

SELF-DETERMINATION THEORY AND INJURY-MITIGATING HEALTH BEHAVIOURS AND OUTCOMES IN PHYSICALLY DEMANDING PERFORMANCE SETTINGS: A SYSTEMATIC REVIEW

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ABSTRACT

Introduction: Musculoskeletal injuries (MSKIs) are prevalent across physically demanding performance environments, including competitive sport and high-demand occupations, impacting health, performance and organisational operations. Self-Determination Theory (SDT) can be applied within these contexts to understand how motivational regulation impacts injury risk and protective behaviours. However, SDT research and its constructs in relation to injury-related processes and outcomes have not been consolidated to inform interventions. Therefore, this systematic review investigated associations between SDT motivational constructs and injury-mitigating health behaviours and outcomes in physically demanding performance settings. **Methods:** A search of five electronic databases identified studies published between 1985 and 2026 involving participants (≥ 16 years) in sport or occupational performance contexts. This yielded 10,838 studies, with 26 studies meeting the inclusion criteria across sporting, military, police and firefighter settings. **Results:** Autonomous motivation and basic psychological need satisfaction were consistently associated with greater engagement in injury-mitigating health behaviours, protective practices, lower injury risk and improved rehabilitation outcomes. Models through which these mechanisms might occur are presented. Evidence is presented suggesting individuals may internalise health-directed goals despite external demands, allowing autonomous and controlled motivations to coexist. We therefore propose a contextual extension of the SDT process model in which positive agentic engagement may support the translation of internalised health behaviours into effective injury mitigation. **Conclusion:** Although the evidence base was limited by predominantly self-reported, cross-sectional designs, restricting causal inference, this review provides a foundation for future longitudinal research and the development of theory-informed injury mitigation interventions in physically demanding performance settings.

KEYWORDS: MOTIVATIONAL REGULATION, SELF-DETERMINATION THEORY, MUSCULOSKELETAL INJURIES, INJURY MITIGATION, HIGH-PERFORMANCE SETTING

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1. INTRODUCTION

Musculoskeletal injuries (MSKIs) represent a significant burden in physically demanding performance settings, including competitive sport and high-demand occupational contexts such as the military and emergency services¹⁻³. This review defines these settings by sustained physical exertion and high cognitive and psychological demands associated with competitive and professional roles, alongside an increased risk of MSKIs. MSKIs encompass disorders of muscles, tendons, joints, nerves, and spinal structures and are highly prevalent across sporting and physically demanding occupational populations. In athletics, MSKIs account for up to 70% of all injuries among athletes during training and competition, while in military populations, they represent approximately half of all medical discharges and affect around 20% of service personnel^{4,5}. MSKIs contribute to reduced

performance capacity, prolonged rehabilitation and economic burdens, compromising both individual well-being, operational readiness and team performance^{3,5}.

MSKIs typically arise when physical demands exceed tissue capacity, through acute events or cumulative loading⁶. Athletes must sustain peak physical condition under continuous performance pressure, whilst in physically demanding occupations—such as the military and emergency services—individuals are routinely exposed to repetitive, high-load tasks, increasing the occurrence of both acute and chronic MSKIs^{1,7}.

Beyond physical loading alone, behavioural and psychological processes are increasingly recognised as critical determinants of individual responses to these demands, shaping engagement in injury-mitigating or risk-enhancing behaviours (e.g., overtraining, inadequate nutrition and poor sleep). For this review, injury-mitigating health behaviours are defined as modifiable health behaviours and protective practices that may reduce exposure to injury risk factors or support physical preparedness, recovery, and overall health. Examples include diet quality, adequate sleep, appropriate physical activity, training and load management, and moderated alcohol consumption and smoking cessation^{1-3, 8-10}. These behaviours may influence MSKI risk indirectly through pathways involving physical preparedness, recovery, health status, and responses to symptoms, rather than directly determining MSKI occurrence.

Despite well-established physical risk factors for MSKIs¹, considerably less attention has been paid to the role of motivation quality that may underpin injury-mitigating health behaviours. Existing research has focused on locus of control, self-efficacy and personality traits^{8,11}. However, these approaches provide limited insight into why individuals persist in, modify, or disengage from behaviours that may influence injury risk and MSKI burden.

Importantly, physically demanding performance settings are characterised not only by high physical loads, but also by

organisational expectations, command structures, competition, or selection pressures that may externally regulate behaviour¹². In these settings, individuals may be required to continue training or performing despite fatigue—or indeed, carrying a MSKI—making the underlying quality of motivation particularly important. As such, motivation may influence whether individuals engage in adaptive behaviours (e.g., recovery, injury mitigation) or maladaptive patterns (e.g., overtraining, concealment of injury). Existing injury frameworks recognise psychological and behavioural contributions to injury risk^{6,13}, but do not specifically consider how the quality of motivation may influence engagement in injury-mitigating behaviours, providing a rationale for applying Self-Determination Theory (SDT) as a complementary lens.

1.1 Self-determination theory

SDT is a broad meta-theoretical framework comprising six interrelated mini-theories that explain different aspects of motivation and psychological functioning¹⁴. With a focus on motivation quality rather than quantity SDT provides a robust framework for exploring relationships between the specific psychological drivers of work or health behaviours, engagement in such health behaviours and protective practices relevant to injury risk, and injury-related outcomes, and has been widely applied in health literature¹⁴⁻¹⁶. Organismic Integration Theory (OIT), one mini-theory within SDT, distinguishes between autonomous motivation, in which behaviours are experienced as volitional and personally valued, and controlled motivation, in which behaviours are driven by external pressures or internal contingencies such as guilt or shame¹⁷. Applied to injury contexts, autonomous motivation may support more adaptive regulation of training and recovery, whereas controlled motivation may encourage persistence despite pain or neglect of recovery, particularly where external demands or performance pressures are prominent¹⁵.

