EUJAPA

Review

Theory of planned behaviour for physical activity of adults living with physical disabilities: A replication systematic review

Myung Ha Sur [1] and Deborah R. Shapiro [2]

Received: 20th January 2021; Accepted: 7th December 2021; Published: 22nd August 2022

Abstract: Programme interventionists often determine best practices from systematic reviews of the literature. Interpretations of findings from systematic reviews, however, are susceptible to subjective decisions of the authors. Replication of systematic reviews by different authors on the same topic can increase the authenticity of findings, analysis, and interpretations. The purposes of the current paper were to (a) replicate a systematic literature review using the theory of planned behaviour (TPB) to understand the intention of adults living with physical disabilities to participate in PA, and (b) compare the findings with a published systematic literature review on the same topic. CINAHL, ERIC, SPORTDiscus, Medline, Psycinfo, and Pubmed databases were searched for eligible studies. A total of 11 articles were included for the current review. Intention was the strongest predictor for PA behaviour, with attitude and perceived behavioural control were also significant predictors for intention. Subjective norm had less influence but a distinct role shaping intention. A total of six of 11 studies overlapped with the comparison review. Selection of different studies were due to differences in search databases, search strategy, and inclusion and exclusion criteria. Inconsistency was also found in relationships among other components in the theory, with different interpretations made between the two reviews. The current replication review provides practical and research related implications that add to the understanding of the TBP for persons living with physical disabilities and the findings of the comparative review.

Keywords: physical activity promotion; behaviour change theory; physical impairment; comparative review

Introduction

Promotion of physical activity (PA) for people living with and without disabilities has been a focus of public health promotion initiatives for decades and continues to be a goal of national and international organizations (2018 Physical Activity Guidelines Advisory Committee, 2018; Sterdt et al., 2014; World Health Organization, 2019). PA, encompassing engagement in recreation opportunities, physical fitness, and sport, is important for physical and psychosocial health across the lifespan for people living with and without disabilities. Participation in PA has been found to have significant cognitive, emotional, and social benefits for people living with physical disabilities that can lead to improved health, well-being, and life satisfaction (Hutzler & Bar-Eli, 1993; Martin Ginis et al., 2017). PA engagement has led to increased self-perceptions of ability and self-efficacy, improved affect (e.g., lessoned feelings of loneliness, decreased incidence of depression, reduced stress),

increased friendships, social integration, functional efficiency for activities of daily living and independence (Hutzler & Bar-Eli, 1993; Martin, 2013).

For people living with physical disabilities, barriers to engaging in PA have been studied and best understood by examining the individual and cumulative influence of one's impairment associated with physical disabilities (e.g., inability to use one's legs, pain, discomfort), psychosocial factors (e.g., stigmatizing attitudes, discriminatory behaviours of others, lack of social support, lack of friends to play with), and the environment (e.g., a lack of opportunities, programs, or inaccessible facilities) (Hutzler & Bar-Eli, 1993; Martin, 2013). These barriers can prevent people living with physical disabilities from becoming physically active or may impede favourable intention to engage in PA (Martin Ginis et al, 2016). Collectively, these barriers contribute to rates of PA that may be insufficient to achieve health benefits among people living with physical disabilities (Ma & Martin-Ginis, 2018; Martin Ginis et al., 2016; Martin, 2013). The importance of PA for people living with disabilities, however, has been argued to be of greater significance to address the secondary health conditions such as obesity, diabetes, and decreased functioning in activities of daily living that may result from a lack of PA likely influenced in part by the convergence of factors limiting participation (Kosma et al., 2007; Martin, 2013).

Understanding intention of people living with physical disabilities to engage in PA using theory-based frameworks may provide future direction for intervention and program development intended to promote desired health-related behaviours (i.e., meeting recommended PA level) or change unhealthy behaviours (i.e., sedentary lifestyle or high screen time; Noar et al., 2008). The development of intervention programs should be based on thorough consideration of the unique barriers to PA (e.g., architectural barriers, lack of transportation), the health risks of inactivity, and the significant impact of PA on overall health and well-being. Ma and Martin Ginis (2018) and Sterdt and colleagues (2014) found that PA intervention studies designed using theory had larger effects compared to smaller effects reported in studies developed without theory.

Theory of planned behavior, physical activity, and disability

Theory of planned behaviour (TPB) is a frequently used framework for designing health-related behaviour studies (Painter et al. 2008; Sniehotta et al., 2014). The TPB can be used to explain an individual's intention or one's state of readiness to engage in a behaviour such as PA. Intention to engage in a behaviour is influenced by three components: attitude, subjective norm (SN), and perceived behavioural control (PBC) (see Figure 1). Attitude (favourable or unfavourable) toward a behaviour, SN (i.e., perceived social pressure from significant others) to engage or not engage in a behaviour are immediate antecedents of behavioural intention. PBC refers to one's perceptions of ability toward a behaviour as being under one's control. Ajzen (2002b) explained that PBC affects behaviour indirectly through intention with attitudes and SN and can act as a direct measure of behaviour when a person has enough information and resources about a certain behaviour.

In the context of PA participation, theoretically, when individuals living with physical disabilities have favourable attitudes toward PA (i.e., likelihood of deriving positive consequence from participating in PA such as improving physical fitness or reduced stress), have perceptions that significant others (e.g., family, friends, or doctors) think that they need to and can benefit from engaging in PA, and have greater perceived control over PA participation through positive perceptions of ability, a stronger intention to engage in PA can be developed. Researchers using the TPB to study PA participation have reported intention to be among the strongest predictor of behaviour (Hagger et al., 2002; Symons Downs & Hausenblas, 2005b). One reason for the use of the TPB in PA research is its identification of these three cognitive predictors that, when assessed in the situation in

which the behaviour is performed, correlate with intention to engage in PA and the positive association of intention to PA (Ajzen 2015; Sterdt et al 2014). Therefore, understanding the influence of attitudes, SN, and PBC on intention to be physically active can aide in the development of interventions and programming to promote PA behaviour for people living with disabilities.

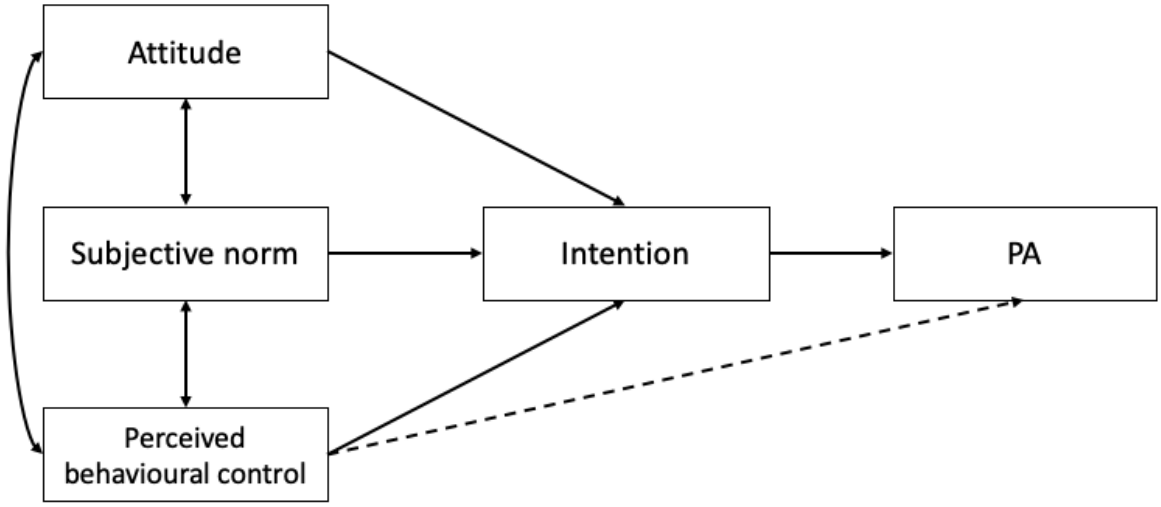

Figure 1. Theory of planned behaviour diagram.

The Role of Replication in Research

There is a difference between replication and reproduction when examining previously published findings. Reproducing a study (i.e., an experiment) suggests that the study is conducted in exactly the same way as the original study. Reproducing a study in the social sciences is largely unattainable given the dynamics of human nature. Replication of research in the social sciences, however, produces results that may be similar to but may differ from the results of the original study (Block & Kuckertz, 2018). The replication of a systematic review can have its unique value when the replication can verify findings of the original review or broaden or narrow the research questions in the existing systematic review (Tugwell et al., 2020). Specifically, conceptual replication refers to the same foundational idea tested through different operationalization in terms of method, type and design of study, and participant population (Crandall & Sherman, 2016; Nosek & Errington, 2020). In addition, purposeful change of the boundary of the review question of existing reviews (e.g., more focused or broader population, settings, or outcomes) is also a characteristic of conceptual replication of systematic reviews (Tugwell et al., 2020). Determination for programming or policy intervention based on a systematic review of literature are at risk for too much reliance on subjective decisions and interpretations of the respective authors (Tugwell et al., 2020). Results of systematic reviews by different authors on the same topic, with differences in procedures can increase the authenticity of findings, analysis, and interpretation (Nosek & Errington, 2020). It is important, therefore, to build upon the synthesis of a systematic review to support, refute, and ensure the generalizability of the findings (Low et al., 2017).

