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## Consensus statement

# Optimising the effects of physical activity on mental health and wellbeing: A joint consensus statement from Sports Medicine Australia and the Australian Psychological Society

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## ABSTRACT

**Objectives:** This consensus statement from Sports Medicine Australia and the Australian Psychological Society aims to provide guidance to practitioners on the ways that physical activity can be promoted to maximise benefits to mental health.

**Methods:** Following the Clinical Consensus Statement protocol, an expert group comprised of eight members with expertise in physical activity and mental health articulated recommendations regarding five physical activity contextual factors: type, physical environment, delivery, domain, and social environment.

**Results:** To optimise the mental health benefits of physical activity, we recommend: i) activity selection be guided by factors associated with adherence and enjoyment as opposed to any specific type (type); ii) facilitators (i.e., teachers, coaches, instructors, practitioners) deliver organised physical activity sessions using an instructional style that satisfies individuals' basic needs for autonomy, competence and social connection (delivery); iii) participation in physical activity with others who provide support, facilitate positive interactions, or make people feel valued, so long as it does not undermine a preference to be active alone (social environment); iv) where possible and appropriate, some physical activity should be undertaken outside in pleasant natural environments (physical environment); and, v) at least some physical activity be undertaken during leisure-time or via active travel, where possible prioritising activities one personally chooses to undertake (domain).

**Conclusions:** The type, domain, physical and social environment of physical activity, as well as the way in which it is delivered, will determine mental health outcomes. Practitioners can use these recommendations to optimise the effects of physical activity on mental health.

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## Practical implications

- Activity selection should be guided by factors associated with adherence and enjoyment.

- Facilitators should deliver organised physical activity sessions using an instructional style that satisfies individuals' basic needs for autonomy, competence and social connection.
- Physical activity should be undertaken with others who provide support, facilitate positive interactions, or make people feel valued, so long as it does not undermine a preference to be active alone.
- Some physical activity should be undertaken outside in pleasant natural environments.

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- At least some physical activity be undertaken during leisure-time or via active travel.

## 1. Introduction

Physical activity has become a universally accepted intervention for the promotion of mental health and wellbeing, and the prevention of mental ill-health, across all demographic groups.<sup>1</sup> For example, there is robust evidence that physical activity interventions reduce symptoms of anxiety<sup>2</sup> and depression.<sup>3</sup> In turn, practitioners (including psychologists, exercise physiologists, teachers, coaches, and General Practitioners [GPs]) are now actively encouraged to promote physical activity for its mental health and wellbeing benefits. To exemplify this encouragement, the European Psychiatry Association and the International Organization of Physical Therapists in Mental Health have published a statement on the use of physical activity in the treatment of mental illness.<sup>4</sup> However, the effects of physical activity on mental health and well-being are not homogenous. Whilst effects are directionally consistent, discrepancies in effect sizes (e.g., from no effect to large effects) have been found for different populations (e.g., clinical populations versus general population), domains of activity (e.g., leisure-time versus occupational physical activity), and types of activity (e.g., walking versus resistance training). In addition, there is evidence that poorly designed and implemented physical activity programmes may have negative effects on mental health.<sup>5</sup> The aim of this consensus statement is to provide global guidance for the promotion of physical activity to optimise the effects on mental health and wellbeing. Whilst physical activity can be an effective treatment for severe mental illness,<sup>6</sup> there are already recommendations in place to guide practitioners in this regard (e.g., 4). As such, the aim of this consensus statement is to provide guidance on the consideration of contextual factors of physical activity that may maximise the benefits to mental health and wellbeing among the general population.

Physical activity may provide benefits for mental health and wellbeing via multiple overlapping neurobiological, psychosocial, and behavioural mechanisms.<sup>7,8</sup> Physical activity, for example, may lead to improved mental health through changes in brain structure and function, such as changes in cortisol activity or improved brain-wide vasculature.<sup>9</sup> In addition, physical activity may lead to changes in self-esteem and self-efficacy,<sup>10</sup> which in turn generalise to improved mental health.<sup>8</sup> Physical activity can also enhance social connection and support which are important for mental health.<sup>8</sup> Finally, physical activity can lead to behavioural changes such as improved sleep quantity and quality, as well as better coping and self-regulation skills which are important for mental health. However, in models of the mechanisms through which physical activity provides mental health benefits, both Kandola et al.<sup>7</sup> and Lubans et al.<sup>8</sup> have noted that the contextual factors of physical activity may moderate the relationship between physical activity and mental health outcomes. That is, mental health outcomes may be optimised under certain conditions, beyond that driven by quantitative factors such as physical activity frequency, duration, or intensity. The focus of this consensus statement is to identify those contextual factors (i.e., qualitative characteristics) that may enhance or optimise the effects of physical activity on mental health and wellbeing.

