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**Psychology of Physical Activity:
a 30-year reflection on correlates, barriers, and theory**

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Abstract

Over a 30-year period, we have authored five versions of the textbook *Psychology of Physical Activity*. This provides us with more than three decades of experience to reflect on the field of the psychology of physical activity. Typically, the book has been structured around the three themes of determinants/correlates and theory, mental health outcomes, and behaviour change interventions. In the current paper, we delimit our reflections to physical activity correlates and barriers, and the use of theory. Overall, the field has expanded greatly. Physical activity is central to most national preventive health policy initiatives and is now highly visible. Over the 30 years of our book writing, we have seen trends in the correlates and barriers for physical activity that reflect an increasing recognition of the different types and intensities of physical activity, some reflecting in a 'systems thinking' approach that recognises the natural complexity of the behaviour and its settings. But further work is recommended in gaining clarity on the frequently stated barrier of 'lack of time' and assumed physical activity correlate of enjoyment. Moreover, the move to a dual-process approach to theory is one that will continue to develop but may need more work in its application to behaviour change. A reflection across recent editions of the book suggest that some good progress has been made, but not universally so.

Introduction

Physical activity is an important health behaviour. Research on the benefits of a physically active lifestyle is extensive and includes evidence for positive psychological, social, physical, and other outcomes. However, levels of physical activity remain low across most, if not all, population groups. For example, global estimates from self-reported data show that 28% of adults and 81% of adolescents do not meet recommendations for aerobic exercise. This discrepancy by age is likely due to the different criteria adopted in recommendations for young people and adults. Moreover, the data for adults seems particularly optimistic. Trends suggest no overall improvement in global levels of physical activity participation over the last two decades (Guthold et al., 2018, 2020).

The International Children's Accelerometer Database (ICAD) has reported physical activity assessed by accelerometer in over 25,000 young people from several countries (Cooper et al., 2015). Using the criterion of at least 60 mins of moderate-to-vigorous physical activity each day, only 2% of girls and 9% of boys achieved this. Whichever way physical activity is assessed, there is a clear need for better understanding of how and why people might choose to be physically active and how physical activity levels can be increased. Part of the solution to this problem is through an understanding and application of psychology, notwithstanding that other perspectives and influences, including social and environmental factors, will also be important.

We have authored five versions of the textbook *Psychology of Physical Activity*, with the 4th edition published in 2021 (Biddle et al., 2021) (see Figure 1). A predecessor of the current book was started in the 1980s but unfortunately had limited marketing and was very expensive (Biddle & Mutrie, 1991). Hence we moved to another publisher and started updating and writing the current series with the first edition being published in 2001 (Biddle

& Mutrie, 2001, 2008; Biddle et al., 2015). With the different editions of the book, including its predecessor, we have more than 30 years of experience to reflect on the field of the psychology of physical activity. Typically, we have organised the book around the three themes of determinants/correlates and theory, mental health outcomes, and behaviour change interventions. In the current paper, we will delimit our reflections to physical activity correlates and barriers, and the use of theory. Mental health and interventions will not be addressed.

Figure 1 about here

What's in a word?

We started with the book *Psychology of Physical Activity and Exercise*. This was the first English language textbook on 'exercise psychology', despite another publisher, a year later, claiming that their own book was the first! At the time, it was common to refer to the field as 'exercise psychology', and indeed it took some effort to change the ubiquitous use of the term 'sport psychology' to 'sport and exercise psychology', including its use in journal titles (see Biddle & Vergeer, 2019). Given that much of the early literature referred to structured exercise, we kept the word in the original book title. However, we were comfortable adopting the terminology proposed in the seminal paper by Caspersen and colleagues (1985), and hence preferred to use the term 'physical activity'. Of course, this includes 'exercise' (see Table 1) and, as such, by adopting the term physical activity, exercise is not excluded. One could argue that physical activity is a more acceptable term than exercise for most people when promoting active lifestyles.

Table 1 about here

In addition to the definitions by Caspersen et al., we included a definition of 'sport', based on Rejeski and Brawley (1988) and Loy (1968), in all versions of our book.

Specifically, we have defined sport as “a sub-component of physical activity ... (that is) rule governed, structured, competitive, and involves gross motor movement characterised by physical strategy, prowess, and chance” (Biddle et al., 2021, p. 22).

