AUG 03, 2023

OPEN ACCESS

DOI:
dx.doi.org/10.17504/protocols.io.yxmvm32kbl3p/v1

Protocol Citation: Christine Roberts 2023. Typology of Physical Activity. **protocols.io** https://dx.doi.org/10.17504/protocols.io.yxmvm32kbl3p/v1

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Protocol status: Working
We use this protocol and it's working

Created: Aug 03, 2023

Last Modified: Aug 03, 2023

Typology of Physical Activity

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ABSTRACT

Different physical activity types vary in metabolic demand (intensity), but also in non-metabolic demand (balance, co-ordination, speed and flexibility), cognitive demand (attention, memory and decision making), and social demand (social interaction). Activity types with different demands may have different effects on health outcomes but this cannot be formally tested until such demands can be reliably quantified. The present Delphi expert consensus study aims to objectively quantify the cognitive, physical and social demands of different PA types and used these scores to create a formal activity demand typology. International experts will systematically rate common activity types in terms of their intrinsic cognitive, physical and social demands, until consensus is reached. Cognitive, physical and social demand scores will be combined to create an overall non-metabolic demand rating for each activity type.

PROTOCOL integer ID:
85912

Keywords: physical activity, activity type, non-metabolic demands, cognitive, social

Typology of Physical Activity

1 A TYPOLOGY OF PHYSICAL ACTIVITY

2 Title: A Typology of Physical Activity

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4 Funder: Rowett Institute of Nutrition and Health, University of Aberdeen

5 Protocol details: Version number: 3.0 Date: 8.2.16

6 BACKGROUND: The World Health Organisation definition of health is “a complete state of physical, mental and social well-being” (Preamble to the Constitution of the World Health Organization, 1946, p100). Physical activity has been shown to benefit a wide range of aspects across these three major health dimensions. For example, physical benefits of an active lifestyle include a reduced risk of cardiovascular disease (Reddigan et al,. 2011), colon and breast cancer (Lemanne et al., 2013), obesity (Jakicic & Otto, 2005), and greater physical functioning through improved muscular strength (Latham et al., 2004) and mobility (Yeom et al., 2009). Mental benefits of physical activity may include improved cognitive functioning such as memory

(Nagamatsu et al., 2013), attention (Schafer et al., 2006), executive functioning (Guiney & Machado, 2013), protection against cognitive decline in old age (Sofi et al.,2011), and other benefits such as quality of life (Pucci, 2012), sleep (Kline et al., 2013) and stress reduction (Rueggeberg et al., 2012). In addition, physical activity has been linked with social health. Enhanced social relationships (Sandford et al., 2008; Fisher et al., 2004) and greater social activity (Shiovitz-Ezra & Litwin, 2012; Pucci et al., 2012; Podewils et al., 2005) all appear to be positively related to a physically active lifestyle. Physical activity benefits also extend to aspects of health that require combinations of physical, mental and social functioning, such as functional independence (Ip et al., 2013; Paterson & Warburton, 2010; Lui & Latham, 2009; Arcoverde et al., 2008) and ability to perform activities of daily living (ADLs) in old age (Burge et al., 2012). One of the most commonplace definitions of physical activity is “any bodily movement produced by skeletal muscles that results in energy expenditure” (Casperson et al., 1985, p126). The frequency, intensity, time and type (FITT) of physical activity are typically recorded as specific measures. The frequency, intensity and time aspects are generally well-researched (often summarised as level of physical activity, or expressed as energetic expenditure), leaving physical activity type largely under-researched. The most common method of classifying the type of physical activity is to categorise activities into one of the three broad categories: endurance (also referred to as aerobic and cardiovascular exercise); strength (also referred to as resistance or weight training), or; flexibility (also referred to as stretching or mobility training). However, the demands of different types of physical activities vary far more extensively than that which can be accounted for using such broad classifications. Physical activities differ in terms of their mental (eg. attention, memory, decision-making, reaction time), physical (eg. strength, flexibility, balance, coordination) and social (eg. alone, in a group, with an instructor) demands, which may relate to different mental, physical and social health outcomes. Some physical activities have different/greater underlying mental demands compared to others. For example: golf requires the ability to read the greens, make tactical decisions and keep score; dancing requires the ability to interpret music, lead/follow a partner and remember choreography; archery requires focus and attention to strike the target; football requires team strategy, communication and decision making skills to score goals in a time-pressured situation; and tennis requires prediction and fast reaction time to counteract an opponent’s moves. These examples portray more mentally demanding activities, whereas simpler activities such as walking and running may be considered less mentally demanding. Physical activities can be characterised by their physical demands on endurance, strength and flexibility, and in terms of their demands for skill. For example: yoga requires extensive flexibility but also static balance; tennis requires not only aerobic fitness and strength, but also agility and dynamic balance; and dancing requires extensive coordination of limbs to execute movement patterns. Increased understanding of the importance of these physical skills has resulted in their inclusion in major physical activity guideline institutions, e.g. the American College of Sports Medicine’s (ACSM) recommendations for physical activity in older adults includes balance training alongside aerobic, strength and flexibility training (Wojtek et al., 2009). Some physical activities are also inherently more social than others. For example, team sports such as football and basketball not only require social interaction with a team and an opposing team, but participation also requires direct, purposeful and strategic verbal and non-verbal communication and teamwork in order to achieve a common goal. Running with a friend may include social interaction and communication, but communication itself is not integral to the