### 1.1. Contextual factors of physical activity

Scientific attention and applied practice in physical activity interventions for health have focussed heavily on the quantitative aspects of physical activity including its frequency, intensity, and time/duration. For example, current clinical guidelines refer practitioners to consider these aspects in the prescription of physical activity (e.g., 11). This focus has informed physical activity guidelines globally (e.g., 12), which are also focussed on the frequency, intensity, time, and (in some cases) type of physical activity necessary for physical and mental health benefits. To illustrate, the Australian physical activity guidelines recommend that adults are active most days – preferably every day –

of the week with 150 to 300 min of moderate intensity physical activity, or 75 to 150 min of vigorous intensity physical activity, or an equivalent combination of moderate and vigorous activities across the week.<sup>13</sup> In addition, adults are recommended to include muscle-strengthening activities on at least 2 days each week.<sup>13</sup> Similar guidelines exist for infants, toddlers, and pre-schoolers<sup>14</sup>; children and young people<sup>15</sup>; pregnancy<sup>16</sup>; older adults<sup>17</sup>; and people with disability or chronic conditions.<sup>18</sup>

Whilst such guidelines provide useful information for practitioners in terms of the quantitative factors and types of physical activity that they should prescribe for health benefits, other considerations that may optimise the effects of physical activity on mental health and wellbeing have received little attention. As noted by Teychenne et al.,<sup>19</sup> “...given that evidence has shown that the relationship between physical activity and mental health/ill-health is likely to, in part, be influenced by contextual factors across the lifespan (e.g. domain of physical activity), there is a need to extend the focus/scope of existing physical activity guidelines to ensure they effectively address mental health” (pg. 1). We define contextual factors as the qualitative characteristics of physical activity that include, but are not limited to, the type of activity, the way in which it is delivered, the social and physical environment in which it takes place, and activity domain. We have further outlined five distinct categories of contextual factors that may be considered to optimise the mental health benefits of physical activity: type (e.g., aerobic versus resistance exercise); delivery (e.g., instructional style, mode of delivery, supervised versus self-initiated); social environment (e.g., group or team versus individual participation); physical environment (e.g., indoor versus outdoor environments; green or blue space versus man-made environments); and, domain (e.g., leisure time versus occupational physical activity). We expand on each of these contextual factors below. Fig. 1 gives an overview of the contextual factors.

We note that there will be overlap among contextual factors for any given instance of physical activity. That is, any physical activity will represent a given combination of these factors. For example, a spin class in a gym may be a combination of interval training, indoor activity, in a group, during leisure time, and delivered by an instructor with a particular style of delivery. There is evidence that the interaction of such factors is related to mental health outcomes. For example, Wicks et al.<sup>20</sup> have shown that physical activity undertaken in natural environments, leads to larger improvements in mental health when undertaken with other people. Furthermore, whilst these contextual factors represent broad categories for consideration, further specifications are possible. For example, physical environment can be classified into indoors or outdoors, whilst outdoors can be further specified into green space, blue space, or man-made environments. Alternatively, physical environment might also refer to the safety of the neighbourhood in which one undertakes physical activity, or the adequacy of indoor facilities. As such, the contextual factors outlined here represent broad categories of relevant considerations that may influence the effect of physical activity on mental health and wellbeing. Finally, there may be meaningful variation in individual preferences for particular contextual factors (e.g., group versus individual activity) which result in tangible differences in enjoyment, which is in turn linked to the mental health outcomes of physical activity.<sup>19,21</sup> As such, consideration of these contextual factors in the context of physical activity prescription should occur with a concomitant consideration of individual preferences. It is our aim to provide guidance to practitioners on the ways that physical activity can be promoted to optimise benefits to mental health. The recommendations are appropriate for the general population, including people who are mentally healthy, and those who have common mental illnesses such as schizophrenia. A practitioner can take the recommendations below and implement them alongside the existing physical activity guidelines which describe the minimum frequency, intensity, and duration of physical activity necessary for health benefits. Specifically, the recommendations below help to guide practitioners on the ways that physical activity can be undertaken – where, when, what, and with who – to