Another mini-theory within SDT is Basic Psychological Needs Theory (BPNT), which posits that satisfying autonomy (feeling a sense of choice and volition), competence (feeling capable and effective), and relatedness (feelings supported by others)

supports autonomous motivation and well-being. Within physically demanding performance settings, organisational structures, leadership styles, coaches, and cultural norms may support or frustrate these needs, shaping motivation quality and engagement in health behaviours and protective practices. This review focuses on OIT and BPNT because they provide the most direct theoretical basis for examining motivational regulation, internalisation of health-related behaviours and protective practices, and the psychological conditions that may support these processes.

Research identifies positive associations between autonomous motivation and sustained engagement in exercise, physical performance, proactive health behaviours and rehabilitation across sport and occupational settings^{15,18-21}. Autonomous motivation has also been linked to greater self-regulation and responsiveness to physiological cues, potentially supporting adaptive responses such as modifying training load and recognising injury symptoms²². Conversely, controlled motivation may encourage short-term engagement in positive performance or health behaviours, but may be unsustainable and, in demanding performance settings with external pressures, may contribute to persistence despite pain and suboptimal health behaviours¹⁴.

Importantly, the direction of autonomous motivation may also influence injury-related outcomes. SDT suggests that well-being is supported when the content of individuals' goals is aligned with autonomous behavioural regulation, such that intrinsic goals (e.g., maintaining health and well-being) are pursued for self-endorsed reasons rather than extrinsic goals (e.g., demonstrating strength or gaining status)²³. In this context, autonomous motivation directed towards health and recovery may support adaptive behaviours such as load management and symptom reporting; conversely, when directed towards performance attainment or status, individuals may voluntarily tolerate excessive load or ignore early injury signals in pursuit of achievement. This tension may be particularly relevant in high-performance cultures, including both sport and occupational (military) settings, where norms

and expectations may reinforce perseverance despite pain²⁴.

Building on this literature, SDT may help explain how motivational regulation relates to injury-mitigating health behaviours, protective practices and outcomes across physically demanding performance settings. Although injury-related research has explored constructs such as self-efficacy and locus of control, these are rooted in distinct theoretical traditions and were not the focus of the present review, while being acknowledged for their conceptual overlap with competence and autonomy, respectively²⁵. Figure 1 presents an adapted SDT process model initially developed for exercise behaviour¹⁵, providing the theoretical foundation for considering how SDT constructs may interact to influence health behaviours and injury-related outcomes in physically demanding performance settings.

1.2 Knowledge gaps

Although SDT has been widely applied in healthcare and exercise contexts, its application to injury-mitigating health behaviours and outcomes in highly demanding physical performance settings remains limited. Emerging research across sport and high-demand occupational settings suggests that SDT constructs may be associated with engagement in injury-mitigating health behaviours, protective practices and injury-related outcomes, including rehabilitation²⁶; however, findings are fragmented and have not been synthesised systematically. To date, no systematic review has examined how motivational regulation across the self-determination continuum relates to both injury-mitigating health behaviours, protective practices, and injury-related outcomes across these settings, or how contextual factors may shape these relationships.

1.3 Objectives

The objectives of this systematic review are threefold:

(1) to systematically review associations between SDT-based motivational regulation, injury-mitigating health behaviours, protective practices and injury-related outcomes in physically demanding