To our knowledge, there is one systematic review by Kirk and Haegele (2019) who evaluated the literature using TPB of people living with physical disabilities in the context of PA. There have been no replicating systematic reviews examining the consistency of the findings. The primary and original purpose of the present paper was to conduct an independent systematic review on the application of the TPB to adults living with physical disabilities regarding their intention to participate in PA. The following research questions guided this review: (a) How has TPB been implemented in research exclusive to adults living

with physical disabilities with regards to their PA engagement? (b) How well do components of the TPB predict intention to engage in PA among adults living with physical disabilities? A secondary purpose was a conceptual replication of the current review with that of Kirk and Haegele (2019). A third research question guiding this replication portion of the study was (c) How does the process, findings, interpretations, and directions for research and practice compare between the current review and that of Kirk and Haegele (2019).

Materials and Methods

Data Base & Search Strategy

The Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines were adopted as a primary structure for screening and organizing articles (Moher et al., 2010). The databases used to search for relevant studies were CINAHL, ERIC, Medline, Psycinfo, SPORTDiscus, and Pubmed. The search string utilized was [("planned behav*" OR "reasoned action") AND (disab*) AND (sport* OR "physical education" OR "physical activity" OR "exercise*")]. Four different categories of words were used in the string to capture articles using various forms and definitions of PA. The word "disab*" was used to capture all possible studies conducted with people living with disabilities. The use of specific physical disabilities (i.e., spinal cord injury, cerebral palsy) were not included in the search string. Physical disabilities were used, however, as one of the criteria when screening articles for inclusion and exclusion as described below. In addition, reference lists of included articles in the current review were manually reviewed for any additional studies. The search examined all possible studies using TPB or theory of reasoned action (TRA) with people living with physical disabilities from the inception of the theory in 1975 thru to August 2018. Considering that TRA is the foundational theory of TPB and both TPB and TRA examine individual's intention toward behaviour, TRA was deemed to aligned with TPB in the current review. An update search was conducted from 2018 to August 2021 to seek any new studies published between the initial search and the time the current review was submitted.

Inclusion & Exclusion Criteria

The eligibility criteria for article selection were: (a) original empirical research, (b) peer-reviewed, (c) published in English, (d) based on TPB or TRA as a main theoretical framework (e) used TPB as described by Ajzen when developing or using a TPB scale(s), (f) available with full text, (g) participants had physical disabilities, (h) participants were over 18 years of age, and (i) participants' PA behaviour was measured with either a devise (e.g., pedometer or accelerometer) or self-reported survey questions. In the current review, physical disability is operationally defined by following the definition of the National Education Associate of Disabled Students that

> A physical disability is one that affects a person's mobility or dexterity. A person with a physical disability may need to use some sort of equipment for assistance with mobility. It also includes people who have lost limbs or who, because of the shape of their body, require slight adaptations to be made to enable them to participate fully in society." (National Education Association of Disabled Students, n.d.).

Therefore, the term physical disability included but was not exclusive to those with a physical impairment such as spinal cord injury, cerebral palsy, spina bifida, muscular dystrophy, multiple sclerosis, amputation, or polio. Articles excluded from this study were review articles, abstracts, papers published in a language other than English, participants without disabilities or with intellectual or developmental disabilities (e.g., Autism Spectrum Disorder), and studies involving participants under the age of 18 (see Figure 2).

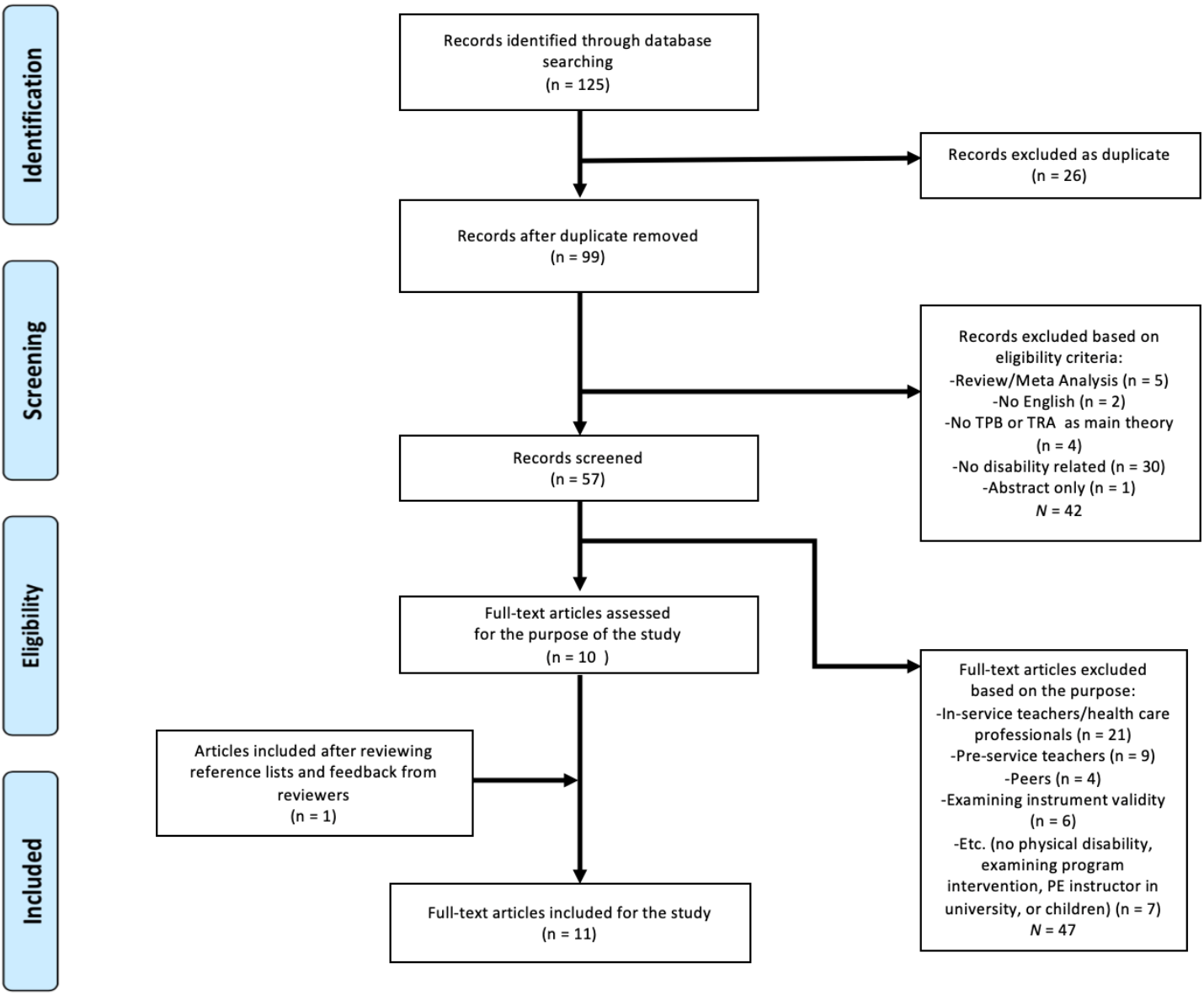

Figure 2. Article selection flow chart.

Data extraction

During the screening process, 125 articles were initially identified. A total of 115 articles were excluded for reasons such as: participants were not individuals with physical disabilities, studies were for instrument validity, only an abstract was available, or studies were systematic reviews or meta-analyses (See Figure 2). Authors reviewed reference lists and found one article relevant to the current review. The authors independently reviewed, discussed, and agreed upon the removal of the 115 articles from the analysis, the addition of the single article identified from the reference lists, and the 10 articles from the screening deemed appropriate for inclusion in the current review for a total 11 articles. Data from included articles were organized into a table using the following categories: author(s), year of publication, region, method, participants, main theme of study, and main findings (See Table 1).

Table 1. Descriptive information of included studies.