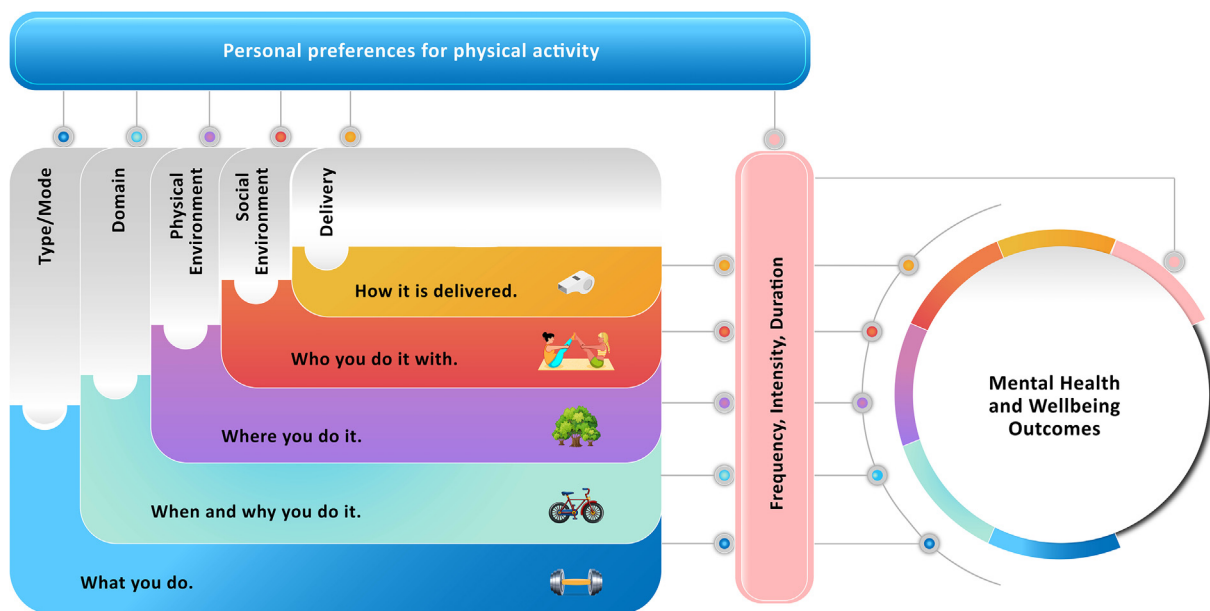


Fig. 1. Descriptive model of the influence of contextual factors on mental health and wellbeing.

optimise mental health benefits, alongside the existing guidelines that include how much, for how long, and at what intensity.

## 2. Methods

We followed a process informed by the Clinical Consensus Statement Manual provided by Rosenfeld et al.<sup>22</sup> In Stage 1, representatives of Sports Medicine Australia (SMA) and the Australian Psychological Society College of Sport and Exercise Psychology (CoSEP) came together in July 2021 to articulate the need to provide a statement based on best evidence - a consensus statement - that could fill an important gap for the promotion of physical activity for mental health and wellbeing. An independent chair was subsequently appointed to lead the consensus statement (the first author), and a leadership group was appointed that included representatives of SMA and CoSEP, including a methodologist with significant expertise in the development of physical activity guidelines (the last author). The leadership agreed upon a further six content experts who were invited to the Consensus Statement Development Group (all other authors). All Group members were academics with relevant expertise. The Development Group first met for half a day in August 2021 to define the purpose, scope, and process for developing the Consensus Statement. The Group met for a second time in the same month to make the following decisions. First, the World Health Organization definition of mental health was adopted: “a state of wellbeing in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community”. Further, the Development Group operationalised the definition of mental health into relevant outcomes that would inform the literature search and statement development. The relevant mental health outcomes were: positive aspects of mental health (e.g. self-esteem, wellbeing, resilience, quality of life); and, signs and symptoms of common mental disorders (depression, anxiety, psychological distress) in both clinical and non-clinical populations. Outcomes pertaining to serious mental illness (SMI; e.g. psychosis, schizophrenia, bipolar disorder) were excluded. Whilst the use of physical activity in the treatment of SMI is important to recognise, the severity of the problem, including its impact on individual functioning, requires separate consideration. The Development Group also articulated a definition of contextual factors (given above) that could direct the literature search and statement development, and defined five key contextual factors a priori (also above).