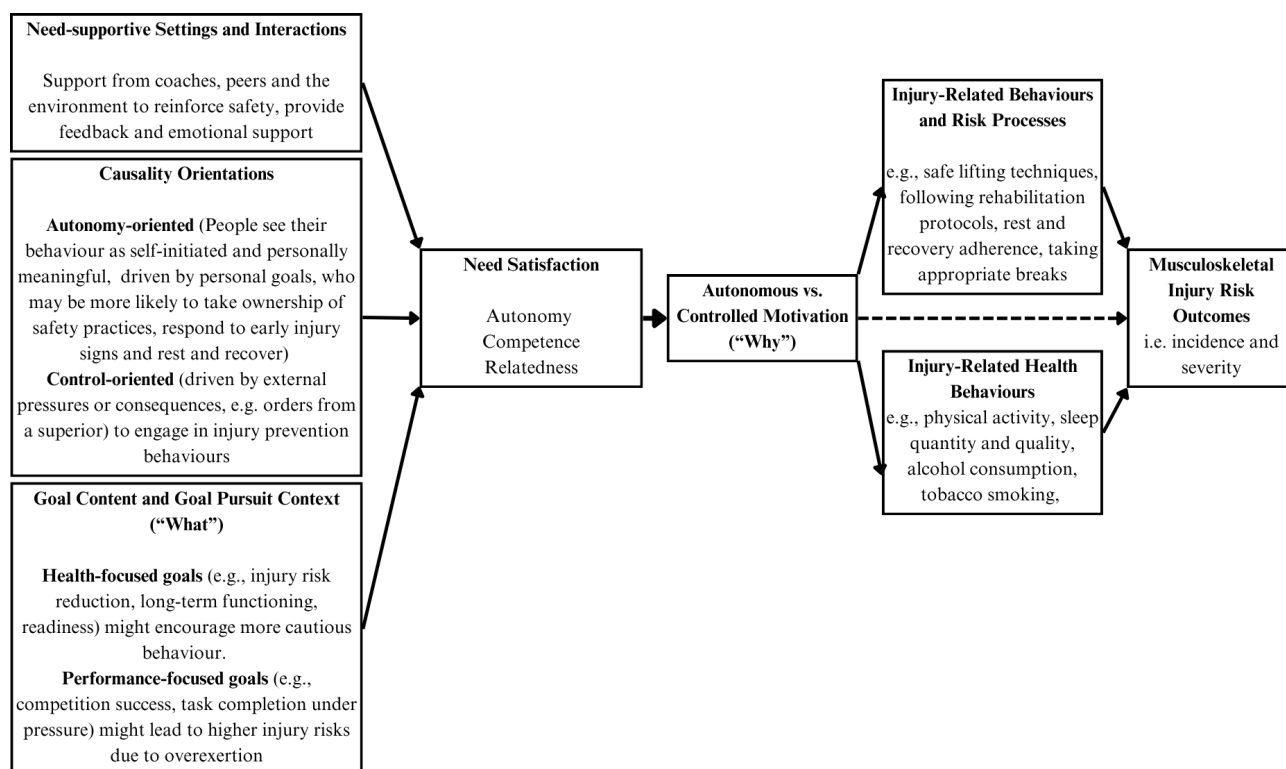


FIGURE 1. An adapted SDT Process Model illustrating proposed pathways from Self-Determination Theory constructs, injury-mitigating health behaviours, protective practices and outcomes in physically demanding performance settings¹⁵.

performance settings;
 (2) to explore whether these associations differ according to the quality of motivational regulation (i.e., more autonomous versus more controlled); and
 (3) to identify contextual or behavioural factors that may help explain variation in observed associations and inform an SDT-based conceptual proposition.
 To achieve these objectives, the following research questions were formulated:

What is the strength and direction of associations between different forms of motivational regulation along the self-determination continuum, injury-mitigating health behaviours, protective practices and injury-related outcomes (e.g., injury incidence and injury risk indicators) across physically demanding performance settings?

Do associations with injury-mitigating health behaviours, protective practices and injury-related outcomes differ according to the quality of motivational regulation, specifically more autonomous versus more controlled regulation?

What contextual or behavioural factors may help explain variation in these associations,

and how can these findings inform an SDT-based conceptual proposition for injury mitigation in physically demanding performance settings?

2. METHODS

2.1 Protocol and registration

This systematic review was registered in PROSPERO (CRD42024522361) on 21st April 2026. The protocol was drafted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, ensuring adherence to a suitable reporting standard²⁷ (Supplementary File 1). The study was given favourable opinion by the Ministry of Defence's Research Ethics Committee (Reference: 2252/MODREC/23).

2.2 Eligibility criteria

Studies were eligible for inclusion if they: (1) included participants in full-time physically demanding performance settings (e.g., competitive sport, military, emergency responders) with a mean age of 16 years or older; (2) explicitly measured SDT-based motivational constructs in relation to predefined MSKI-related outcomes (e.g.,

injury-mitigating health behaviours or injury incidence); (3) used experimental, longitudinal, or observational designs (e.g., cohort, qualitative, and case-control studies); and (4) were available in full-text and published in the English language. These study designs were selected to capture both cross-sectional associations and, where possible, temporal relationships between SDT constructs and injury-mitigating health behaviours, protective practices and outcomes. Restriction to full-text, English-language publications was applied to ensure access to complete methodological detail for a thorough quality assessment and data extraction process.

For inclusion, studies were required to assess either injury-mitigating health behaviours or MSKI outcomes. Injury-mitigating health behaviours were defined a priori as modifiable behaviours that may help prevent MSKI or support recovery after injury. Behavioural outcomes were classified into three categories: (a) injury-mitigating health behaviours (i.e., physical activity, nutrition, sleep, alcohol consumption); (b) injury-prevention or protective practices (i.e., warm-ups and recovery behaviours); and (c) rehabilitation behaviours (i.e., rehabilitation intentions and adherence). These behavioural outcomes were identified from prior systematic reviews and relevant literature, which were used to develop a study-specific classification framework^{1,28,29} (Supplementary File 2). Where reported, intermediate physical or physiological outcomes, such as body composition and physical fitness, were classified separately as measurable factors that may influence MSKI risk, rather than as behavioural outcomes. MSKI incidence resulting in time loss or medical attention was reported in accordance with the STROBE-Sport Injury and Illness Surveillance guidelines³⁰.

Psychological outcomes, including depression, anxiety, burnout, and general well-being, were excluded as primary outcomes because they represent psychological states rather than explicit injury-mitigating health behaviours or measurable injury-related outcomes. Papers were also excluded if they did not meet the language criterion, included participants below the age threshold, were published before the formal introduction of SDT in

1985¹⁴, or did not report a measurable injury-related outcome. Non-peer-reviewed articles, conference abstracts, poster presentations, unpublished abstracts, and case reports were excluded. To retain focus on SDT constructs, alternative motivational constructs such as self-efficacy and locus of control were not included as they are grounded in different theoretical frameworks (e.g., social learning theory and social cognitive theory). The eligibility criteria are presented in Supplementary File 3.