Authors & Year	Method	Participants	Main theme	Main findings
Ellis et al. 2007	Quantitative: online survey (PASIPD for PA participation) Qualitative: open-ended question for PA beliefs (behavioural belief, normative belief, and control belief)	223 adults with physical disabilities (SCI, CP, MS, or other physical disabilities)	Elicit PA beliefs (behavioural, normative, and control) from individuals with physical disabilities. Examined self-reported PA participation.	Behavioural beliefs of PA: improve emotional function, weight management, improve health, increase bone and muscle strength etc. Normative beliefs: family, friends, healthcare professionals, and spouse or significant others. Control beliefs restrict PA: disability associated symptoms, lack of access to facilities, equipment, or programs, fatigue or lack of energy, or pain. PA participation self-report: 20.5 METS-hours/day (SD = 16.8) ranged from 0.4 to 78.2.
Ellis et al. 2009	Quantitative: online survey (questionnaire from several previous studies for TPB, PASIPD for PA participation)	223 adults with physical disabilities, same participants from Ellis 2007)	Compare two models by testing TPB for predicting PA participation. Determine the most important predictor of physical activity intention and participation.	The model using scale correspondence explained more variance (66%) than the other (15%). Attitude had the largest effect on intention followed by PBC for both models. Intention is the only predictor of PA.
Godin et al. 1986	Quantitative: survey (developed question for TRA), Monark forearm ergometer for VO2 peak for fitness level	62 male adults with lower limb physical disabilities (SB, MS, other physical disabilities)	Predict leisure time exercise intention and behaviour.	Intention was the main predictor for exercise behaviour. Attitude had direct influence on exercise behaviour only for participants with strong exercise habits. Cause of disability influences intention and behaviour link. Overall, TRA failed to predict the intentions of participants in the study.
Jaarsma et al. 2014	Both Quantitative and Qualitative: online survey (Questionnaire from Mulier Institute, 2010)	76 Paralympic athletes (Les Autres, Amputation, SCI, other physical disabilities)	Explore barriers and facilitators of sports in Paralympic athletes.	Attitude and SN were considered the most important components for intention but not PBC.

Authors & Year	Method	Participants	Main theme	Main findings
Keegan et al. 2016	Quantitative: online survey (Self-Report Functional Independence Measure [SRFM] for impact of SCI, Outcome Expectations for Exercise Scale [OEE] for perceived benefits of PA, SCI Exercise Self-Efficacy Scale [ESES] for self-efficacy for PA, adapted questionnaire from previous study for normative belief and control belief	144 adults with SCI	Determine whether variables of social cognitive theory and TPB can differentiate people with SCI in different SOC for exercise and physical activity; determine whether different SOC differs health related quality of life of people with SCI.	Higher self-efficacy, perceived benefits, control beliefs, support from others, and intention were found from people with SCI who are in active group. People with SCI in active group had higher physical and mental health than inactive group.
Kosma et al. 2007	Quantitative: online survey (questionnaire from several previous studies for TPB, PASIPD for PA participation)	143 adults with physical disabilities (SCI, CP, MS, other physical disabilities)	Examine mediating role of intention and SOC in future PA behaviour using two models.	TPB model explained 16% of variance of PA. SOC integrated model explained 28% of variance of PA; attitude and PBC predicted intention and SOC more than SN.
Kosma et al. 2009	Quantitative: online survey (Short-Form version 2.0 Health Survey for health-related quality of life, PASIPD for PA participation, questionnaires from several previous studies for TPB and stage of change)	141 adults with physical disabilities (SCI, muscle/joint disorder, other physical disabilities)	Explore the effects of past TPB components and SOC on future health-related quality of life and PA.	Attitude was the most important predictor of SOC followed by PBC, SN was not important predictor. SOC was the strongest predictor of future PA for health-related quality of life followed by PBC (only for physical health quality of life). PA had significant effect on Health-Related Quality of Life.
Latimer et al. 2004	Quantitative: survey (developed questionnaire for TPB, Godin Leisure Time Exercise Questionnaire [GLTEQ])	124 individuals with SCI (70 tetraplegia, 54 paraplegia)	Examine predictors of exercise behaviour using TPB.	TPB had limited utility in predicting exercise behaviour. Only PBC predicted intention in tetraplegia. Only PBC predicted exercise behaviour in the moderate exercise tetraplegia group.
Latimer & Martin Ginis 2005	Quantitative: interview, survey (developed questionnaire for TPB, PARA-SCI)	104 individuals with SCI (75 male, 29 female)	Examine TPB for predicting LTPA for people with SCI.	Intention was predicted by attitude, SN, and PBC. Intention predicted LTPA (16%) but PBC did not. Intention had mediating role between attitude, SN, PBC and LTPA.

Authors & Year	Method	Participants	Main theme	Main findings
Martin Ginis et al. 2017	Quantitative: telephone interview (questionnaire from previous study for TPB, PARA-SCI for PA participation) Qualitative: semi-structured interview	347 individuals with SCI (especially wheelchair user or gait aid) for quantitative & 5 male with SCI for qualitative	Identify factors that affect lower LTPA of people with SCI.	Ambulators had lower attitude than wheelchair users. For ambulators, PBC had negative direct impact on LTPA, only attitude had indirect influence on LTPA, model accounted 13% of LTPA. For wheelchair users, attitude, SN, and PBC had indirect influence on LTPA, PBC didn't have direct impact on LTPA. Model accounted for 8% of LTPA.
Sweet et al. 2012	Quantitative: phone interview, survey (questionnaire from Latimer & Martin Ginis 2005 for TPB, PARA-SCI for PA participation)	541 individuals with SCI	Examine influence of pressure ulcer, demographic variables, and TPB on LTPA patterns over 18-month period.	Pressure ulcer negatively impact LTPA pattern Active (high LTPA) participants had higher Intention. Age, years of post-injury, and severity of injury were significantly related to LTPA.

Note. TRA = Theory of reasoned action; TPB = Theory of planned behaviour; LTPA = leisure time physical activity; PBC = perceived behavioural control; SN = subjective norm; PA = physical activity; SB = spina bifida; MS = multiple sclerosis; CP = cerebral palsy; SCI = spinal cord injury; SOC =stage of change; PASIPD = Physical Activity Scale for Individuals with Physical Disabilities; PARA-SCI = Physical Activity Recall Assessment for People with Spinal Cord Injury.

Quality Assessment

The quality of included studies were investigated with 14 criteria derived from a review by Hutzler (2003), who developed 15 items to analyze methodological quality based on two guiding papers (Porretta et al., 2000; Sherrill & O'Connor, 1999) related to research in adapted physical activity. The criteria included: (a) theoretical approach, (b) hypotheses or research question, (c) sampling procedure, (d) participants, (e) data collection, (f) tool validity, (g) specific validity during study, (h) tool reliability, (i) specific reliability during study, (j) scale description, (k) response rate, (l) scores, (m) effect-size, and (n) statistical analysis. One point was given for the existence of each criterion, and zero points were allocated when there was no evidence of the criteria. Each study had a different total possible score since not all criteria were applicable for studies with different purposes and methods. Scores gained from the analysis of quality were divided by the total possible points and converted to a percentage. To reduce the risk of bias, two reviewers assessed the quality of the articles independently. Ratings were compared and any disagreements were addressed through discussion until consensus was reached. No studies were excluded based on quality ratings. The results of the quality ratings were considered when interpreting the data. Kirk and Haegele adopted assessment tools from the National Institutes of Health's Quality Assessment (National Institutes of Health, n.d.) with the quality criteria as good, fair and poor. While the use of these quality ratings can determine quality of the articles included in a review (National Institutes of Health, n.d.), there have been no other published validated quality ranges, interpretations, or overall ratings (e.g., poor, fair, good) in the literature.

Results

Sample characteristics

Of the 11 studies selected in our review, the majority were published from 2004 to 2017 except Godin and colleagues (1986). The sample sizes of each study ranged from 62 (Godin et al., 1986) to 541 (Sweet et al., 2012). Two groups of authors (Ellis et al., 2007; 2009; Kosma et al., 2007; 2009) conducted their studies with the same group of participants from two studies (Cardinal et al., 2004; Kosma et al., 2004). Participants of Sweet and colleagues (2012) and Martin Ginis and colleagues (2017) were drawn from the study of Martin Ginis and colleagues (2008). Considering the duplicate use of samples, there were approximately seven unique samples identified from 11 studies in this review.

Impairment classification

The most frequently recruited population of adults with physical disabilities in the reviews included in the current study were those with a spinal cord injury (SCI). Five studies (Kosma et al., 2009; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017; Sweet et al., 2012) involved only people living with SCI. Six studies (Ellis et al., 2007; 2009; Godin et al., 1986; Jaarsma et al., 2014; Kosma et al., 2007; 2009) included participants living with various types of physical disabilities inclusive of Cerebral palsy (CP), Multiple sclerosis (MS), muscle or joint disorders, brain-related disorders, post-polio, amputation, and spina bifida. People living with SCI represented the largest portion (21.5% to 58%) of participants in these latter studies except Jaarsma and colleagues (2014) where Les Autres was the dominant category of participants (34%) followed by individuals living with an amputation, SCI, CP, and other neurological disabilities.