The Development Group undertook a systematic review of the evidence to underpin the consensus.<sup>23</sup> This review took place from September 2021 to July 2022, and involved the search for, and analysis of meta-analyses of randomised controlled trials whereby the effects of the contextual factors of physical activity could be identified (e.g., via moderation analyses). The review is available upon request from the first author. The group also identified other relevant systematic reviews that could inform the articulation of recommendations for each contextual factor. As stipulated by Rosenfeld et al.,<sup>22</sup> the group met for half a day in April 2022 to consider the evidence presented in the systematic review, and to assign group members to conduct further evaluation of the evidence for each contextual factor and draft recommendations for each. Each contextual factor was assigned to one or group members based on their specific expertise. Following this meeting, a Delphi process<sup>24</sup> was undertaken in August 2022 to ascertain the extent to which consensus was reached among all members of the group for each recommendation and offer Development Group members a chance to provide comments on each recommendation. Consensus was considered to have been reached when all members “agreed” or “strongly agreed” with each recommendation (i.e., provided a rating of 4 (*agree*) or 5 (*strongly agree*) on a Likert scale from 1 (strongly disagree) to 5). Consensus was reached between all eight group members after a single round. However, minor wording changes to two recommendations were incorporated based on feedback provided during the Delphi process. The final recommendations upon which consensus were reached are given below.

## 3. Summary and recommendations

### 3.1. Type

Our review of the literature was unable to ascertain any systematic advantage of one type of physical activity over another in generating mental health benefits. Evidence from systematic reviews and meta-analyses consistently demonstrate the positive impact of various types of physical activity including aerobic, resistance,<sup>25,26</sup> high intensity interval training,<sup>27</sup> Pilates,<sup>28</sup> mind–body exercise such as Yoga,<sup>29</sup> and sport<sup>30</sup> on a range of mental health outcomes. Randomised trials testing different types of exercise interventions are unlikely to be able to consider individual participant preference at the stage of randomisation as well as enjoyment and previous exercise history, which are known

to influence physical activity participation. Importantly, various types of physical activities can elicit positive effects on a wide range of mental health and wellbeing outcomes among people who are mentally healthy and who have symptoms of common mental health problems such as depression and anxiety, regardless of the baseline level of symptoms, psychological distress, or impaired levels of psychosocial functioning. The conclusion is that the type of physical activity likely has no meaningful effect on mental health independent of its quantitative characteristics (i.e., its frequency, intensity, and duration) or other contextual factors such as the social and physical environment. As such, the type of physical activity should be selected based on personal preference and other factors which are likely to lead to greater long-term adherence and better mental health.

Self-esteem is known to be a key factor in broad-spectrum mental health promotion.<sup>31</sup> Systematic review evidence shows that both aerobic and resistance training interventions can increase self-efficacy and self-worth among adolescents.<sup>32,33</sup> Similarly, among older adults, qualitative research shows that increases in strength associated with resistance training often contribute to increases in confidence, satisfaction, self-perception, and self-efficacy, which may all contribute to enhanced self-esteem.<sup>34,35</sup> Among adolescents, resistance training may increase wellbeing through improvements in muscular fitness.<sup>36</sup> In addition, there is some evidence showing that those who meet both aerobic and muscle-strengthening guidelines have lower odds of experiencing psychological distress.<sup>37</sup> In light of this and due to the lack of relevant comparative studies on which to make specific recommendations, the type of physical activity should be selected deliberately to enhance enjoyment, adherence, and self-esteem, as well as client/patient physical activity history, skill set, and access.

### 3.1.1. Recommendation

Activity selection be guided by factors associated with adherence and enjoyment as opposed to any specific type. Practitioners should also focus on factors such as access, client/patient preference and physical activity history.

### 3.2. Delivery

Globally, a large and increasing amount of young people's physical activity involves participation in organised sessions in school (e.g., physical education) and community (e.g., organised sports, dance, gymnastics) settings.<sup>38</sup> Similarly, adults and older adults regularly engage in organised physical activity that is facilitated by instructors and coaches.<sup>39</sup> As such, the delivery (i.e., instructional style, quality of coaching or method) of organised physical activity sessions, level of supervision (i.e., supervised versus unsupervised) and delivery mode (e.g., face-to-face versus online) may influence the impact of physical activity on mental health.