2.3 Search strategy

To identify relevant studies, a search of key electronic databases, including PubMed (MEDLINE), Web of Science, APA PsycNET, Scopus and Embase, was conducted on studies published from 1985 to March 2026. Searches combined free-text keywords applied to titles, abstracts, and index terms, and a thesaurus-based search using Medical Subject Headings (MeSH) terms in PubMed. Backward and forward citation searching using CitationChaser, and screening of reference lists from systematic reviews, were also conducted. This approach maximised retrieval by capturing both indexed terms and potentially overlooked free-text terms. Databases were selected to ensure coverage across medical and psychological perspectives. The search strategy was developed in collaboration with the University subject librarian and refined with subject experts. The final search was conducted on 01st March 2026.

Search terms were entered into each database under three concepts: (1) motivational constructs; (2) professional performance; and (3) injury-mitigating health behaviours and outcomes, with relevant synonyms included for each concept to maximise search sensitivity. The search strategy followed the PECO framework, with Population defined as performance domain or occupation, Exposure as SDT-based motivational constructs, and Outcome as injury-mitigating health behaviours, protective practices, and injury-related outcomes. Keywords in each concept were grouped with the OR operator. The results from each concept were then combined with the AND operator to produce the search strategy (Full search strategies for each database are provided in Supplementary File 4).

2.4 Selection criteria

All records identified through the search strategy were uploaded to Covidence for duplicate removal. After removing duplicates, three reviewers (MCW, MJW, and SJE) screened all titles and abstracts independently against the predefined eligibility criteria. Full-text articles deemed potentially eligible were then independently assessed by MCW and MJW, and methodological quality was then evaluated. Any disagreements were resolved through discussion with the original three reviewers until consensus was reached. Reference lists of relevant reviews were manually screened to identify additional studies; however, no further eligible records were identified. The data were extracted via Covidence into an Excel spreadsheet by MCW and verified by MJW.

2.5 Data extraction and synthesis

A data extraction table was compiled for all included studies that examined associations between SDT-based motivational constructs and injury-related outcomes. The following data items were extracted:

- (1) Study characteristics (e.g., title, author(s), in-text reference, country, study design, performance domain, publication year, primary outcome, theoretical framework and statistical approach);
- (2) Participant demographics (e.g., age, gender, sample size, performance level and setting);
- (3) Measurement of motivational constructs, including instruments used and their role in the analysis (e.g., predictor, mediator, or moderator);
- (4) Behavioural and injury-related measures, classified a priori as: (a) injury-mitigating health behaviours (i.e., physical activity, nutrition, sleep, alcohol), (b) injury-prevention or protective practices (i.e., warm-ups, recovery), (c) rehabilitation behaviours (i.e., intention and adherence), or (d) MSKI outcomes (i.e., stress fractures);
- (5) Measurement and operationalisation of the outcome, including the measurement instrument, whether outcomes were self-reported or objectively/clinically assessed;
- (6) Reported associations, including direct effects and any mediation or moderation pathways.

A structured narrative synthesis was

conducted, with findings grouped by motivational construct, behavioural context, and injury-related outcome. Meta-analysis was not considered appropriate due to heterogeneity in study designs, measures, populations, and outcomes.

2.6 Study quality assessment

2.6.1 Mixed Method Appraisal Tool (MMAT)

Methodological quality of included studies was assessed independently by two reviewers (MCW and MJW) using the Mixed Methods Appraisal Tool³¹. Disagreements were resolved through discussion and consensus. The MMAT is designed for appraising the quality of qualitative, quantitative, and mixed-methods studies within systematic reviews. The MMAT serves as a checklist to evaluate study quality across settings, including the appropriateness of the research question and data, participant representativeness, measurement validity, completeness of outcome data, and consideration of confounding variables. The full MMAT criteria are in the MMAT User Guide (version 2018).

2.6.2 GRADE (Grading of Recommendations Assessment, Development, and Evaluations)

The certainty of the evidence was assessed using the GRADE approach with evidence synthesised according to the principal behavioural contexts and injury-related outcomes identified in the review, consistent with GRADE guidance³². This tool has been used in numerous health contexts that allow potential biases to be assessed, ensuring transparency, consistency, and clarity in reporting evidence³³.

3. RESULTS

3.1 Study identification

This review included studies published until March 2026 investigating the relationships between SDT-based motivational constructs and injury-mitigating health behaviours and outcomes. The initial search yielded 10,838 studies. After removing duplicates and screening titles and abstracts, 105 studies progressed to full-text review. Of these, 79 were excluded due to not measuring motivational constructs, incorrect study design or outcomes. The list of excluded studies, with reasons, is available in

Supplementary File 5. Twenty-six studies met all inclusion criteria for the final review. Figure 2 presents the PRISMA flow diagram, illustrating the outcomes observed at various phases of the screening process²⁷.

3.2 Study characteristics

The 26 included studies, published between 2007 and 2025, represented a broad range of physically demanding performance settings. Ten studies were conducted in professional sport, including elite, collegiate, endurance and team-sport athletes, seven in military personnel or trainees, five in police officers or police cadets, three in firefighters, and one in law enforcement officers. Sample sizes ranged from 6 to 1,591 participants, representing more than 6,000 participants across all included studies. Study details are provided in Supplementary File 6.

Studies were conducted across five continents, spanning 13 countries: France (n=1), Norway (n=4), China (n=5), Israel (n=1), Jordan (n=1), Brazil (n=2), Singapore (n=1), the United Kingdom (n=2), Sweden (n=1), Belgium (n=1), Canada (n=3; one multinational study also included Australian

participants), and the United States (n=3). Most studies were quantitative observational studies (n=21), primarily cross-sectional, with four prospective or repeated-measures cohort studies; the remainder were two qualitative and three mixed-methods studies.