Physical activity engagement

A total of nine studies in our review examined leisure time physical activity (LTPA) of participants (Ellis et al., 2007; 2009; Godin et al., 1986; Keegan et al., 2016; Kosma et al., 2007; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017; Sweet

et al., 2012). LTPA refers to any structured or unstructured PA an individual chooses to do during one's own leisure time (Latimer & Martin Ginis, 2005). Keegan and colleagues (2016) used the terms PA and exercise although actual behaviour such as intensity or duration of PA participation were not measured. Jaarsma and colleagues (2014) conducted their study related to participation in sports.

Research method, design, and implementation of TPB

Two types of research methods were identified in our review. A total of eight studies (Ellis et al., 2009; Godin et al., 1986; Keegan et al., 2016; Kosma et al., 2007; 2009; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Sweet et al., 2012) were conducted with quantitative methodology, and three studies used mixed methods (Ellis et al., 2007; Jaarsma et al., 2014; Martin Ginis et al., 2017).

Studies using a quantitative approach utilized survey questionnaires to measure components of TPB and PA behaviour. Questions for TPB components consisted of scales measuring the degree of each component toward the PA behaviour. PA behaviour was measured with self-reporting instruments. A more detailed explanation about measurement instruments is described in the next section. The qualitative part of mixed method studies was to elicit facilitators and barriers (Jaarsma et al., 2014) related to participation in PA or to measure beliefs about PA (Ellis et al., 2007). Martin Ginis and colleagues (2017) conducted interviews to get the perspective of participants regarding LTPA.

Three types of research designs were identified among selected studies, which are cross-sectional design (Ellis et al., 2007; 2009; Godin et al., 1986; Jaarsma et al., 2014; Keegan et al., 2016; Latimer et al., 2004), prospective research design (Kosma et al., 2007; 2009; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017) and longitudinal design (Sweet et al., 2012). Most studies were cross-sectional studies measuring components of TPB and PA participation one time. In studies with prospective research design, PA participation was measured after one week (Latimer & Martin Ginis, 2005) or 6 months (Kosma et al., 2007; 2009; Martin Ginis et al., 2017) from the initial measurement of TPB variables. Using the longitudinal research design, Sweet and colleagues (2012) measured variables three times over 18 months (baseline, 6 months, and 18 months).

TPB was the sole theoretical framework utilized in eight papers. The remaining studies used a combination of theories in addition to the TPB (Jaarsma et al., 2014; Keegan et al., 2016; Kosma et al., 2007; 2009). Jaarsma and colleagues (2014) used the International Classification of Functioning, Disability and Health model. The study of Keegan and colleagues (2016) utilized the TPB as well as Social Cognitive Theory (SCT) and Stages of Change (SOC). Two studies (Kosma et al., 2007; 2009) integrated the SOC with the TPB. Specifically, Kosma and colleagues (2007) compared intention and SOC to identify which components had better predictive validity. Kosma and colleagues (2009) integrated the TPB and the SOC to predict health-related quality of life of individuals with physical disabilities.

Instruments used to examine TPB components and PA behaviour

Based on our review of the selected studies, the self-reporting questionnaire was the predominant method used among studies to measure TPB and PA behaviour. To measure TPB components, studies either followed Ajzen's (2002a) recommendation or adopted questions developed by Ajzen or from previous studies which followed Ajzen's recommendation for question construction. Ajzen (2002a) emphasized the importance of compatibility of measures with the target behaviour in terms of action, target, context, and time. For example, Ellis and colleagues (2009) reported using questions developed by following the guideline of Ajzen (2002a) by asking participants' attitude, SN, PBC, intention to participate in PA behaviour per week, and actual PA participation per week. However, in

some studies, there was no specific procedure outlining how Ajzen's recommendations for survey construction, were followed.

A total of three instruments were identified from selected studies measuring PA behaviour. *The Physical Activity Scale for Individuals with Physical Disabilities* (PASIPD) was developed by Washburn and colleagues (2002) and was used by four studies (Ellis et al., 2007; 2009; Kosma et al., 2007; 2009). *The Physical Activity Recall Assessment for people with SCI* (PARA-SCI) was developed by Martin Ginis and colleagues (2005) and utilized by three studies (Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017; Sweet et al., 2012). One study (Latimer et al., 2004) adopted the modified version of *Godin Leisure Time Exercise Questionnaire* (GLTEQ) developed by Godin and Shephard (1985).

Unique to some of these instruments are the variables assessed. Godin and colleagues (1986) measured PA habits of participants using a question with three response options: (1) 3 or more times a week; (2) about 1 or 2 times a week; or (3) zero to 3 times a month. Jaarsma and colleagues (2014) had items that measured sport participation, disability, and barriers and facilitators. Keegan and colleagues (2016) combined several different questionnaires to measure impact of SCI, perceived benefits of PA and exercise, perceived barriers to PA and exercise, self-efficacy for PA and exercise, normative and control beliefs about PA and exercise, interpersonal support for PA and exercise, health-related quality of life, and SOC for PA and exercise.

Examination of the TPB

Ajzen (2006) recommended using multiple regression or structural equation analyses to measure relative contribution and predict the effects of TPB components. The majority of studies (n = 8) selected in our review followed this recommendation. Multiple regression (Godin et al., 1986; Latimer et al., 2004; Latimer & Martin Ginis, 2005), path analysis (Ellis et al., 2009; Kosma et al., 2007; 2009; Martin Ginis et al., 2017), and latent class growth modeling (Sweet et al., 2012) were used to analyze data. The remaining studies (Ellis et al., 2007; Jaarsma et al., 2014; Keegan et al., 2016) used different data analysis methods based on their purpose such as cross-tabulation and categorization, multivariate analysis of variance (MANOVA), or Mann-Whitney U-test. Of the studies reviewed, none examined the direct or indirect influence of background factors (inclusive of previous behaviour) on beliefs and intention towards PA behaviour.

Beliefs

Among the papers, four studies measured beliefs (Ellis et al., 2007; Godin et al., 1986; Keegan et al., 2016; Latimer et al., 2004). However, no study measured both foundational beliefs and components of TPB (attitude, SN, and PBC) at the same time. It was not possible, therefore, to examine the relationships between beliefs and TPB constructs.

Attitude-Intention

Five out of the eight studies in our review (Ellis et al., 2009; Kosma et al., 2007; 2009; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017) found that attitude had a statistically significant effect on intention to engage in PA. The remaining studies (Godin et al., 1986; Latimer et al., 2004) reported results that were not statistically significant.

Subjective norms-Intention.

Three out of seven studies reported a statistically significant relationship between subjective norms and intention (Kosma et al., 2007; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017). Out of these three, Martin Ginis and colleagues (2017) indicated only the group of wheelchair users showed statistically significant relationship between SN and intention.

Perceived behavioural control-Intention

In five out of six articles, PBC had a statistically significant predictive effect on intention (Ellis et al., 2007; Kosma et al., 2007; 2009; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017). Among these six papers, two studies (Latimer et al., 2004; Martin Ginis et al., 2017) showed a statistically significant relationship between PBC and intention only among certain groups (participant with SCI with tetraplegia compared to those with paraplegia, or participants with SCI who were wheelchair users compared to participants with SCI who were ambulatory).

Intention-PA behaviour

A total of seven studies examined the relationship between intention and PA behaviour (Ellis et al., 2009; Godin et al., 1986; Kosma et al, 2007; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017; Sweet et al., 2012). All studies reported a statistically significant relationship between these two variables except one (Latimer et al., 2004).

Perceived behavioural control-PA behaviour

A total of six studies examined the direct relationship between perceived behavioural control and actual behaviour (Ellis et al., 2009; Kosma et al, 2007; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017; Sweet et al., 2012). Three of the six studies found a statistically significant relationship between perceived behavioural control and actual behaviour (Kosma et al, 2007; Latimer et al., 2004; Martin Ginis et al., 2017). Among these studies with statistical significance, Latimer and colleagues (2004) indicated that the significant relationship was only found in the group of participants with tetraplegia with moderate exercise levels. Interestingly, Martin Ginis and colleagues (2017) found that participants who were ambulatory showed a statistically significant negative coefficient value between perceived behavioural control and PA behaviour when a path analysis was conducted (β = - .26, p < .05).