Quality of coaching is arguably the single most influential factor contributing to drop-out in youth sport.<sup>40,41</sup> Coaches that promote an 'ego climate' focussed on winning, with success being based on being better than others, contribute to drop-out by undermining young people's confidence, and their enjoyment of sport. Similarly, poor quality physical education can thwart psychological need satisfaction and has unintentional negative effects on young people's mental health. As such, instructional styles that include the facilitation of appropriate motivational climates and fulfil basic psychological needs can minimise the decline in organised physical activity (i.e., sport and physical education) that is typically observed during adolescence and may help to prevent the spike in mental health problems that emerge during this time-period.<sup>42</sup>

Prominent psychological frameworks<sup>43–45</sup> propose that satisfying an individual's need for social connection, autonomy, self-acceptance, environmental mastery, and purpose in life, can lead to improvements in mental health and well-being. Of the existing frameworks, self-determination theory (SDT) has been used extensively in the design and delivery of physical activity interventions in school<sup>46</sup> and

community sport contexts.<sup>47</sup> Guided by SDT, 'autonomy supportive interventions' require instructors to take the perspective of their participants, acknowledge their feelings, provide them with relevant information and opportunities for choice, whilst minimising pressure and demand.<sup>48</sup> Young people who receive physical activity interventions delivered by instructors who have been trained to be 'autonomy supportive' have reported improvements in various indicators of mental health and well-being.<sup>36,49</sup>

There is also evidence to suggest that supervised physical activity sessions lead to larger improvements in physical and mental health in clinical populations.<sup>3,50,51</sup> These effects are not surprising as supervised programmes typically achieve higher levels of adherence, and the supervised format provides an opportunity for facilitators to interact with participants and satisfy their psychological needs. The COVID-19 pandemic and associated physical restrictions have contributed to an increased interest in telehealth (i.e., telephone delivered<sup>52</sup>) and ehealth (i.e., delivered via the internet<sup>53</sup>) physical activity interventions, as public health agencies explore strategies that can reach large numbers of individuals in a cost-effective manner. However, there is not enough evidence to draw firm conclusions regarding the impact of telehealth and ehealth physical activity interventions on mental health and wellbeing.

### 3.2.1. Recommendation

We recommend facilitators (i.e., teachers, coaches, instructors, practitioners) deliver organised physical activity sessions using an instructional style that satisfies individuals' basic psychological needs, most importantly the need for autonomy and social connection. At a minimum, design principles for such instructional style should include engaging participants' perspectives/preferences, offering choice and minimising pressure. We also recommend the use of supervised physical activity sessions for clinical populations, which appear to be more beneficial than unsupervised sessions.

### 3.3. Social environment

Multiple dimensions of the social environment have been identified in relation to physical activity.<sup>54</sup> Those dimensions include social interactions and interpersonal relationships, and are reflected in constructs such as social support, connection, and social networks. Because physical activity includes a vast array of behaviours (e.g., exercise, team sport, walking, incidental movement) in a range of locations (e.g., neighbourhoods, home, gyms) and through a range of different structures and formats (e.g., informal walk, group class), the social environment can vary meaningfully. Social interaction has long been proposed as one of the mechanisms via which physical activity improves mental health.<sup>55</sup> For example, Werneck et al.<sup>56</sup> found that group physical activity (e.g., team sport) was more strongly associated with lower depressive symptoms among males than individual activities (e.g., swimming). Alternatively, Teychenne et al.<sup>57</sup> identified that women who complete some of their activity with other people experience lower odds of depressive symptoms than those who complete all activity alone. In addition, there is evidence to suggest that being physically active with others may enhance the effects of other contextual factors, such as being physically active in natural environments.<sup>20</sup>

Constructs such as peer belonging, social connectedness, and social support consistently mediate the association between physical activity and mental health.<sup>58,59</sup> This suggests that it may not be social interaction itself (e.g., being around other people) but the quality of that interaction, that strengthens the mental health benefits of physical activity. Some evidence also shows that social support moderates (i.e., strengthens) the relationships between physical activity and reductions in depression<sup>60</sup> and distress.<sup>61</sup> Finally, social support is one of the best predictors of physical activity, and therefore being physically active with others may also facilitate mental health benefits by increasing adherence. As such, physical activity undertaken with others who



provide support and positive interactions may be most beneficial for mental health, and may also be beneficial by increasing adherence.

One caveat is that some individuals prefer to be physically active alone. As noted by Steltenpohl et al.<sup>62</sup> many individuals prefer to exercise alone, and this may indeed be psychologically beneficial for those that have few opportunities for solitude at other times during the day. As such, individual preference may influence the degree to which social connection, belonging and support are desirable when engaging in physical activity. We also acknowledge the other various dimensions of social environments that may impact upon physical activity levels, including social inequality, discrimination, and neighbourhood factors such as perceptions of safety.<sup>54</sup>

### 3.3.1. Recommendation

We recommend engaging in some physical activity with others who provide support, facilitate positive interactions, or make people feel valued, so long as it does not undermine a preference to be active alone.

### 3.4. Physical environment

Physical activity behaviours are diverse and can take place in a range of distinct environments. Broadly speaking, the 'physical environment' is defined as the setting, surroundings, or space within which physical activity takes place. The simplest and most common distinction between physical activity environments involves comparisons between indoors and outdoors. A systematic review of intervention studies that compared physical activity indoors and outdoors identified that walking or running outdoors led to lower feelings of depression and greater feelings of revitalisation and vigour compared with the equivalent activity conducted indoors.<sup>63</sup> Similarly, a systematic review of experimental studies found moderate to large effects in favour of the natural environment for a range of mental health outcomes.<sup>20</sup> Therefore, outdoor environments may support greater mental health benefits than indoor environments. However, outdoor environments vary significantly, and the specific features of these environments may be important. For example, they may include green space (e.g., parklands), blue space (i.e., water environments), or man-made urban structures, each of which may result in varying impacts on mental health when used as the setting for physical activity.

Meta-analytic evidence of intervention studies indeed shows that single sessions of exercise in green space have greater affective benefits than exercise completed indoors.<sup>64</sup> More recently, experimental evidence has begun to show similar effects for blue space.<sup>65</sup> Though green and blue spaces are qualitatively distinct, they are both examples of 'nature', defined as "areas containing elements of living systems that include plants and non-human animals across a range of scales and degrees of human management, from a small urban park through to relative 'pristine wilderness'".<sup>66</sup> When comparing natural outdoor environments to urban outdoor environments, results from a meta-analysis of intervention studies favoured physical activity in natural environments in terms of the effects on depression, anxiety, affect, and vigour.<sup>20</sup> Of note, prior evidence demonstrating an 'outdoor effect' may be capturing a 'nature effect', in that outdoor spaces are simply more likely to expose individuals to elements of nature than indoor spaces. This said, such elements can, through thoughtful interior design, be made available indoors. Under these conditions, it is possible that an indoor setting could provide greater mental health benefits from exercise than an outdoor setting devoid of natural features (e.g., congested streets, highly developed urban areas). This may explain some contradictory findings, such as the meta-analysis by Robertson and colleagues<sup>67</sup> who reported effect sizes for depressive symptoms that were more than twice as high among studies involving indoor walking compared to those utilising physical activity outdoors, albeit from a total of only seven studies. Such findings underscore the complexity of the interactions between objective physical environments and individuals' subjective perceptions when engaging in physical activity.

Despite the complexity of these associations, there is a growing body of evidence exploring the mechanisms that underpin the effect of nature exposure on mental health (both within and beyond the context of physical activity). For example, in their overview of the evidence and research agenda, Frumkin and colleagues<sup>68</sup> highlight 'Stress Recovery Theory' (SRT) and 'Attention Restoration Theory' (ART) as complementary theoretical frameworks that may explain 'how' regular exposure to nature supports well-being. Briefly, SRT posits that nature contact has stress reduction benefits, which has been supported by experimental work demonstrating blunted cortisol among participants walking in nature relative to those simply viewing nature on TV or walking indoors.<sup>69,70</sup> Alternatively, ART suggests nature contact may restore attentional resources that are depleted or fatigued by exposure to 'man made' elements of the modern world. Again, there is compelling empirical support for the restorative potential of natural environments, at least for certain cognitive capacities.<sup>70</sup> SRT and ART are among the seminal attempts at explaining the psychological processes that underpin the nature–mental health association, but research exploring alternative hypotheses continues to appear in the published literature.<sup>71</sup> Further scholarship will help to elucidate these mechanisms, but the theoretical and empirical work conducted to date lends support to a recommendation for engaging in physical activity in nature to enhance wellbeing.

Although there is relatively consistent evidence showing that natural outdoor environments may lead to better mental health benefits, many studies show positive effects for single sessions of exercise indoors, and so a lack of easy access to nature need not preclude mental health benefits from physical activity. Moreover, it must be recognised that not all types of physical activity can be easily performed outdoors (e.g., complex resistance training involving weight machines). Nevertheless, on balance it appears outdoor natural environments are better than indoor environments, or outdoor urban environments for a variety of mental health outcomes.

#### 3.4.1. Recommendation

Where possible and appropriate, some physical activity be undertaken outside in pleasant natural environments (e.g., green or blue spaces).

### 3.5. Domain

Domain refers to the life domain in which physical activity is performed, and includes leisure-time, transport, domestic, occupational, and school. For more than a decade, research has suggested that the domain in which physical activity is undertaken may play an important role in mental health.<sup>72,73</sup> A number of meta-analyses of randomised controlled trials show that physical activity interventions that target leisure-time physical activity are associated with reductions in symptoms of depression (e.g. 25) and anxiety (e.g., 26) and improved quality of life (e.g., 74) and wellbeing (e.g., 75). Whilst intervention studies demonstrate the mental health benefits of leisure-time physical activity, these studies have not compared physical activity performed in different domains (e.g., leisure-time versus occupational physical activity). Therefore, whilst it is possible to conclude that experimental evidence supports the use of leisure-time physical activity in the promotion and protection of mental health, it is impossible to conclude from intervention evidence alone whether one domain is better for mental health, when compared to other domains.

The bulk of the evidence examining the domain of physical activity and its relationship with mental health lies within observational studies, as these studies enable comparisons across multiple domains. Indeed, the results of the most comprehensive meta-analysis of both intervention and observational studies, including cross sectional and longitudinal designs,<sup>73</sup> also support the notion that leisure-time physical activity is beneficial to mental health. This review demonstrates that only leisure-time physical activity is consistently associated with

both lower mental ill-health and higher mental health. Alternately, transport-related (e.g., cycling to work), household (e.g., gardening), school (e.g., lunch-time play), and work-related (e.g., carrying heavy objects) physical activities are not associated with improved mental health and wellbeing. This suggests that leisure-time may be the most optimal domain for promoting mental health through physical activity. This may be because leisure-time physical activity is voluntary in nature, and one is free to choose if and when to undertake physical activity, which activity, where, and with whom to be active. Nevertheless, this review also showed that transport-related physical activity had a positive association with mental health and school sport had an inverse association with mental ill-health. These findings suggest that physical activity outside of leisure-time may be beneficial, however the evidence base is not as consistent or as large. Further, and perhaps more importantly, this meta-analysis identified that occupational physical activity was associated with higher mental ill-health. This result suggests that physical activity may indeed hold different relationships with mental health and mental ill-health depending on which aspect of daily life (i.e., domain) one engages in physical activity.

Not only might the social and physical environment of physical activity vary between domains, along with the type and delivery of physical activity, but conceptual frameworks suggest that psychosocial factors play a role in the mental health benefits of physical activity.<sup>7,8</sup> These factors (e.g., self-esteem, mastery, social support/connectedness, and mood) may explain why some domains are more beneficial than others. For example, evidence shows that enjoyment and autonomous motivation are associated with mental health outcomes,<sup>76,77</sup> and physical activity during leisure-time may be more likely to be a chosen activity (i.e., autonomy) that invokes feelings of enjoyment because human beings have more volition over how they spend their time during leisure. Because human beings have the innate need to experience mastery and relatedness,<sup>78</sup> chosen activities may also be more likely to provide opportunities to enhance 'self-efficacy' and experience social support, when compared to activities that involve less autonomy (e.g., occupational physical activity),<sup>19</sup> and abundant evidence shows that self-efficacy<sup>79</sup> and social support<sup>80,81</sup> are both essential to mental health and wellbeing. Alternatively, work-related or household-related physical activity may not provide as strong of an opportunity for enjoyment, novelty, autonomy, self-efficacy/mastery, or social support. Domains such as transport-related and school-related physical activity however may vary in terms of individuals' reasons for engaging, and therefore their motives for participation may influence the association with mental health, leading to heterogenous results among these domains. In sum, whilst evidence remains limited on all physical activity domains other than leisure-time, and little experimental evidence exists, evidence to date does consistently show that leisure-time physical activity may be the optimal domain to promote mental health. Nevertheless, evidence also suggests that motivation, enjoyment, self-efficacy, and social support may be important.

### 3.5.1. Recommendation

We recommend that at least some physical activity is undertaken during leisure-time, where possible prioritising activities one enjoys or personally chooses to undertake.

## 4. Discussion

A summary of our recommendations is given in Table 1. Additional research is required to fully elucidate the moderating effects of each of the contextual factors described in this consensus statement, and we encourage a greater focus on this line of scientific enquiry. Indeed, our review of the literature shows that this is an under researched area with significant potential for further scholarly development. However, we also argue that there is sufficient evidence, balanced against potential harms such as injuries or cost, to form tentative recommendations for individuals, practitioners, and exercise/mental health researchers. These should be revised or updated as further empirical evidence becomes available. Furthermore, whilst the recommendations offered here are evidence-informed, and in our view inherently actionable, it must be recognised that some constraints will dictate the degree to which they can be adopted in practice. Importantly, we emphasise that most forms of physical activity, irrespective of their concordance with our recommendations, are likely to support mental health compared with no physical activity at all. As such, our recommendations should be viewed as a guide, rather than a stringent set of criteria that must be met for mental health gains to be expected. We encourage participants and practitioners to consider these recommendations alongside the commonly recognised quantitative elements of physical activity that are routinely incorporated into traditional exercise prescription (i.e., frequency, intensity, duration). In doing so, decisions can be applied in a pragmatic manner that best suits individual preferences and constraints. As an example, a busy working professional with family commitments may not have the capacity to engage in active travel to and from work, but they may be able to replace some of their indoor treadmill walking with the same activity outdoors in a pleasant local park. Similarly, a clinician promoting resistance training to their clients may not be able to offer the same activity outdoors. However, they might direct their clients to a supervised programme, delivered by a needs supportive exercise facilitator, using a group-based format that encourages social connectedness. Our point is to consider which recommendations are on the menu of possibilities in each unique circumstance and to action our recommendations where appropriate. We contend that incorporating at least some of our recommendations into some of individuals' routine physical activity some of the time, is likely to produce greater mental health benefits.

## 5. Conclusion

The aim of this consensus statement was to provide guidance for practitioners on best-practice approaches to using physical activity to

**Table 1**  
Summary of recommendations.

Contextual factor	Recommendation
Type	Activity selection be guided by factors associated with adherence and enjoyment as opposed to any specific type.
Delivery	Facilitators (i.e., teachers, coaches, instructors, practitioners) deliver organised physical activity sessions using an instructional style that satisfies individuals' basic psychological needs. We also recommend the use of supervised physical activity sessions for clinical populations, which appear to be more beneficial than unsupervised sessions.
Social environment	Some physical activity be undertaken with others who provide support, facilitate positive interactions, or make people feel valued, so long as it does not undermine a preference to be active alone.
Physical environment	Where possible and appropriate, some physical activity be undertaken outside in pleasant natural environments (e.g., green or blue spaces).
Domain	At least some physical activity be undertaken during leisure-time or via active travel, where possible prioritising activities one enjoys or personally chooses to undertake.

maximise benefits for mental health and wellbeing. We have made recommendations regarding the type, delivery, social and physical environments, and domain, of physical activity to optimise mental health outcomes. In addition, we call for an increased focus on these contextual factors of physical activity, including a more explicit focus on testing the influence of contextual factors in research designs and, greater consideration of the potential influence of contextual factors when designing physical activity programmes.

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### Confirmation of ethical compliance

We did not seek ethics approval for the views reported in this manuscript, and there is no reason to believe that ethics approval was required.

### CRediT authorship contribution statement

**Stewart A. Vella:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Eugene Aidman:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Megan Teychenne:** Methodology, Writing – original draft, Writing – review & editing. **Jordan J. Smith:** Methodology, Writing – original draft, Writing – review & editing. **Christian Swann:** Methodology, Writing – original draft, Writing – review & editing. **Simon Rosenbaum:** Methodology, Writing – original draft, Writing – review & editing. **Rhiannon L. White:** Writing – original draft, Writing – review & editing. **David R. Lubans:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Supervision.

### Declaration of interest statement

The authors declare no conflicts of interest.

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