Regarding the outcomes examined, 12 studies examined injury-mitigating health behaviours (i.e., physical activity, training frequency, sleep quality, fast-food consumption), while four studies assessed physical or physiological factors (i.e., skeletal muscle mass, VO₂max and physical fitness scores). Six studies investigated injury-mitigating protective practices (i.e., pain-related decision making, safety commitment and communication, adherence to injury-mitigating practices and recovery) and four studies focused on injury rehabilitation (i.e., rehabilitation adherence and return-to-activity intentions). Lastly, three studies examined injury-related outcomes (i.e., stress fractures and overtraining). Studies could contribute to more than one category where multiple outcomes were assessed.

Most studies adopted SDT as their guiding theoretical framework, with several drawing on Basic Psychological Needs Theory, one applying the Hierarchical Model of Intrinsic and Extrinsic Motivation, and two incorporating the Theory of Planned Behaviour alongside SDT. One study³⁴ did not explicitly report a theoretical framework but assessed motivation and need satisfaction using constructs conceptually consistent with SDT and was therefore interpreted accordingly. Across the review, the principal motivational constructs included autonomous motivation (intrinsic, integrated and identified regulation), controlled motivation (introjected and external regulation), amotivation, and basic psychological need satisfaction or frustration.

3.2.1 Measurement approaches

Motivational regulation was assessed using nine different established SDT-based instruments in most studies (i.e., Basic Psychological Needs Satisfaction and Frustration Scale, Sports Motivation Scale, Situational Motivation Scale, Treatment Self-Regulation Questionnaire, Behavioural Regulation in Exercise), among others in Supplementary File 6.

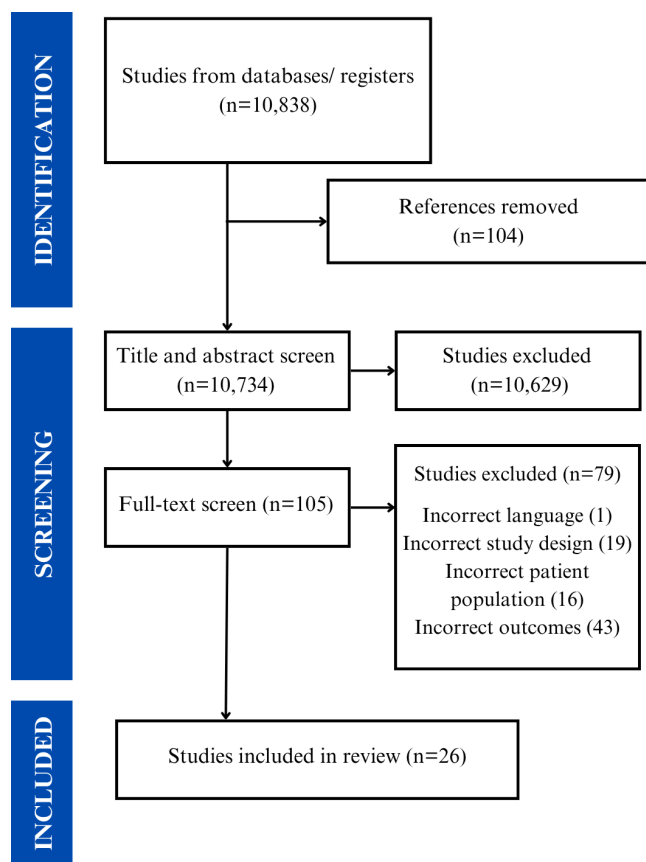


FIGURE 2. PRISMA Flow Diagram

Injury-related outcomes were measured using medically verified injuries (e.g., bone scintigraphy and military medical records), self-reported injury incidence, and psychometric indicators associated with injury risk. Statistical analyses included Bayesian multilevel analysis, path analysis, multiple regression, and structural equation modelling.

3.2.2 Quality assessment

The results of the MMAT indicated several strengths across studies, including clearly defined research questions and the use of established measures to address aims. Qualitative studies demonstrated adequate data collection procedures and appropriate analytical approaches. Overall, included studies met 87% of applicable MMAT criteria, indicating generally strong methodological quality. Quantitative non-randomised studies met 84% of criteria, while qualitative and mixed-methods studies met 100% of applicable criteria. However, limitations were identified, including reliance on self-reported injury-related outcomes, limited adjustment for potential confounders (e.g., sex differences), missing data and predominantly cross-sectional designs, restricting causal inference.

GRADE assessment indicated low certainty of evidence across the behavioural contexts of injury-mitigating health behaviours, protective practices and injury rehabilitation, primarily owing to the predominance of observational study designs. Evidence relating to injury-related outcomes was rated as very low certainty because of heterogeneity in outcome measures and the limited number of prospective studies directly assessing injury occurrence. Supplementary File 7 details the results of the MMAT for the included review studies³¹.

3.3 Synthesis of findings

3.3.1 SDT constructs and injury-mitigating health behaviours

More autonomous forms of motivational regulation in the included studies were generally associated with greater engagement in injury-mitigating health behaviours, whereas controlled motivation and amotivation were generally associated with less adaptive health behaviours and protective practices. Across both competitive and occupational settings, individuals

reporting higher autonomous motivation, particularly intrinsic and identified regulation, demonstrated greater physical activity participation, especially vigorous physical activity, training volume and exercise. In military occupations, highly intrinsically motivated personnel completed approximately 70% more physical training than those with lower intrinsic motivation³⁵, with intrinsic motivation significantly associated with and moderating the relationship between exercise frequency and fitness outcomes³⁶⁻³⁹. Autonomous motivation was also associated with better overall health behaviours and physiological factors such as skeletal muscle mass and fitness test performance^{19,38}.