activity. Some types of dancing have an intrinsic social element, where a participant is required to follow the direction, or lead a partner, in a close spatial area. Going to the gym alone may result in incidental social interaction, whereas using a stationary cycle at home may be completely socially isolated. Physical activity is a complex, multifaceted behaviour (comprised of mental, physical and social demands). Activities with different combinations of mental, physical and social demands may well produce different effects on health outcomes. Several Cochrane reviews identify the need for investigation into the type of activity and its effect on a range of health issues, including dementia (Forbes et al., 2015), physical functioning (Lui & Latham, 2009) and Health Related Quality of Life (HQRoL) in cancer survivors (Howe et al., 2011). To date, the non-metabolic demands of different activity types have been poorly conceptualised. Detailed analysis of this important health behaviour is scarce. Limitations in detailed physical activity classifications compromise our understanding of how this complex behaviour produces mental, physical and social health benefits.

7 Purpose of the study: This Delphi study aims to generate a typology of physical activity types that quantifies the different characteristics of each. Mental, physical and social demands of different types of physical activities will be scored, so that future research can explore the effect of specific physical activities (with their unique mental, physical and social demands) on health outcomes.

8 Study Aim: The aim of the research: To generate a physical activity typology that conceptualises and scores the mental, physical and social demands of different physical activity types

9 Objectives: Data will be gathered from an expert panel via Delphi methodology. The mental, physical and social demands of different physical activity types will be scored until a consensus is reached.

10 Research question: What are the levels of mental, physical and social demands within different types of physical activities?

11 METHODOLOGY

12 Participants: While there is no agreement on panel sizes for Delphi studies, the literature recommends 10 to 18 experts on a Delphi panel (Okoli & Pawlowski, 2003). Attrition of participants may mean the degree of consensus reached in the final round is overestimated (Sinha et al., 2011). In order to counteract problems associated with drop-outs, the upper end of

the suggested panel size will be adopted. Panel sizes of around 20 participants (selected via strict inclusion criteria) have been considered appropriate where panel members have similar training and general understanding in the field of interest (Atkins et al., 2005). Therefore, sample of expert participants (n=40) will be recruited from the UK and wider western nations via non-probability sampling techniques to form two expert panels: (n=20 MEN: cognitive experts to provide data on mental and social demands of different activity types; and n=20 PHY: physiological experts to provide data on physical and social demands of different activity types. Experts are defined as 'graduate researchers, educators and/or professionals working in the fields of cognitive psychology, health psychology or sport and exercise science'. Inclusion criteria are: graduate qualification status; experience of working in a relevant field; assurance that sufficient time will be dedicated to the Delphi study; and good written (English language) communication skills. To reimburse their time, panelists will be offered monetary rewards (£10 per questionnaire round they complete, with a maximum of three rounds). Participants will be invited to participate via email. They will also be sent an information sheet and a reply form. It will be made clear that participation is entirely voluntary, that participants are free to withdraw from the study at any point, without providing a reason for withdrawal, and that anonymity of all participants will be enforced. Those who wish to participate will be asked to return the reply form via email.