When we first wrote our book in 1991, the primary focus, not surprisingly, was on the psychology of physical activity. However, over the years we have adopted a psychology-based approach that has become less constrained by the field of psychology whereby we look at psychology embedded in the wider framework of physical activity and public health. For example, the commonly adopted ecological framework (Sallis & Owen, 2015; Salmon et al., 2020) embeds intra- and inter-individual factors (including psychological and social psychological variables) within a wider model of behavioural influences that include environments and policy. We also adopt such an approach that seeks to see the ‘bigger picture’ while also drilling down into important psychological issues. As we revised the different editions of the book, we have tried to achieve a better balance between psychology, behavioural medicine, and epidemiology, and hence have psychology embedded within the wider field of physical activity for health. Behavioural medicine can include a number of disciplines in addition to psychology, such as public health, geography, sociology, and health economics (Marteau et al., 2006).

One relatively recent development which reflects a wider view of physical activity is the adoption of integrated 24-hour guidelines. Proponents of such an approach argue that it is better to study ‘movement behaviours’ as an integrated whole across a 24-h period. Such behaviours include not only moderate-to-vigorous physical activity, but also light-intensity physical activity and sedentary behaviour, with the latter being low energy sitting during waking hours. In addition, the 24-h period will include sleep. Within a finite time period, such as a full day, changes to one of these behaviours will inevitably affect others. For example, by reducing sedentary behaviour, this time will be displaced elsewhere, which

could be in light or more intense physical activity. Equally, the time could be allocated to sleep (Dumuid et al., 2022). This approach has been applied to guidelines, with the first being in Canada (Tremblay et al., 2016). Recent guidelines for young people in Australia state “for optimal health benefits, children and young people (aged 5-17 years) should achieve the recommended balance of high levels of physical activity, low levels of sedentary behaviour, and sufficient sleep each day”, and further details of these recommendations are provided (Okely et al., 2022; p.16).

In our 2021 book edition, we said that further work may be required to know whether the expectation and load imposed on people from addressing three behaviours is considered too much, or whether such an integrated approach is helpful. Research as part of the Canadian 24-h guidelines has shown support when asking a range of stakeholders, including parents and health professionals (Faulkner et al., 2016; Riazi et al., 2017). Experimental research suggests that the integrated 24-h guidelines improve social cognitions, such as self-efficacy and planning, in the context of parental support for their children meeting the recommendations (Tennant et al., 2019). From a psychological perspective, research is also needed to see if adherence to such guidelines is improved relative to guidelines that address each behaviour separately.

Correlates and Barriers

One of the main themes of the psychology of physical activity concerns the behavioural antecedents of participation. Typically, this has involved the study of correlates of, and barriers to, physical activity, as well as theoretical perspectives underpinning behavioural choices in the physical activity context.

Correlates and Determinants

The study of the ‘determinants’ of physical activity has a long history. The term ‘determinants’ assumes some level of causal determination, which often we cannot confirm. Perhaps the most common usage is in the term ‘social determinants of health’ (see Cockerham, 2022). While there is a great deal of recognition and agreement that social factors (e.g., socio-economic status, social context) are very important for health outcomes, true causal linkages can sometimes be hard to confirm. Nevertheless, the use of the word determinants can be an acceptable, if slightly imprecise, term, and it tended to be used more frequently when researchers first studied this field (Dishman et al., 1985). For consistency, we have kept the term in the sub-title of our book. More recently, determinants have been distinguished from ‘correlates’ of physical activity. The latter refers to factors associated with physical activity but not necessarily causally so. Many variables in physical activity are likely to be correlates rather than true determinants (Bauman et al., 2012).

Early work in this field did study determinants and correlates associated with just the two domains of ‘structured exercise programs’ and ‘spontaneous physical activity’, but little on different intensities (Dishman et al., 1985). This was a reflection of the available data at the time. Moreover, determinants were a little more narrowly focussed than today, with categories labelled as personal, environmental, and activity characteristics (Dishman et al., 1985). The same authors stated in 1985 that “there is little standardization in defining and assessing determinants and physical activity” (p. 161).

The early literature also reported motives for participation as correlates of different forms of physical activity. For example, young people being physically active through sport often reported motives of fun, skill development, social affiliation, fitness, and challenge, thus it was assumed that these factors were driving participation. While this can be the case, motives are self-reported reasons for participation and differ from factors associated with future participation. Motives are usually reported after the event, whereas correlates and/or

determinants, should be predictive of, or associated with, subsequent participation in a logical temporal sequence. That is, correlates should precede or at least be co-existing, with participation, and not necessarily be an outcome of participation.

