by athletes' engagement in diversified sporting pursuits.
4. The review revealed the importance of several intrapersonal psychological processes that can contribute to athlete functioning, such as the use of goal engagement, disengagement, and reengagement strategies; attentional control; and stress regulation techniques to enable athletes to perform under pressure.
5. Some intraindividual psychological constructs reveal complex relations with indices of athlete achievement. For example, the within-person relations between self-efficacy beliefs and performance outcomes are contingent on the availability of sufficient information to judge one's capabilities, and perfectionism can both drive achievement outcomes and impair athletes' psychological health.
6. Research on group processes in sport has revealed unique insights into the relations between team composition and achievement outcomes, synergistic effects among athletes within interdependent teams, and the extent to which athlete leaders can facilitate efficacy contagion by fostering a sense of social identity.
7. Research illustrates the "bright" and "dark" motivational pathways through which coaches can support and frustrate the psychological needs of athletes as well as the mechanisms through which coaches can nurture athletes' prosocial attitudes and engagement behaviors.
8. We suggest that research would benefit from a greater recognition of the dynamic nature of the psychological processes that exist in sport and from embracing recent methodological advances such as intensive longitudinal methods to examine (a) the time-bounded relations between psychological factors and athlete functioning in situ and (b) the efficacy of interventions that are delivered to optimally meet the specific needs of athletes when they might need them most.

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