13 Measures and Procedure: Background and demographic information Age of participant, years of education, occupation, institution, area/s of expertise will be collected. Delphi Method The Delphi method, or Delphi technique, is a widely used and accepted method for attaining consensus of expert opinion in real-world knowledge (Hsu & Sandford, 2007). Questionnaires are individually submitted to participants of an expert panel. Once completed and returned, the researcher compiles data into summaries, which are then anonymously recirculated to the panel alongside each individual respondent's data. This allows panel members to: (i) ensure that their views are correctly interpreted; (ii) acknowledge the views of fellow panel members, and (iii) edit their responses after viewing the data from the rest of the panel. This process would constitute one round. For more detailed exploration/consensus-building of the topic area, additional rounds may follow. While there are no specific guidelines and many variations exist, a classical Delphi is characterised by anonymity, iteration, controlled feedback, and statistical aggregation of group response (Skulmosky & Hartman, 2007). In a Delphi method, round one often uses an inductive approach whereby participants are at liberty to offer ideas with complete freedom in their responses (Hasson, 2000). While this approach has many advantages, it has been criticised for its inability to produce the level of information that could be generated by a thorough literature review (Miller, 2000; Wheeller et al., 1990). Thus, this study uses a modified Delphi technique, whereby preselected items drawn from the existing literature are used to form a structured, round one questionnaire. This modification is considered both acceptable and common (Hsu & Sandford, 2007). A thorough investigation of the existing literature was undertaken to identify mental, physical and social demands, which were then placed in structured, quantitative questionnaires. This modification is advantageous in that it improves the initial round response rate, and provides a solid grounding in previously developed work (Custer et al., 1999). Round One: Mental (attention/concentration, memory, decision-making and strategy, speeded reactions), physical (flexibility, balance, coordination, speeded reactions) and social (social

interaction) demands of different physical activity types identified from the existing literature. It is possible that the cultural differences within the sample may lead to varied interpretations of these demands. Therefore, these demands will be clearly and succinctly defined in the questionnaires. Participants will be asked to rate how much each activity type requires each of the listed demands (MEN participants: mental and social demands only; PHY participants: physical and social demands only). The list of different physical activity types will be extracted from Ainsworth's (2011) Compendium of Physical Activities. For each activity type, participants will be asked to rate the likely demand on each individual (mental, physical or social) demand (1=little/no demand; 2=moderate demand; 3=high demand). For example for the activity "Golf", participants would be asked to rate how much golf involves attention/concentration, procedural memory, speeded reactions, flexibility, balance, social interaction and so on. Round one questionnaire findings will be compiled and a summary of results circulated to all participants alongside each participant's individual responses. Participants will have access to the anonymous responses from all other participants, and will be given the opportunity to clarify or change their own ratings on the basis of this feedback. While a universal level of agreement does not exist for Delphi (Hasson et al., 2000), Sumison (1998) recommends consensus should be equated with agreement between 70% of respondents. Thus, items that are scored in agreement (70% mean score agreement) will be deemed to have reached consensus and will not be further investigated. Remaining items will continue to be explored in subsequent rounds. Rounds Two and Three: Participants will be asked to review the feedback from round one (outlining how the other participants rated each activity type) before completing a second questionnaire that asks them to re-rate the non-agreed physical activity items on all mental, physical and social demands, and state (where required) justifications for their scores. Again, items that are scored in agreement (70% mean score agreement) will be deemed to have reached consensus. Remaining items (if any) will progress to round three. If agreement is not achieved, a third and final round will be undertaken.

14 Statistical analysis: In line with recommendations (Holey et al., 2007), mean scores of agreement for individual mental, physical and social demands across each physical activity type will be calculated, alongside a total percentage of agreement kappa values (stability measures). A 70% plus agreement will be accepted as consensus.

15 Withdrawal of participants: Participants are informed that they may withdraw from the study at any time. All data collected to the point of withdrawal will be retained for analysis unless the participant expresses that they wish for all the data to be destroyed.

16 Ethics: Along with the questionnaires, participants will receive (via email) an information sheet and consent form in two copies. The consent form will contain contact information for the Chief Investigator, and offer the participant the opportunity to ask questions and discuss any concerns they may have by contacting the Chief Investigator. Participants' initials must be entered next to each statement on the consent form, followed by the participant's name and signature. Participants will be asked to scan their signed consent forms and return via email. Once received, a copy will be returned to the Chief Investigator at the University, and the other signed copy will

be for the participant to keep. If the participants have any questions they may contact the researchers at any time before, during or after the research.

17 Burden/inconvenience to the participant: Taking part in this study may involve minor inconveniences for the participants, in terms of taking time to complete the questionnaires, which will take approximately 60 minutes to complete per round. The questionnaire design has been chosen to minimise burden to the participants. Whilst they will provide a wealth of valuable information for the study, they are not overly lengthy or complex in nature. No risk is associated with any of the measures to be used. All participants will remain strictly anonymous to one another.

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