Correlates have subsequently been categorised into socio-demographic, biological, psychological, behavioural, social, and environmental factors (Sallis et al., 2000). In the latest edition of our book, we concluded that the main correlates of physical activity for young people are age, sex, intentions, self-efficacy, sedentary behaviour after school and at weekends, parental support, and time spent outside. Sedentary behaviour has become a highly visible research topic since the early 2000s and is now a significant focus of interest alongside physical activity (Bull et al., 2020; Tremblay et al., 2017). This led to the topic being addressed more fully in later editions of the book (Biddle et al., 2015; Biddle et al., 2021).

For adults the main correlates of physical activity are sex, self-efficacy, activity history, social support, access to facilities, and the local transport environment (Biddle et al., 2021). It is clear to see, therefore, that correlates are multi-faceted and not just psychological. They may also vary by type or domain of physical activity, such as physical activity through active transport, in the home, or in sport. There will also be correlates of physical activity that might differ by the stages of behavioural adoption and maintenance, and Dishman et al. (1985) did comment on this nearly four decades ago. Over the past 30 years, we have become more aware of this distinction and the importance of physical activity maintenance. However, rather little progress has been made on the best ways to sustain physical activity, although a number of directions are evident from the literature (Kwasnicka et al., 2016). It is interesting to note that Chapter 2 in our first book was titled 'Exercise Adoption and Maintenance', although it is fair to say rather less was known about true maintenance (Biddle & Mutrie, 1991). Theories have now evolved to consider maintenance more explicitly

(Dunton et al., 2022; Dunton et al., 2021; Kwasnicka et al., 2016; Rhodes & Sui, 2021; Strobach et al., 2020).

The identification of different domains of physical activity has been a clear trend in the literature. For example, we stated in 2015 that “more needs to be known about how the correlates of physical activity may differ across different intensities and types of activity” (Biddle et al., 2015, p. 400). In evaluating this, we stated that progress had been weak-to-moderate – “some progress is evident, but generally the field of physical activity correlates remains a little stagnant. More emphasis is still needed on what correlates exist for different types of intensities of physical activities” (Biddle et al., 2021, p. 451). Given that the field of physical activity for health has expanded its breadth, such as giving more recognition to light-intensity physical activity and high-intensity interval training (HIIT), the need to study correlates of different intensities of physical activity has become more evident.

As psychologists, we should be placing more emphasis on the behavioural type and context, such as what function the physical activity is serving for the individual (e.g., social, health), where it takes place (e.g., work, leisure), and what form it might take (e.g., different intensities). Correlates will differ across these domains. Moreover, we should be conducting studies on how correlates might change over time and affect behavioural maintenance. The same can be said for sedentary behaviour.

Finally, it is somewhat surprising that intuitive correlates of physical activity, such as levels of enjoyment, have shown inconsistent results. For example, in the seminal review by Dishman et al. (1985), ‘enjoyment of activity’ had ‘weak or mixed’ evidence of association with supervised exercise and was not associated with participation in more spontaneous forms of physical activity. Sallis et al. (2000), in a highly cited review of correlates, found enjoyment of exercise unrelated to participation for adolescents.

In the different editions of our book, we have argued that several theories or frameworks help us understand the nature of enjoyment, such as the concept of flow (Csikszentmihalyi, 1975) or theories of intrinsic motivation (Deci & Ryan, 1985). But we still have limited understanding of the true nature of enjoyment in the context of physical activity and how or why it might drive participation. Interestingly, Dishman et al. (1985) alluded to enjoyment being a more important driver of physical activity maintenance than health, with the latter being important in the adoption phase. This was confirmed in a review of physical activity in older adults (van Stralen et al., 2009).

With the concept of enjoyment being so central to psychology, we have argued that more work is required for both definition and measurement. For example, the interchangeable use of words, such as enjoyment, fun, affective states etc, may lead to confusion. In addition, measurement of enjoyment may not yet be optimal. Reported states of 'enjoyment' may, instead, reflect a 'job well done' or some form of satisfaction, especially in challenging exercise contexts. Given that the 'Physical Activity Enjoyment Scale' (PACES; Kendzierski & DeCarlo, 1991) is used frequently, and has items reflecting gratification and sense of accomplishment, it is difficult to be precise as to the exact nature of 'enjoyment' being expressed. Moreover, we argue in the 4th edition of our book that enjoyment can be cyclical, reflecting motives, in-task affect, and post-task reflection, and some of these feelings may drive future participation more than others (Rhodes & Kates, 2015). In short, we still have a great deal to learn about the apparently 'simple' or 'obvious' construct of enjoyment.