Comparison with Kirk and Haegele review

Sample characteristics

Articles included in the Kirk and Haegele review were published from 2004 to 2017, and the number of participants ranged from 61 to 695. There was a total of seven groups of participants identified. Similar to our review, participants in Ellis and colleagues (2009) and Kosma and colleagues (2007) were from the same participants as Cardinal and colleagues (2004) and Kosma and colleagues (2004). Four studies (Arbour-Nicitopoulos et al., 2010; Martin Ginis et al., 2017; Stapleton et al., 2014; Sweet et al., 2012) were conducted with the same group of participants recruited by Martin Ginis and colleagues (2008). The remaining studies recruited their own participants.

Literature search

There were many similarities and some differences in the search methods relating to (a) data base selection, (b) search strategy (search words), and (c) inclusion/exclusion criteria that led to the inclusion of the same or different articles across both reviews.

Database selection. The following databases common to both reviews were CINAHL, ERIC, and SPORTDiscus. These databases are considered the primary sources for the discipline of the current topic. A librarian, who advises researchers on literature search skills and database use from the authors' university, provided insights for comparison of databases. Among databases adopted in our review, Medline and Pubmed can be considered among the primary resources for the field of medicine and when combined, should have full coverage of the field (D. Dimsdale, personal communication, June 17, 2019). The librarian

advised that Psycinfo database is considered by some to have better coverage in the field of psychology than Psychological and Behavioral Sciences Collection database used by Kirk and Haegele (2019). Kirk and Haegele (2019) used additional databases inclusive of Academic search complete, Education source, Health Source: Nursing/Academic edition, and Scopus. CINAHL can be an alternative to Health Sources: Nursing/Academic collections according to the librarian. Our review may have benefitted from including Academic Search Complete and Educational Source. Neither study reported which articles were obtained from which databases, (this is not a requirement for publication of systematic reviews and would require extensive research directly with each database company individually), thus it was not possible to determine the extent to which the range of databases contributed to differences in article identification.

Search strategy. Similarities in search string terms included the use of theory of planned behaviour, disability, disabled, physical activity, exercise, and sport. These similarities led to the common identification of six studies (Ellis et al., 2009; Kosma et al., 2007; Latimer et al., 2004; Latimer & Martin Ginis et al., 2005; Martin Ginis et al., 2017; Sweet et al., 2012). Differences in search terms included the use of reasoned action and physical education in our review and the terms recreation and impairment by Kirk and Haegele (2019; see Table 2). A total of five studies (Ellis et al., 2007; Godin et al., 1986; Jaarsma et al., 2014; Keegan et al., 2016; Kosma et al., 2009) were identified that were unique to our review. Conversely, Kirk and Haegele (2019) included five studies (Arbour-Nicitopoulos et al., 2010; Haegele et al., 2017; Kwan et al., 2013; Latimer et al., 2006; Stapleton et al., 2014) that did not meet the inclusion criteria of our review or were not identified in our search. The reasons for the unique studies of Kirk and Haegele (2019) are as follows: (a) Arbour-Nicitopoulos and colleagues (2010) was not identified in our search, (b) Haegele and colleagues. (2017) was conducted with different disability (i.e., visual impairment), (c) Kwan and colleagues (2013) was identified in the search but excluded because the age and the disability deviated from the aim of our review (adolescent with developmental coordination disorder). (d) Latimer and colleagues (2006) was excluded due to lack of explicit usage of the theory. While Latimer and colleagues (2006) adopted intention and PBC for PA intervention, the study did not state that TPB was the main theoretical framework for the intervention, and (e) Stapleton and colleagues (2014) did not examine the relationships among components of TPB

Inclusion/exclusion criteria. There were three differences in the inclusion criteria which may have influenced the selection of papers between the two reviews including (a) definition of disability, (b) use of term reasoned action, and (c) age range.

Our review adopted the definition of physical disability from National Education Associate of Disabled Students, and Kirk and Haegele used the Individuals with Disabilities Education Act (2004) as a foundation for their definition of disability. By operationally defining physical disability, our review could clearly communicate a range of physical disabilities more commonly found in adult populations (e.g., muscular dystrophy, polio, SCI). The use of the term 'theory of reasoned action' and not limiting the time frame of publication broadened the inclusion of studies in our review resulting in the inclusion of one study using the theory of reasoned action (Godin et al., 1986). While both reviews focused on people living with disabilities, our review placed restriction on those over 18 years of age with no upper age limit. Kirk and Haegele limited their age range to 55 years with no lower age limitation.

Table 2. Review comparison.

Criteria	Sur & Shapiro (2022)	Kirk & Haegele (2019)
Search terms	planned behav*, reasoned action, disab*, sport*, physical education, physical activity, exercise*	Not specified but term categories (a) disability, disabled, impairment; (b) physical activity, exercise, sport, recreation; and (c) the theory of planned behavior
Database searched	CINAHL, ERIC, Medline, Psycinfo, SPORTDiscus, Pubmed	Academic search complete, Education research complete, Education source, ERIC, health source: Nursing/Academic edition, Psychology and Behavioural sciences collection, Scopus, SPORTDiscus
Inclusion criteria		
Empirical research	Yes	Yes
English	Yes	Yes
Peer-reviewed	Yes	Yes
Date range	1975 – Dec 2018	1990 – Mar 2018
Age range	18 years and above	Max age 55 years (no lower age limit)
Disability definition	National Education Associate of Disabled Students	IDEA definition of disability
Theoretical framework	TRA/TPB/other	TPB/others
Outcome variables	Various forms of physical activity	Physical activity behaviour or beliefs
Methodological Quality	Hutzler (2003)	National Institutes of Health's Quality Assessment
Number of Statistically Significant relationships		
Attitude-Intention	4/7	6/8
SN-Intention	2/7 with 1/7 (partial significance‡)	6/8
PBC-Intention	5/6 with 2/6 (partial significance‡)	6/8 with 2/8 (partial significance‡)
Intention-Behaviour	6/7	8/9
PBC-Behaviour	3/6 with 2/6 (partial significance‡)	4/9

Note: * = search string truncated; ‡ = Only certain participant groups showed a statistically significant relationship; TPB= Theory of Planned Behaviour; TRA= Theory of Reasoned Action; PBC = perceived behavioural control; PA=physical activity; SN = subjective norm.

Methodological quality

Overall, quality ratings of the selected studies ranged from 62-%-93%. A total of nine out of 11 studies were considered to have good methodological quality with an average score of over 70% except for Godin and colleagues (1986) and Jaarsma and colleagues (2014) who received ratings of 64% and 62%, respectively (Table 3). Kirk and Haegele's (2019) quality ratings ranged from 43% to 100%. These authors similarly reported overall ratings of over 70% for nine out of 11 studies in their review except for Ellis and colleagues (2009) and Latimer and colleagues (2006) with ratings of 43% and 45%, respectively. Overall, methodological ratings of included studies were generally higher in Kirk and Haegele (2019) compared to the ratings of the same studies in the current review. In four of the studies common to both reviews, methodological rating differences ranged from 3% to 17% higher, with two studies rated lower by Kirk and Haegele by 3% and 15%, respectively. There was one large discrepancy in quality rating of Ellis and colleagues (2009). Kirk and Haegele rated it as 43%, and we scored it at 79%. We attribute the overall lower quality ratings to limited reporting of instrument validity and reliability. For example, four studies did not mention the tool validity, none of the studies described specific validity, tool reliability was omitted in three studies, and five studies did not mention specific reliability (Table 3). There also was a lack of information describing participant recruitment. The response rate was a criterion which six of 11 studies did not report. Kirk and Haegele (2019) noted a lack of reporting of the rationale for participant description and statistical power. Lastly, the degree to which the included studies used the TPB 'correctly' could not be determined as each study had their own justification for using the TPB.

Table 3. Quality Ratings of Included Studies.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Total	(%)
Ellis et al. (2007)	1	1	1	1	1	1	0	1	0	1	1	1	N/A	1	11/13	85
Ellis et al. (2009)	1	1	1	1	1	0	0	1	0	1	1	1	1	1	11/14	79
Godin et al. (1986)	1	0	1	1	1	0	0	0	1	1	0	1	1	1	9/14	64
Jaarsma et al. (2014)	1	1	1	1	1	0	0	0	0	0	1	1	N/A	1	8/13	62
Keegan et al. (2016)	1	1	1	1	1	1	0	1	1	1	0	1	1	1	12/14	86
Kosma et al. (2007)	1	1	1	1	1	1	0	1	0	1	1	1	1	1	12/14	86
Kosma et al. (2009)	1	1	1	1	1	1	0	1	1	1	1	1	1	1	13/14	93
Latimer et al. (2004)	1	1	1	1	1	0	0	0	1	1	0	1	1	1	10/14	71
Latimer & Martin Ginis (2005)	1	1	1	1	1	1	0	1	1	1	0	1	1	1	12/14	86
Martin Ginis et al. (2017)	1	1	1	1	1	1	0	1	0	1	0	1	1	1	11/14	79
Sweet et al. (2012)	1	1	1	1	1	1	0	1	1	1	0	1	1	1	12/14	86

A = Theoretical approach; B = Hypotheses/research question; C = Sampling procedure; D = Participants; E = Data collection; F = Tool validity; G = Specific validity; H = Tool reliability; I = Specific reliability; J = Scale description; K =Response rate ; L = Scores; M = Effect-size; N = Statistical analysis.