Intrinsically motivated firefighters and police cadets similarly engaged in significantly more weekly exercise and were more likely to meet WHO activity guidelines and engage in more leisure-time physical activity^{40,41} and healthier food behaviours¹⁸. Firefighters' autonomy support and need satisfaction accounted for 16% of the variance in aerobic exercise and 34% of the variance in strength training behaviour⁴². Similarly, policing contexts also showed that greater intrinsic and integrated motivation was associated with higher overall physical activity and more vigorous physical activity^{43,44}.

3.3.2 SDT Constructs and Injury-Related Outcomes (injury occurrence, injury rehabilitation and injury-mitigating protective practices)

3.3.2.1 Injury occurrence.

Evidence directly linking SDT constructs with injury occurrence was limited. Where studies assessed perceived injury susceptibility or behavioural tendencies associated with injury risk, these were considered separately from observed injury occurrence. Among studies assessing injury occurrence, autonomous forms of motivational regulation and greater basic psychological need satisfaction were associated with lower injury occurrence over time in elite university athletes⁴⁵, while lower motivation and basic psychological need satisfaction were associated with stress fractures in military trainees⁴⁶. Other studies examined perceived injury susceptibility. Among endurance athletes, more autonomous forms of motivation were negatively associated with perceived injury susceptibility⁴⁷. External

regulation predicted greater susceptibility to persist despite pain, a behavioural tendency associated with increased injury risk. Intrinsic, identified and external regulation were not significant predictors of injury susceptibility after controlling for past injury, while amotivation showed a marginal positive association.

3.3.2.2 Injury rehabilitation behaviours.

Autonomous motivation was associated with greater rehabilitation engagement, more favourable rehabilitation intentions and higher perceived recovery status^{20,22,48-50}. Among injured police officers, autonomous work motivation and physician autonomy support positively predicted autonomous treatment motivation, which was a strong predictor of treatment adherence.

Qualitative studies emphasised satisfying the basic psychological needs for autonomy, competence and relatedness during rehabilitation. High-level athletes identified competence, autonomy and relatedness as central to successful return-to-sport experiences, with confidence in physical ability, realistic goal setting, social support and involvement in return-to-play decisions reported as key influences on successful return to sport^{20,49}. External pressure from coaches, teammates and expectations to return quickly undermined motivation, resulting in participants experiencing predominantly externally regulated motivation²⁰.

Injured military personnel also attributed sustained health behaviour change to autonomy-supportive coaching, peer support and opportunities to develop competence and relatedness⁵¹.

3.3.2.3 Injury-mitigating protective practices.

In sport, autonomous motivation predicted adherence to protective practices, including stretching, massage or physiotherapy attendance, neuromuscular training, and safety-related beliefs in sport⁴⁸.

In police officers, autonomous motivation was positively associated with prioritising and adhering to injury-mitigation practices, commitment to safety and safety communication, whereas controlled motivation was positively associated with communication barriers and amotivation with

fatalism, safety violations and greater worry regarding injury mitigation^{22,34}.

3.3.3 Mediating mechanisms and moderating factors

Across sport and policing contexts, perceived autonomy support from coaches and supervisors positively predicted autonomous motivation, which predicted injury-mitigating motivation and behaviours^{34,48}. Similarly, psychological mechanisms may also influence the relationship between motivational regulation and injury-related outcomes, with perceived stress⁴⁵ and perceived susceptibility to continue running through pain⁴⁷ identified as potential mediators.

Several contextual factors appeared to influence relationships between SDT constructs and injury-mitigating health behaviours and injury-related outcomes. Among elite athletes, autonomous motivation explained additional variance in overtraining symptoms beyond established predictors⁵². Moreover, the association between motivation and overtraining symptoms was stronger during the latter stages of the competitive season, which further predicted burnout⁵⁰. In occupational settings, organisational context with supportive leadership and opportunities to foster autonomous exercise motivation was associated with greater autonomous motivation among firefighters, which encouraged adherence to fitness routines⁴². In military populations, sex and training stage influenced motivational profiles and health behaviours^{19,46}.

4. DISCUSSION

This systematic review aimed to consolidate literature concerning SDT-based constructs in relation to injury-mitigating health behaviours, protective practices and outcomes in physically demanding performance settings. Twenty-six studies met the inclusion criteria, and certainty of evidence was rated as low according to GRADE, emphasising the need for high-quality, well-designed research in this field. While caution should be exercised when interpreting the findings, the included studies spanned professional sport, military, police and firefighting populations, across multiple countries, offering an initial cross-context

perspective on motivational regulation and injury-related processes in physically demanding high-performance occupations. Across the included studies, autonomous forms of motivational regulation and basic psychological need satisfaction were generally associated with greater engagement in injury-mitigating health behaviours, protective practices and rehabilitation. Evidence directly linking SDT constructs with injury occurrence was considerably more limited. Most studies examined proxy outcomes, such as physical activity, fitness, rehabilitation adherence and protective practices, rather than injury incidence itself. These findings suggest that SDT may provide a useful framework for understanding behavioural and psychological processes relevant to MSKI mitigation, although its direct relationship with injury occurrence remains uncertain.