Barriers to Physical Activity

A fundamental part of the psychology of physical activity is to understand what facilitates or undermines participation. The study of correlates and motives is a key part of

the former while barriers are important for understanding low levels of participation. They may also be studied in people struggling to increase current low levels of physical activity.

Initial studies of barriers used several different constructs, with little consistency between them. For example, the UK's Allied Dunbar National Fitness Survey in the 1990s provided national data on motives and barriers, including barriers related to time, need to rest, 'not being the sporty type', and injury/disability. However, replication of these categories of barriers has not been done and little progress has been made concerning the psychometric development of measuring scales since work in the 1980s (Sechrist et al., 1987; Steinhardt & Dishman, 1989).

An observation from the Allied Dunbar National Fitness Survey was the identification of the importance of barriers that differed by age and sex (Sports Council and Health Education Authority, 1992; see also <https://www.mrc-epid.cam.ac.uk/research/studies/adnfs/>). While perceived lack of time was rated more highly by men and women over the age of 35 years (see discussion on this barrier later), perceptions of 'not being the sporty type' were rated more highly by women than men.

It was in our first book that we highlighted research suggestive of participation 'expanding' and 'contracting' across the life cycle. That is, some activities, and by inference the barriers too, will be added or deleted over time. To put it simply, interests and involvement change over time, hence barriers may also change alongside the change in physical activities. But little has been researched on this over past few decades.

Barriers to physical activity have been identified over the full 30 years of our book writing. Initially, the focus was on reasons for dropping out of structured exercise programs for adults or sport programs for youth. In the same way that motives for participation can be conceptually different from correlates (see above), we argue that reasons for dropping out are

not necessarily the same as perceived or structural barriers to adoption or maintenance. Moreover, initial work on dropout from exercise programs had a strong emphasis on intra-individual differences, such as motivation. Less emphasis was put on a wider range of possible barriers, such as socio-cultural or physical environmental factors. One clear trend over the past 30 years has been the recognition of environmental barriers, such as climate, the built environment, and transport infrastructure (Giles-Corti et al., 2016).

A common finding over many years, including all 30 years of our books, is that a major barrier to physical activity is stated as 'lack of time'. In the early editions of the book, we alluded to the study of barriers, as well as correlates and motives, as largely descriptive. We said it was a good place to start - for research and development of knowledge - but not a good place to finish. By this, we meant that further study of the underlying components, including theoretical frameworks, was required to advance the field, and correlates and barriers needed better integration into intervention designs. Therefore, we have now expanded our thinking on the barrier of time. In the latest edition, we have suggested that the barrier of time is a perception not always matched by reality. The core of the argument is that data suggest in most cases we do have leisure time to allocate to physical activity if we so wish. However, we often choose to allocate time to other tasks, some of which will be sedentary. We need to look at how people prioritise physical activity within the context of competing behaviours and time allocation (Biddle, 2022; Biddle et al., 2021). This will help move the field from description to interpretation and analysis, and perhaps link better to intervention design and implementation.

Theory: Trends and Usage

Earlier editions of the book drew heavily on historically important theories that were used in exercise psychology and related fields, and especially educational, health, and social

psychology. These theories initially included the Theory of Reasoned Action/Planned Behaviour, Social Cognitive Theory (with a strong emphasis on self-efficacy), and perceptions of control, such as initially through the construct of locus of control, and subsequently through a more humanistic approach with an emphasis on Self-Determination Theory and intrinsic motivation (Rhodes et al., 2019). The popular Transtheoretical Model was also covered, with the concept of stages of change being central. The notion that different processes of change and psychological constructs may differ at various stages of decision making was gaining in popularity as we were writing the 1st Edition of the current series. It did not feature in the initial book in 1991. Moreover, coverage of locus of control, the Health Belief Model, and some other health-related and social psychological theories (e.g., Protection Motivation Theory; Attribution Theory), were de-emphasised or dropped in newer editions of the book. They became less prominent with time. Coverage of theories across all versions of the book are shown in Figure 2.