Comparison of results

Attitude-Intention

Our findings for the relationship between attitude and intention are similar to those of Kirk and Haegele (2019) who reported statistically significant relationship from six studies (Arbour-Nicitopoulos et al., 2010; Ellis et al., 2009; Kosma et al., 2007; Kwan et al., 2013; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017), four of which overlap with our review. There is agreement between the two reviews on this relationship and its distinct role in understanding intention to PA behaviour.

Subjective norms-Intention

Like the relationship between attitude and intention, Kirk and Haegele (2019) reported the relationship between subjective norms and intention as less predictive but still important

in the TPB to predict PA. In the review of Kirk and Haegele (2019), five studies (Arbour-Nicitopoulos et al., 2010; Kosma et al., 2007; Kwan et al., 2013; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017) reported a statistically significant relationship between subjective norms and intention, and three studies (Kosma et al., 2007; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017) overlapped with our review.

Perceived behavioural control-Intention

Kirk and Haegele (2019) reported the relationship between PBC and intention to be the most significant and largest predictor of intention among the antecedent variables in the theory. This conclusion was made after identifying seven studies with statistically significant relationships (Arbour-Nicitopoulos et al., 2010; Ellis et al., 2009; Kosma et al., 2007; Kwan et al., 2013; Latimer et al., 2004; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017). Among the studies, five overlapped with our review.

Intention-PA behaviour

The results were similarly noted by Kirk and Haegele who identified eight articles with significant relationships between intention and behaviour. Four studies (Ellis et al., 2009; Kosma et al., 2007; Latimer & Martin Ginis, 2005; Martin Ginis et al., 2017) overlapped with our review. The remaining four studies (Arbour-Nicitopoulos et al., 2010; Haegele et al., 2017; Kwan et al., 2013; Latimer et al., 2006) were unique to the review by Kirk and Haegele (2019).

Perceived behavioural control-PA behaviour

A total of four out of nine studies in Kirk and Haegele (2019) reported a statistically significant relationship between perceived behavioural control and PA behaviour (Kosma et al., 2007; Latimer et al. 2004; Latimer et al., 2006; Martin Ginis et al., 2017). Three studies overlapped with our review, and one study (Latimer et al., 2006) was unique to Kirk and Haegele's (2019) review. Kirk and Haegele also noted the negative relationship found in Martin Ginis and colleagues' research (2017).

Discussion

The purpose of this study was to investigate the use of TPB to understand intention of adults living with physical disabilities to engage in PA and compare these results with the findings from the systematic review by Kirk and Haegele (2019).

Suitability of TPB to adults living with physical disabilities

Relationships among constructs of TPB in the current review are quite similar to the results of previous meta-analyses (Hagger et al., 2002; Symons Downs & Hausenblas, 2005b) of PA behaviour of individuals without disabilities and the conclusions of Kirk and Haegele (2019). Overall, the theory can be used as an effective tool to explain and predict PA engagement of adults living with physical disabilities. Intention seems to be the strongest predictor for PA behaviour, with attitude and perceived behaviour control also significant predictors for intention. Subjective norms is considered to have a distinct role influencing intention toward PA while inconsistent results were found within selected studies (Hagger et al., 2002; Symons Downs & Hausenblas, 2005b).

Background factors unique to participants with physical disabilities seem to influence the relationships among the predictors and intention to engage in PA. These characteristics include severity of disability (Martin Ginis et al., 2017), physiological consideration like pressure ulcers (Sweet et al., 2012), years post injury (Latimer et al., 2004), or cause of disability (congenital or acquired; Godin et al., 1986). For example, Martin Ginis and colleagues (2017) described possible reasons of lower level of LTPA of ambulators with SCI

than those of wheelchair users to include: (1) underestimation of one's disability by others which led to less support or guidance, (2) lack of wheelchair skill self-efficacy, and (3) chronic pain related to disability which lessened effort to engage in LTPA. Sweet and colleagues (2012) reported that pressure ulcers negatively impacted the level of LTPA in the more active group of participants with SCI. Latimer and colleagues (2004) reported that PA was reduced as the participants' time post injury increased. The authors discussed the possible explanation as the physiological stress derived from SCI hindered PA of participants despite knowing the benefits of being physically active. On the other hand, Godin and colleagues (1986) indicated that participants who had less time (relatively recently injured) to adapt their life to their new situation showed weaker links between intention and PA behaviour. Overall, participants with physical disabilities seem to differently experience their PA behaviour through physiological statuses and environments in which they are situated that differ from those without disabilities.

Physical and social barriers related to disability differently influenced TPB components. For example, lack of facility and transportation, fear of injury, and cost and time consuming were barriers (Ellis et al., 2007; Jaarsma et al., 2014) that negatively influenced components of TPB leading to a lack of intention to engage in PA. Although these barriers were also identified from people without disabilities (Symons Downs & Hausenblas, 2005a), people living with physical disabilities may encounter those barriers with increased frequency in combination with their unique physiological needs. Therefore, it is necessary for researchers to take both social and physical barriers into account when examining predictors of intention and PA behaviours of people living with physical disabilities.

The term physical disability seems to accommodate a broader range of disability unlike other disability categories. For instance, perceived barriers or accessibility may differ between individuals with paraplegia and those with tetraplegic SCI. Differences in perceptions can influence the relationship among components of TPB as shown by Latimer and colleagues (2004). Given significant differences in characteristics between people living with different physical disability categories, it is hard to objectively compare results based on the term "physical disability." However, this difference suggests some support for the notion that the type of physical disability implicitly or explicitly through attitudes, subjective norms and perceived behavioural control impacts intention towards PA.

Comparison among systematic reviews

With the similar results, slightly different interpretations were made between the two reviews. Unlike the interpretation in our review, Kirk and Haegele (2019) concluded a lack of consensus in the relationships among components of TPB, except the relationship between intention and PA behaviour. More specifically, the discrepancy in interpretation was found between attitude and perceived behavioural control. The interpretation of our review is aligned with the findings of Hagger and colleagues (2002) that attitude and perceived behavioural control are main components influencing intention. On the other hand, Kirk and Haegele (2019) interpreted their results in a way, that perceived behavioural control appeared to be the strongest predictor over other components. The different interpretation of the relationships between components shows that the subjective interpretation of authors in one systematic review can change with the interpretation of different authors with the process of replication (Nosek &Errington, 2020; Tugwell et al., 2020). Even though the interpretation about the components are different, the final conclusion of both reviews is similar in that all three components have a distinctive role in contributing and explaining intention toward PA engagement of adults living with physical disabilities.

The difference in the use of instruments to assess methodological quality of the selected studies in the two reviews illustrates multiple ways of assessing methodological quality of studies. While there have been several quality scales and checklists proposed (Moja et al., 2005), there is no consensus on which tool works best to represent the true quality of a study. Views toward components of methodological quality are changing, contributing to differences in the interpretation of the results of methodological quality assessments. Martin and colleagues (2019) described the contemporary view of validity and reliability of sport psychology studies as different from the traditional perspective. For example, Cronbach's coefficient alpha has been the most frequently used reliability measure across various disciplines, but a growing body of methodological studies argue against the use of the coefficient alpha (Martin et al., 2019). A recommendation is the use of multiple approaches to examine the quality of studies, as results and interpretations can be biased even though researchers are well trained, and the tools are validated.

Conclusions

Table 4 summarizes the key findings, comparing the two reviews. An overview of the number of studies, definition of disability, participants and use of additional theories are key differences between the review of Kirk and Haegele and our review.

Table 4. Summary of key findings.