These findings reinforce the importance of assessing motivational quality, rather than quantity, when studying injury-related behaviours and outcomes^{23,52}. Despite the external demands present in performance settings, the protective potential of needs satisfaction and autonomous motivation identified in this review might be explained by the internalised behaviours. If individuals internalise injury-mitigating health behaviours as personally meaningful and health-directed, they may be more likely to sustain protective engagement. However, if individuals' motivational regulation is not internalised and is primarily directed toward purely performance engagement, it may contribute to different risk pathways that heighten exposure to injury-related risk processes²³.

This interpretation is consistent with broader SDT literature, demonstrating that internalised and self-endorsed health behaviours are more likely to be maintained^{15,53-55}. This review also supports the trans-contextual nature of motivation, whereby autonomous motivation developed in one context (e.g., rehabilitation) may transfer to related health behaviours such as injury mitigation^{48,56}. Collectively, the findings provide a new lens to the existing literature on autonomous motivation and positive health behaviours from an injury-mitigation perspective, which appear to shape behavioural decision-making, coping

responses and stress regulation, subsequently influencing engagement in injury-mitigating health behaviours and rehabilitation.

With these new insights, this review suggests that the application of SDT within physically demanding performance settings may require greater consideration of contextual influences. These settings differ in organisational structure, the degree of autonomy afforded to individuals, external demands and the consequences of non-compliance; mandatory training and operational requirements may constrain behavioural choice more strongly in military and emergency-service settings, whereas competitive and selection pressures may exert greater influence in sport. Nevertheless, across elite sport, military service, policing and firefighting, individuals operate within externally structured environments where coaching practices, command expectations, resource availability and time pressures may influence injury-mitigating health behaviours⁵⁷. Thus, this suggests a potential extension of the traditional SDT process model whereby individuals could endorse autonomous motives toward health-directed goals even when behaviours are shaped by external environmental demands. The wider literature supports this proposition across military and sport rehabilitation settings, where psychological need satisfaction has been associated with both autonomous and controlled motivation, while introjected regulation and amotivation were positively associated with physical activity among military personnel, and external motivation was reported during rehabilitation^{19,20,39}. This suggests that need satisfaction may support autonomous motivation without necessarily eliminating controlled forms of motivation in demanding performance environments, allowing autonomous and controlled motivations to coexist.

Therefore, we propose that agentic engagement may represent an important mechanism extending the traditional SDT process model¹⁵ within physically demanding performance settings. Agentic engagement refers to individuals proactively shaping how they respond to their environment by expressing preferences, seeking feedback and resources, goal setting, self-monitoring,

taking ownership of behaviours and aligning actions with personal values and identities⁵⁸. As a behavioural expression of autonomous motivation, agentic engagement could enable individuals to proactively navigate external demands, helping to sustain experiences of autonomy, competence, and relatedness while supporting engagement in health-promoting behaviours.

Applied to physically demanding performance settings, agentic engagement may enable individuals to proactively engage in health behaviours and injury mitigation despite persistent external pressures, such as performance expectations, mandatory fitness requirements and organisational demands. Such a process may be fostered through need-supportive coaching, leadership and organisational environments, which—according to the findings of the present review—promoted autonomous motivation, injury-mitigating health behaviours and rehabilitation engagement across performance settings.

Considering the theoretical propositions and findings from this review, Figure 3 presents a hypothesised SDT-informed conceptual model for injury mitigation in performance

settings. The model proposes potential pathways between motivational regulation, agentic engagement, injury-related health behaviours, protective practices and injury-related outcomes, with contextual factors potentially supporting or constraining these processes. As agentic engagement was not directly evaluated, these pathways require prospective empirical testing and refinement.

4.1 Methodological strengths and limitations

This review's strengths include focusing on empirical studies examining SDT-based motivational regulation in relation to injury-mitigating health behaviours and outcomes, addressing a gap in the literature⁵⁹. The inclusion of diverse research designs strengthened the synthesis by allowing consideration of associations, potential mechanisms and contextual influences across performance settings. Methodological rigour was strengthened through adherence to PRISMA guidelines, PROSPERO registration, use of Covidence, application of GRADE and MMAT, and a multi-database search strategy.

The included evidence base was limited by inconsistent motivation measurements, a