Figure 2 about here

Theories wax and wane. By the time of writing the 4th Edition it was clear that a few social-psychological theories were dominating the field. These were the Theory of Planned Behaviour (evolving from the Theory of Reasoned Action), Social Cognitive Theory, Self-Determination Theory, and the Transtheoretical Model (Rhodes et al., 2019; Rhodes & Nasuti, 2011). These were far from being free of criticism, however, including one suggestion to ‘retire’ the Theory of Planned Behaviour (Sniehotta et al., 2014), and others challenging the effectiveness of the Transtheoretical Model (Adams & White, 2003, 2005). Moreover, theories that were discarded from coverage in the book were done so not because they were no longer current, but because they seemed to no longer have received attention in the specific study of physical activity. Other health behaviours continue to use these theories (see Orbell et al., 2020).

Interestingly, Michie and colleagues (2014) summarised 83 theories relevant to health behaviour change. Not all of these may be relevant to physical activity, and not all are true theories, but it highlights the diversity of the field and the narrow approach adopted in physical activity research. That said, there is also considerable overlap in constructs across theories, and we previously alluded to this by mapping construct convergence across six theories (Biddle & Mutrie, 2001). Constructs most overlapping across theories were intentions, outcome expectancy, social norms, and self-efficacy.

More recently, in Michie et al.'s (2014) summary of 83 theories of behaviour and behaviour change, they state that "although we identified a very large number of different construct labels, 1659 in total, many of these appeared to be alternative labels for essentially the same construct" (p. 462). Moreover, the interconnectedness of theories was demonstrated through network analysis whereby 'self-efficacy theory' and 'social cognitive theory' (they separated the two, although it could be argued that they are closely linked), contributed to 23 and 12 other theories, respectively. Moreover, the Health Action Process Approach (HAPA), featured in later editions of our book, was influenced by five theories (Michie, West, et al., 2014).

Similarly, the Theoretical Domains Framework (Cane et al., 2012; Michie, Atkins, et al., 2014) was developed in response to a perceived need by those planning and implementing interventions. It was thought that the large number of theories and overlap between constructs we have just alluded to was not helpful, hence the framework was developed whereby core constructs were extracted. This led to 14 'domains' (constructs), including knowledge, skills, intentions, and emotion.

In addition, it is often assumed theory-based approaches will be superior, such as for intervention effectiveness, compared with those not adopting theory. However, the evidence

for this is uneven (Gourlan et al., 2016; Prestwich et al., 2014), and the number of papers in physical activity research that report no use of theory remains high (Rhodes & Nasuti, 2011).

Two main developments in theory were evident across the 30-year period of the books. First, theories in the study of physical activity tended to be static and unidirectional, such as Theory of Planned Behaviour. By this we mean that linkages tended to be unidirectional, such as attitudes to intentions, rather than allowing for linkages in reverse. It is entirely plausible that intentions or behaviours will influence subsequent attitudes. As a result, more dynamic and nuanced frameworks emerged, such as the Transtheoretical Model and Health Action Process Approach. Both recognised that people move through different stages of decision making and this is important for understanding of intentions and behaviour – a so-called ‘one size does not fit all’ approach. What might be helpful for someone in the stage of contemplation may not be appropriate for those in the action stage. Such developments also reflected what we called a shift from emphasising the ‘left side’ of the model (e.g., attitudes in the Theory of Planned Behaviour) to the ‘right side’ of action-planning and behaviours.

The second major trend in the use of theory in the psychology of physical activity was the recognition that social-cognitive and motivational theories were insufficient as theoretical approaches. Such theories (e.g., Social Cognitive Theory) emphasise cognitive effort and reflect slow, reflective thinking, sometimes referred to as ‘Type 2’ processing. Recognising that not all actions follow such a path, greater emphasis has started to be placed on fast, automatic (‘Type 1’) processing, thus requiring less cognitive effort. This distinction led to the ‘dual-process’ approach now accepted in physical activity research (Brand & Cheval, 2019; Brand & Ekkekakis, 2018). Dual-process refers to both reflective and automatic processing. For example, while some situations may appear attractive for physical activity (e.g., open green spaces or colourful and accessible stairs), making choices to be active in

such contexts may also require some cognitive processing of, say, self-efficacy and intentions. Automaticity may also depend on the extent of prior experience and the need to process information. For example, we know that in novel situations, such as using gym equipment for the first time, behaviour will be more regulated by conscious decision making. However, as experience is gained, behaviour becomes more habitual as it is driven by familiar environments and routines. Less conscious effort is required as 'habits' are developed. In all of these cases, the processing of affective cues is also important and 'reward' is likely to be influential (Cheval et al., 2018). 'Gut feelings' of likes and dislikes can also act as strong drivers of behaviour with low conscious effort.