Category	Summary
Number of Studies	A total of 16 studies combined between the two reviews were identified using the TPB to investigate the intentions of individuals with disabilities to engage in PA. A total of five studies were unique to our review with five papers identified solely by Kirk and Haegele (2019).
Definition of disability	The definitions of disability used on each review were more similar than different and did not significantly influence the identification of articles. Only one study (Arbour-Nicitopoulos et al., 2010) included by Kirk and Haegele (2019) was not identified in the current review.
Participants	Participants across all articles, in both reviews, were primarily those with a spinal cord injury with four of 15 studies also including persons with cerebral palsy, multiple sclerosis, spina bifida, amputations and other muscle, joint, or brain-related disorders. Kirk and Haegele included Kwan and colleagues (2013) which was conducted with participants with developmental coordination disorder and Haegele and colleagues (2017) conducted with people with visual impairment. Type and severity of disability of participants were found to have an impact on intention to engage in PA in both reviews.
Use of additional theories	While TPB was used in all studies, additional theories such as social cognitive theory, and stage of change were included and provided additional predictive variance to understanding the relationship in the TPB in both reviews.
Attitude, SN, PBC & Intention	Attitude was found to have a significant effect on intention to engage in PA. The relationship between SN and intention is less predictive but still important in the TPB. PBC may be the most significant and largest predictor of intention to engage in PA but also differed the most with severity of disability. Intention was statistically significant related with behaviour across all but one study of Latimer and colleagues (2004). Kirk and Haegele (2019) concluded a lack of consensus in the relationships among components of TPB except the relationship between intention and PA behaviour. However, the final conclusions of both reviews are in agreement that all three components have unique contribution to intention toward PA engagement.
PBC and Behaviour	Fewer studies examined the relationship between PBC and behaviour. This relationship was found to be statistically significant but inconclusive as it was observed in only three of seven papers in the current review and four of seven studies in the review by Kirk and Haegele.

Note. TPB = Theory of planned behaviour; SN = subjective norm; PA = physical activity; PBC = perceived behavioural control.

Perspectives

We propose the following considerations to understand engagement in PA of people living with physical disabilities. First, background factors unique to people living with disabilities (e.g., length of time living with impairment, mode of ambulation) should be examined for their influence on attitudes, subjective norms, perceived behavioural control and behaviour through their effect on intention (Martin, 2013). Using perceived barriers as a background variable within a predictor such as perceived behavioural control or as a moderator in the TPB model between intention and behaviour may enhance understanding of how to help people with physical disabilities cope with barriers to enhance participation (Martin Ginis et al., 2017). It is important to identify and understand behavioural and normative beliefs. Martin Ginis and colleagues (2017) reported the influence of beliefs of external others predicted the inverse relationship between intention and PA. The use of mixed method designs may help elucidate the behavioural and normative beliefs and provide direction for intervention. Last, the addition of new mediating or moderating variables is encouraged by Ajzen (2015). Constructs embedded in other social cognitive theories could be added as a predictor variable to determine their individual and cumulative effect on increasing the predictive validity of intention on behaviour.

Author affiliations:
[1] Department of Physical Education, University of South Carolina, USA; msur@mailbox.sc.edu
[2] Department of Kinesiology and Health, Georgia State University, USA; dshapiro@gsu.edu
* Correspondence: msur@mailbox.sc.edu; Tel.: +1 815-761-2399

Author Contributions: Conceptualization, M.S. and D.S.; Methodology, M.S. and D.S.; Formal Analysis, M.S. and D.S.; Writing-Original Draft Preparation, M.S. and D.S.; Writing-Review & Editing, M.S. and D.S.

Funding: This research received no external funding.

Availability of data and materials: Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Conflicts of Interest: The authors declare no conflict of interest.

References

2018 Physical Activity Guidelines Advisory Committee. (2018). 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services, Retrieved from https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf

Ajzen, I. (2002a). Constructing a TPB questionnaire: Conceptual and methodological considerations. Retrieved from https://pdfs.semanticscholar.org/0574/b20bd58130dd5a961f1a2db10fd1fcbae95d.pdf?_ga=2.269109553.1929640853.1573654009-54211593.1573654009

Ajzen, I. (2002b). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, *32*(4), 665-683. https://doi.org/10.1111/j.1559-1816.2002.tb00236.x

Ajzen, I. (2006). Behavioral interventions based on the theory of planned behavior. Retrieved from https://people.umass.edu/aizen/pdf/tpb.intervention.pdf

Ajzen, I. (2015). The theory of planned behaviour is alive and well, and not ready to retire: a commentary on Sniehotta, Presseau, and Araújo-Soares. *Health Psychology Review*, *9*(2), 131-137. https://doi.org/10.1080/17437199.2014.883474

Arbour-Nicitopoulos, K. P., Ginis, K. A. M., Wilson, P. M., & SHAPE-SCI Research Group. (2010). Examining the individual and perceived neighborhood associations of leisure-time physical activity in persons with spinal cord injury. *Annals of Behavioral Medicine, 39*(2), 192–197. https://doi.org/10.1007/s12160-009-9149-9

Block, J., & Kuckertz, A. (2018). Seven principles of effective replication studies: Strengthening the evidence base of management research. *Management Review Quarterly,* 68, 355-359. https://doi.org/10.1007/s11301-018-0149-3

Cardinal, B. J., Kosma, M., & McCubbin, J. A. (2004). Factors influencing the exercise behavior of adults with physical disabilities. *Medicine & Science in Sports and Exercise*, *36*(5), 868-875. http://doi.org/10.1249/01.MSS.0000126568.63402.22

Crandall, C. S., & Sherman, J. W. (2016). On the scientific superiority of conceptual replications for scientific progress. *Journal* of *Experimental Social Psychology*, 66, 93-99. https://doi.org/10.1016/j.jesp.2015.10.002

Ellis, R., Kosma, M., Cardinal, B. J., Bauer, J. J., & McCubbin, J. A. (2007). Physical activity beliefs and behaviour of adults with physical disabilities. *Disability and Rehabilitation*, *29*(15), 1221-1227. https://doi.org/10.1080/09638280600950108

Ellis, R., Kosma, M., Cardinal, B. J., Bauer, J. J., & McCubbin, J. A. (2009). A comparison of two measures of physical activity among adults with physical disabilities: The issue of scale correspondence. *Journal of Developmental and Physical Disabilities*, *21*(5), 393-407. http://doi.org/10.1007/s10882-009-9150-z

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, *10*(3), 141-146.

Godin, G., Colantonio, A., Davis, G. M., Shephard, R. J., & Simard, C. (1986). Prediction of leisure time exercise behavior among a group of lower-limb disabled adults. *Journal of Clinical Psychology*, *42*(2), 272-279. https://doi.org/10.1002/1097-4679(198603)42:2<272::AID-JCLP2270420208>3.0.CO;2-G

Haegele, J. A., Hodge, S. R., & Kozub, F. M. (2017). Beliefs about physical activity and sedentary behaviors of adults with visual impairments. *Disability and Health Journal*, *10*(4), 571-579. https://doi.org/10.1016/j.dhjo.2017.03.008

Hagger, M. S., Chatzisarantis, N. L., & Biddle, S. J. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology*, *24*(1), 3-32. https://doi.org/10.1123/jsep.24.1.3

Hutzler, Y. (2003). Attitudes toward the participation of individuals with disabilities in physical activity: A review. *Quest*, *55*(4), 347-373. https://doi.org/10.1080/00336297.2003.10491809

Hutzler, Y., & Bar-Eli, M. (1993). Psychological benefits of sport for disabled people: A review. *Scandinavian Journal of Medicine and Science in Sports*, 3, 217-228. https://doi.org/10.1111/j.1600-0838.1993.tb00386.x

Individuals with Disabilities Education Act. (2004). 20 U.S.C. § 1400 Retrieved from https://www.govinfo.gov/content/pkg/USCODE-2010-title20/pdf/USCODE-2010-title20-chap33-subchapI.pdf

Jaarsma, E. A., Geertzen, J. H., de Jong, R., Dijkstra, P. U., & Dekker, R. (2014). Barriers and facilitators of sports in Dutch paralympic athletes: An explorative study. *Scandinavian Journal of Medicine & Science in Sports, 24*(5), 830-836. https://doi.org/10.1111/sms.12071

Keegan, J., Ditchman, N., Dutta, A., Chiu, C. Y., Muller, V., Chan, F., & Kundu, M. (2016). Social cognitive and planned behavior variables associated with stages of change for physical activity in spinal cord injury: A multivariate analysis. *Rehabilitation Research, Policy, and Education*, *30*(1), 89-106. https://doi.org/10.1891/2168-6653.30.1.89

Kirk, T. N., & Haegele, J. A. (2019). Theory of planned behavior in research examining physical activity factors among individuals with disabilities: A review. *Adapted Physical Activity Quarterly*, *36*(1), 164-182. https://doi.org/10.1123/apaq.2018-0065

Kosma, M., Cardinal, B. J., & McCubbin, J. A. (2004). Predictors of physical activity stage of change among adults with physical disabilities. *American Journal of Health Promotion*, *19*(2), 114-117. https://doi.org/10.4278/0890-1171-19.2.114

Kosma, M., Ellis, R., Cardinal, B. J., Bauer, J. J., & McCubbin, J. A. (2007). The mediating role of intention and stages of change in physical activity among adults with physical disabilities: An integrative framework. *Journal of Sport and Exercise Psychology*, *29*(1), 21-38. https://doi.org/10.1123/jsep.29.1.21