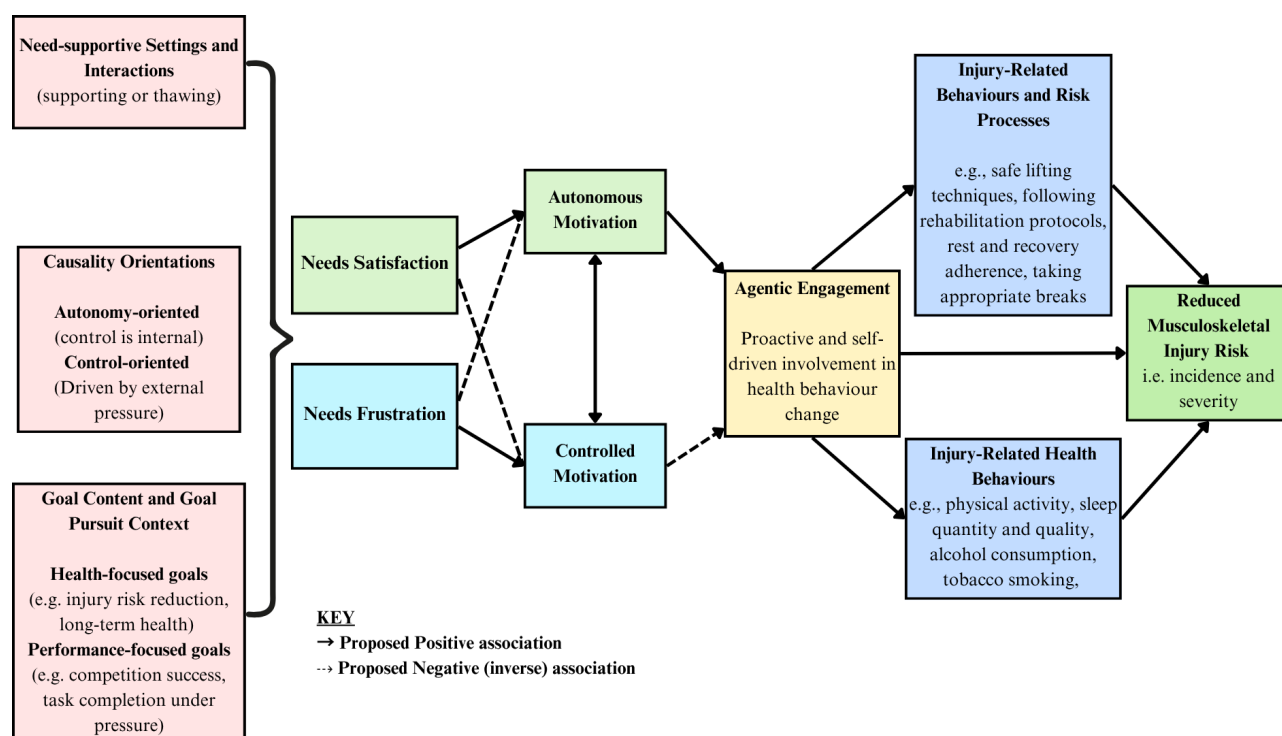


FIGURE 3. Hypothesised SDT-informed conceptual model for injury mitigation, linking Self-Determination Theory constructs with injury-mitigating health behaviours, protective practices and injury-related outcomes in physically demanding performance settings¹⁵.

reliance on self-reported, cross-sectional designs limiting causal inference, and underrepresentation of females, potentially leading to biased results⁵⁹. The small number of mixed-quality studies highlights the need for prospective, longitudinal research with valid, consistent data collection methods. Despite noting the need for longitudinal research over 20 years ago⁶⁰, progress has been limited. Limitations of the present review include the restriction to English-language studies, which may have excluded relevant studies, limiting the generalisability of the findings. Excluding grey literature may also have increased the risk of publication bias.

The broad definition of injury-mitigating behaviours and limited evidence directly assessing injury occurrence also constrain conclusions regarding injury mitigation itself. Another consideration is the heterogeneity across performance settings and injury mechanisms. The populations included in this review differ in training demands, start state in terms of presenting risk factors (e.g. fitness, health behaviours), exposure to violence, career stage, and injury risks. For example, the focus of this review was on MSKI; however, acute, chronic or violence-related injuries are typical in certain policing or tactical environments, which may involve different motivational and behavioural pathways. Similarly, individuals in performance settings may experience varying motivational and injury dynamics across training, active service, and retirement¹⁹. Such contextual variability may moderate the relationship between motivational regulation and injury-mitigating health behaviours and outcomes, limiting generalisability across settings.

4.2 Practical implications

The findings of this review suggest that injury mitigation strategies within physically demanding performance settings could move beyond simply increasing the *amount* of motivation and instead prioritise the quality of motivation by supporting the internalisation of health-directed goals²³. Rather than attempting to reduce external demands, which are inherent to elite sporting, military, police and firefighting contexts (e.g., compliance with fitness standards, operational procedures and safety protocols), strategies could seek to

create need-supportive climates that help individuals understand the value of protecting their health and preventing injuries. Such strategies may promote injury-mitigating health behaviours through autonomy-supportive leadership and competence-building approaches, nurturing skill development and decision-making^{61,62}. This may strengthen autonomous motivation and positive agentic engagement, encouraging individuals to take ownership of injury-mitigating health behaviours and integrate them into their professional identity. However, given the low certainty of evidence, prospective intervention studies are needed to determine whether changes in these behaviours subsequently translate into reductions in injury occurrence.

5. CONCLUSION

This systematic review is the first to synthesise evidence examining SDT constructs in relation to injury-mitigating health behaviours and outcomes across physically demanding performance settings. While the current evidence base is limited and of low certainty, the findings suggest that cultivating need-supportive environments, autonomous motivation and internalisation of injury-mitigating health behaviours and practices may provide a promising approach to promoting behaviours relevant to injury mitigation and potentially improving injury-related outcomes. Future research should prioritise rigorous longitudinal and prospective designs using objective injury measures and standardised assessments of motivational regulation to clarify the temporal and causal relationships identified. Furthermore, the findings also provide a foundation for a preliminary contextual motivation–injury process model, with future research needed to empirically test and refine the proposed relationships across physically demanding performance settings.

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SUPPLEMENTARY FILES:

[Supplementary File 1: PRISMA Checklist Full Review](#)

[Supplementary File 2: Behavioural Risk Factor Classification Framework](#)

[Supplementary File 3: Inclusion/exclusion criteria](#)

[Supplementary File 4: Search String](#)

[Supplementary File 5: List of excluded studies with reasons](#)

[Supplementary File 6: Study characteristics of included studies](#)

[Supplementary File 7: The Mixed Method Appraisal Tool \(MMAT\) for the included review studies](#)