In the 3rd Edition of the book (Biddle et al., 2015), we stated as a research direction "better integration of aspects across different psychological theories should be considered, including more automatic and conscious processing approaches" (see Biddle et al., 2021, p. 451). In our estimation, we felt that progress on this was 'moderate'. Specifically, we said that "there is greater recognition that the theories most prevalent in physical activity ... are not adequate and may reflect an over-commitment to certain theories by researchers in this field. Moreover, dual-process approaches ... are more common" (Biddle et al., 2021, p. 451).

In addition, we also suggested that social, environmental, and policy theories should be considered alongside psychological approaches. There was also 'moderate' progress on this over the past two book editions, but behavioural medicine research was adopting such approaches more readily. It is interesting to note that we wrote a chapter on perceptions of social environments in previous editions of the book but dropped it later as we felt that research was limited and not progressing. More extensive discussion on social, environmental, and policy theory was beyond the scope of the book.

Conclusions

The field of ‘exercise psychology’ – what we have preferred to call “psychology of physical activity” through the three decades of our book writing – covers three broad areas: mental health outcomes, the correlates/determinants of physical activity, including underpinning theory, and interventions to change physical activity levels. The current paper has focussed only on correlates and theory. We have discussed trends that have been evident in the writing of five versions of our book since first being published in 1991. Overall, the field has expanded hugely, underpinned by a significant increase in the number of researchers, educators, and practitioners. Moreover, the synthesising of research evidence has been easier by the proliferation of systematic reviews.

Physical activity is ‘front and centre’ of most national preventive health policy initiatives, whereas this was not always the case. The visibility and importance of physical activity for health has been helped greatly by the availability of national surveillance data and physical activity guidelines. It is probably true to say we no longer need to ‘make the case’ – it is clear to see. Nevertheless, physical activity, like other health behaviours, needs to continue to fight for resources and support.

Over the 30 years of our book writing, we have seen trends in the correlates and barriers for physical activity that reflect an increasing recognition of the different types and intensities of physical activity. It could be argued that we have become more ‘nuanced’ and sophisticated, and this is reflected in a ‘systems thinking’ approach that recognises the natural complexity of the behaviour and its settings. In addition, the move to a dual-process approach, recognising both reflective and automatic theories, is one that will continue to develop. This trend is welcomed but may need further development in being integrated into intervention research designs.

Although interventions have not been the focus of the current paper, the role of correlates and barriers, as well as underpinning theory, is most important when considered in the context of, and applied to, behaviour change. To this end, our latest edition of the book highlights the importance of mixed methods, including qualitative methods, involvement of participants in the development of interventions, and the assessment of physical activity and associated contexts over time. These issues have grown considerable over the time of our book writing. We look forward to further progress over the next decade and beyond.

Pre-publication version

Declaration of Interest Statement

All authors are co-authors of some or all of the textbooks that form the basis for this paper. As such, they are paid royalties on book sales.

Data availability statement. Not applicable.

Pre-publication version

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Table 1. *Definitions proposed by Caspersen et al. (1985)*

| Term | Definition by Caspersen et al. (p. 129) | Comment |
|-------------------|--|---|
| Physical activity | “Any bodily movement produced by skeletal muscles that results in energy expenditure” | Usually interpreted in the context of physical activity for health as elevated energy expenditure from physical activity that would be expected to produce health outcomes (U.S. Department of Health and Human Services, 1996). Typically, this has been moderate-to-vigorous intensity physical activity, although lower levels of intensity can also be beneficial for health, including replacing low energy sitting with changes in posture and/or movement. |
| Exercise | “Planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness” | A sub-component of physical activity. It is debatable that all exercise has to involve the <u>intent</u> to affect physical fitness, but the definition does delineate an important type of physical activity that we all can recognise. |

Figure captions

Figure 1. A timeline for the publication of the book *Psychology of Physical Activity* and its predecessor.

Figure 2. Coverage of psychological theories across all versions of the book from 1991 to 2021.

Pre-publication version