Kosma, M., Ellis, R., Cardinal, B. J., Bauer, J. J., & McCubbin, J. A. (2009). Psychosocial predictors of physical activity and health-related quality of life among adults with

physical disabilities: An integrative framework. *Disability and Health Journal*, *2*(2), 104-109. https://doi.org/10.1016/j.dhjo.2008.10.062

Kwan, M. Y., Cairney, J., Hay, J. A., & Faught, B. E. (2013). Understanding physical activity and motivations for children with developmental coordination disorder: An investigation using the theory of planned behavior. *Research in Developmental Disabilities*, *34*(11), 3691-3698. https://doi.org/10.1016/j.ridd.2013.08.020

Latimer, A. E., & Martin Ginis, K. A. (2005). The theory of planned behavior in prediction of leisure time physical activity among individuals with spinal cord injury. *Rehabilitation Psychology*, *50*(4), 389-396. https://doi.org/10.1037/0090-5550.50.4.389

Latimer, A. E., Martin Ginis, K. A., & Arbour, K. P. (2006). The efficacy of an implementation intention intervention for promoting physical activity among individuals with spinal cord injury: A randomized controlled trial. *Rehabilitation Psychology*, *51*(4), 273-280. https://doi.org/10.1037/0090-5550.51.4.273

Latimer, A. E., Martin Ginis, K. A., & Craven, B. C. (2004). Psychosocial predictors and exercise intentions and behavior among individuals with spinal cord injury. *Adapted Physical Activity Quarterly*, *21*(1), 71-85. https://doi.org/10.1123/apaq.21.1.71

Low, J., Ross, J. S., Ritchie, J. D., Gross, C. P., Lehman, R., Lin, H., Fu, R., Stewart, L. A., & Krumholz, H. M. (2017). Comparison of two independent systematic reviews of trials of recombinant human bone morphogenetic protein-2 (rhBMP-2): the Yale Open Data Access Medtronic Project. *Systematic Reviews*, *6*(1), 28. https://doi.org/10.1186/s13643-017-0422-x

Ma, J. K., & Martin Ginis, K. A. (2018). A meta-analysis of physical activity interventions in people with physical disabilities: Content, characteristics and effects on behaviour. *Psychology of Sport and Exercise*, 37, 262-273. https://doi.org/10.1016/j.psychsport.2018.01.006

Martin, J. J., Beasley, V. L., & Guerrero, M. D. (2019). Sport psychology research: Proper standards and limitations. In M. H. Anshel, T. A. Petrie, & J. A. Steinfeldt (Eds.), APA handbooks in psychology series. APA handbook of sport and exercise psychology, Vol. 1. Sport psychology (p. 17–40). American Psychological Association. https://doi.org/10.1037/0000123-002

Martin, J. J. (2013). Benefits and barriers to physical activity for individuals with disabilities: A socio-relational model of disability perspective. *Disability and Rehabilitation*, 35(24), 2030-2037. https://doi.org/10.3109/09638288.2013.802377

Martin Ginis, K. A., Latimer, A. E., Hicks, A. L., & Craven, B. C. (2005). Development and evaluation of an activity measure for people with spinal cord injury. *Medicine & Science in Sports & Exercise*, *37*(7), 1099-1111. http://doi.org/10.1249/01.mss.0000170127.54394.eb

Martin Ginis, K. A., Ma, J. K., Latimer-Cheung, A. E., & Rimmer, J. H. (2016). A systematic review of review articles addressing factors related to physical activity participation among children and adults with physical disabilities. *Health Psychology Review*, *10*(4), 478-494. https://doi.org/10.1080/17437199.2016.1198240

Martin Ginis, K. A., Papathomas, A., Perrier, M. J., Smith, B., & Shape-Sci Research Group. (2017). Psychosocial factors associated with physical activity in ambulatory and manual wheelchair users with spinal cord injury: A mixed-methods study. *Disability and Rehabilitation*, *39*(2), 187-192. https://doi.org/10.3109/09638288.2015.1045991

Martin Ginis, K., Latimer, A. E., Buchholz, A. C., Bray, S. R., Craven, B. C., Hayes, K. C., Hicks, A. L., McColl, M. A., Smith, K & Wolfe, D. L. (2008). Establishing evidence-based physical activity guidelines: Methods for the Study of Health and Activity in People with Spinal Cord Injury (SHAPE SCI). *Spinal Cord*, *46*(3), 216-221. https://doi.org/10.1038/sj.sc.3102103

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *International Journal of Surgery, 8*(5), 336-341. http://doi.org/10.1016/j.ijsu.2010.02.007

Moja, L. P., Telaro, E., D'Amico, R., Moschetti, I., Coe, L., & Liberati, A. (2005). Assessment of methodological quality of primary studies by systematic reviews:

Results of the metaquality cross sectional study. *Bmj*, 330(7499), 1053. http://doi.org/10.1136/bmj.38414.515938.8F
National Education Association of Disabled Students. (n.d.). Making extra-curricular activities inclusive. Retrieved from http://www.neads.ca/en/about/projects/inclusion/guide/pwd_01.php
National Institutes of Health. (n.d.). Study quality assessment tools. Retrieved from https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools
Noar, S. M., Chabot, M., & Zimmerman, R. S. (2008). Applying health behavior theory to multiple behavior change: Considerations and approaches. *Preventive Medicine*, 46(3), 275-280. https://doi.org/10.1016/j.ypmed.2007.08.001
Nosek, B. A., & Errington, T. M. (2020). What is replication? *PLoS Biology*, 18(3), 1-8. https://doi.org/10.1371/journal.pbio.3000691
Painter, J. E., Borba, C. P., Hynes, M., Mays, D., & Glanz, K. (2008). The use of theory in health behavior research from 2000 to 2005: A systematic review. *Annals of Behavioral Medicine, 35*(3), 358-362. https://doi.org/10.1007/s12160-008-9042-y
Porretta, D. L., Kozub, F. M., & Lisboa, F. L. (2000). Documentary analysis of survey research in adapted physical activity: 1984-1998. *Adapted Physical Activity Quarterly*, *17*(3), 286-296. https://doi.org/10.1123/apaq.17.3.286
Sherrill, C., & O'Connor, J. (1999). Guidelines for improving adapted physical activity research. *Adapted Physical Activity Quarterly, 16*(1), 1-8. https://doi.org/10.1123/apaq.16.1.1
Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review, 8*(1), 1-7. https://doi.org/10.1080/17437199.2013.869710
Stapleton, J. N., Martin Ginis, K. A., & SHAPE-SCI Research Group. (2014). Sex differences in theory-based predictors of leisure time physical activity in a population-based sample of adults with spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, *95*(9), 1787-1790. https://doi.org/10.1016/j.apmr.2014.03.021
Sterdt, E., Liersch, S., & Walter, U. (2014). Correlates of physical activity of children and adolescents: A systematic review of reviews. *Health Education Journal*, 73(1), 72-89. http://doi.org/10.1177/0017896912469578
Sweet, S. N., Martin Ginis, K. A., & Latimer-Cheung, A. E. (2012). Examining physical activity trajectories for people with spinal cord injury. *Health Psychology*, *31*(6), 728. https://doi.org/10.1037/a0027795
Symons Downs, D., & Hausenblas, H. A. (2005a). Elicitation studies and the theory of planned behavior: A systematic review of exercise beliefs. *Psychology of Sport and Exercise*, *6*(1), 1-31. https://doi.org/10.1016/j.psychsport.2003.08.001
Symons Downs, D., & Hausenblas, H. A. (2005b). The theories of reasoned action and planned behavior applied to exercise: A meta-analytic update. *Journal of Physical Activity and Health*, *2*(1), 76-97. https://doi.org/10.1123/jpah.2.1.76
Tugwell, P., Welch, V. A., Karunananthan, S., Maxwell, L. J., Akl, E. A., Avey, M. T., Bhutta, Z. A., Brouwers, M. C., Clark, J. P., Cook, S., Cuervo, L. G., Curran, J. A., Ghogomu, E. T., Graham, I. G., Grimshaw, J. M., Hutton, B., Ioannidis, J, P. A., Jordan, Z., Jull, J. E. Kristjansson, E. ... & White, H. (2020). When to replicate systematic reviews of interventions: consensus checklist. *Bmj*, *370*, 1-7. https://doi.org/10.1136/bmj.m2864
Washburn, R. A., Zhu, W., McAuley, E., Frogley, M., & Figoni, S. F. (2002). The physical activity scale for individuals with physical disabilities: Development and evaluation. *Archives of Physical Medicine and Rehabilitation*, *83*(2), 193-200. https://doi.org/10.1053/apmr.2002.27467
World Health Organization. (2019). Global action plan on physical activity 2018-2030: More active people for a healthier world. World Health Organization. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf