

PHYSICAL ACTIVITY FOR CHILDREN WITH DISABILITIES:
SCOPING REVIEW OF MIXED METHODS RESEARCH

Mathieu Michaud

Department of Kinesiology and Physical Education

McGill University, Montréal

August 2021

A thesis submitted to McGill University in partial fulfillment
of the requirements for the degree of Master of Arts
in Kinesiology and Physical Education

Abstract

Mixed methods research (MMR) combines quantitative and qualitative methods in a single study to provide a thorough understanding of a research phenomenon. Yet, MMR has been characterized as being a grey area in relation to the underlying research assumptions and methodological processes within adapted physical activity (APA) research. Its emergence has also been described as minimal or slow in the APA research community. The purpose of this study was to examine how MMR has been applied in APA research about children and youth with a disability, aged 5–18 years. A scoping review was conducted to answer the following overarching research question: how has MMR been conducted for children and youth with disabilities who participated in physical activity? The Arksey and O'Malley (2005) framework was used to guide the performance of the scoping review. Six electronic databases were searched to retrieve relevant studies conducted between January 2003 and December 2020 (ERIC, SPORTDiscus, Sports Medicine and Education Index, PsycINFO, MEDLINE, Web of Science). Sixty-four studies were identified and analyzed for the purposes of the scoping review. Descriptive numerical summaries and thematic analyses afforded the exploration of the study themes. The findings from this scoping review demonstrated that MMR publications in APA have been gradually increasing over the past decade. Exercise and physical activity, psychological issues and behaviours, and therapy were the most studied content areas. Worldviews were not explicitly stated in any of the MMR studies while theoretical rationales were only described in one third of the review studies. Quantitative and qualitative research objectives were often stated, although MMR-specific objectives were infrequently provided. It was also determined that the explicit identification of MMR and its designs was incomplete. Moreover, heterogeneous samples of participants with multiple disabilities and/or wide age ranges were identified in many review studies. Further, the data integration phase of MMR lacked detail and MMR results were not always reported holistically. Finally, a majority of the review studies were interventions and more than a third of the studies were conducted in a school setting. This original study adds to the knowledge of MMR design and it provides a thorough understanding of the underlying processes and methodological strategies that have guided this approach in APA research. The findings will inform and empower APA researchers to engage in MMR while also aligning future studies with contemporary MMR literature and publication standards.

Résumé

La recherche par méthodes mixtes (MM) combine des méthodes quantitatives et qualitatives dans une seule étude pour fournir une compréhension approfondie d'un phénomène de recherche. Cependant, la recherche par MM a été caractérisée comme étant une zone grise en ce qui concerne les modalités paradigmatiques et les procédés méthodologiques au sein de la recherche sur l'activité physique adaptée (APA). Son émergence a également été décrite comme minime ou lente dans la communauté de recherche de l'APA. Le but de cette étude était d'examiner comment les MM ont été appliqués dans la recherche sur l'APA chez les enfants et les jeunes avec handicaps, âgés de 5 à 18 ans. Un examen de la portée a été mené pour répondre à la question de recherche suivante : comment la recherche par MM a-t-elle été effectuée pour les enfants et les jeunes avec handicaps qui ont participé à de l'activité physique ? La structure d'Arksey et O'Malley (2005) a été utilisée pour guider l'exécution de l'examen de la portée. Six bases de données électroniques ont été consultées pour récupérer les études pertinentes menées entre janvier 2003 et décembre 2020 (ERIC, SPORTDiscus, Sports Medicine and Education Index, PsycINFO, MEDLINE, Web of Science). Soixante-quatre études ont été identifiées et analysées aux fins de l'examen de la portée. Des résumés numériques descriptifs et des analyses thématiques ont permis d'explorer les thèmes de cette étude. Les résultats originaux de cet examen de la portée ont démontré que les publications de recherche par MM dans le domaine de l'APA ont progressivement augmenté au cours de la dernière décennie. L'exercice et l'activité physique, les problèmes et comportements psychologiques et la thérapie étaient les domaines spécifiques les plus étudiés. Les modalités paradigmatiques n'étaient explicitement énoncées dans aucune des recherches par MM, tandis que les justifications théoriques n'étaient décrites que dans un tiers des études de cet examen. Les objectifs de recherche quantitatifs et qualitatifs étaient souvent énoncés, bien que les objectifs spécifiques aux MM n'aient pas été fréquemment fournis. Il a également été déterminé que l'identification explicite de l'utilisation de MM et de ses composantes méthodologiques était incomplète. Aussi, des échantillons hétérogènes de participants ayant des handicaps divers et/ou de larges tranches d'âge ont été identifiés dans de nombreuses études. De plus, la phase d'intégration des données de la recherche par MM manquait de détails et les résultats mixtes n'étaient pas toujours rapportés de manière holistique. Enfin, la majorité des études de cet examen de la portée étaient des interventions et plus d'un tiers des études ont été menées en milieu scolaire. Cette étude originale ajoute aux connaissances sur la conception de la recherche par MM et fournit une compréhension approfondie des processus sous-jacents et des stratégies méthodologiques qui ont guidé cette approche dans la recherche sur l'APA. La discussion des résultats informera et habilitera les chercheurs du domaine de l'APA à s'engager dans la recherche par MM tout en alignant les futures études avec la littérature et les normes de publication contemporaines de la recherche par MM.

Acknowledgments

I would like to thank the following people for the role they played in the completion of this thesis:

- Dr. William Harvey, my supervisor, for his advice, knowledge and determination. Thank you for your relentless work, patience, and compassion. Your expertise is commendable and I am looking forward to expanding my academic journey with you.
- Dr. Gordon Bloom, my co-supervisor, for always challenging me, while encouraging me to be the best I can possibly be.
- Dr. Benoît Gentil, my committee member, for his advice and his encouragement.
- Marcela Isuster, the librarian for kinesiology and physical education, for her help and open-mindedness, even when we thought such a scoping review could not be performed.
- My friends and colleagues from the McGill Sport Psychology Lab: Jordan, Danielle, Siobhan, Aaron, Mishi, Lara, Cherokee, and Marc. Thank you for all your help, support, and advice. I am grateful to have met such an exceptional group of individuals.
- Social Sciences and Humanities Research Council of Canada, for funding this research and convincing me that my research is important.
- Fonds de recherche du Québec — Société et culture, for funding this research and supporting the substantial changes made to the project.
- My parents, for their continuous support throughout my never-ending academic journey.
- Jonathan, for his unconditional support and patience.
- N'yonga, Kaiah, and Podrick, for their unwavering moral support.

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Chapter 1

Introduction

Mixed methods research (MMR) involves the combined use of quantitative and qualitative methods and strategies in a single study (Creswell & Plano Clark, 2018). *Quantitative research* refers to empirical research where the data are exclusively represented in numerical form (Thomas et al., 2015). It aims to answer specific questions with objective answers (Goertzen, 2017). Its objectivity, validity, and reliability may lead to the identification of cause-and-effect relationships (Mertler, 2018) through a reductionist lens where a phenomenon is broken down into smaller components (Creswell & Creswell, 2017; Ratner, 2008). *Qualitative research*, on the other hand, aims to explain or understand the underlying processes and meanings behind behaviours and phenomena through a holistic and experiential lens (Denzin & Lincoln, 2018). It is concerned with experiences that are best captured with non-numerical data such as words, video, audio, and art.

Quantitative and qualitative research methods are beneficial for researchers to answer questions about the phenomenon of their interest (Creswell & Creswell, 2017). Each approach has its own unique philosophical and methodological underpinnings that drive research studies (Creswell & Creswell, 2017). There are associated parameters that provide well-established frameworks for each specific research method. For instance, quantitative researchers seek to generalize their study findings to the general population. They try to use well-defined and large-sized samples where adequate statistical power is sought to guard against making type-I and type-II errors as well as alpha inflation (Boyd & Bee, 2018; Gravetter & Wallnau, 2017). Quantitative research methods are also driven by post-positivistic assumptions that quantitative research is deductive, objective, and value-free based on the (1) ability of the researchers to

remain impartial, (2) validity and reliability of the data collection instruments and procedures, and (3) statistical decision-making performed on the data and associated inferences (Creswell, 2014a, Heale & Twycross, 2015; O'Dwyer & Bernauer, 2014). Qualitative research explores the behaviours, viewpoints, and experiences of people in relation to time, space, and context (Anderson, 2010; Sparkes & Smith, 2013). Qualitative researchers explore the unique perspectives and experiences of the participants. Hence, the parameters of this research approach are different from quantitative methods because the participants are often directly involved in the creation of rich, deep, and meaningful knowledge (Paris, 2011; Sparkes & Smith, 2013). Qualitative research methods are also driven by a variety of constructivist, transformative, and critical philosophies as well as inductive and iterative analytical processes (Creswell & Creswell, 2017; Levitt et al., 2018). Additionally, qualitative researchers do not seek to replicate or generalize their study findings that are the result of naturalistic interactions with few participants (Atieno, 2009; Levitt et al., 2018). See Creswell (2014b) for further discussion of the intricacies of quantitative and qualitative research methods. The combination of these methods has been called MMR (Creswell & Plano Clark, 2018).

MMR refers to the purposeful and rigorous collection, analysis, and integration of both quantitative and qualitative data in a single study (Creswell & Plano Clark, 2018). It may be conceptually located between the qualitative and quantitative paradigms with its constructs and processes intersecting with both methodological approaches (Johnson et al., 2007). MMR may lead to comprehensive, extensive insights and conclusions that would have been impossible to generate with qualitative or quantitative approaches alone (Tashakkori & Creswell, 2007). This depth and richness of findings is, in part, because the strengths of one approach can overcome the weaknesses of the other which may strengthen the findings through the data integration

process (Johnson & Onwuegbuzie, 2004).

However, conceptual issues have affected the MMR approach and associated methodology since its inception which may explain its slow development in various domain-specific areas (Creswell & Tashakkori, 2007b). For instance, MMR first appeared in the 1950s with Campbell and Fiske's work on triangulation (1959) as a validation process where two different measures of a single variable are compared to validate the results of each individual measure. Some qualitative researchers currently perceive triangulation as an unnecessary effort to provide proof to quantitative audiences that their research is credible (Hastings, 2010). Most quantitative researchers seem to hold a more favourable view of triangulation and perceive it as a way to gain more than one perspective on a phenomenon (Hastings, 2010). Triangulation is often used in MMR to cross-reference data obtained through both quantitative and qualitative methods (Hastings, 2010). Although the combination of both quantitative and qualitative data was used by researchers in the second half of the 20th century, MMR only started to fully develop in the social and behavioural sciences in the 1980s (Johnson et al., 2007). It has become an academically recognized approach since the early 1990s (Levitt et al., 2018; Mertens, 2017). However, the advancement of MMR in the fields of kinesiology and adapted physical activity (APA) has been slow to develop thus far (Haegele et al., 2015; Thomas et al., 2015).

Mixed Methods Research in Adapted Physical Activity

The relatively new field of APA was established in 1973 by the Fédération Internationale de l'Activité Physique Adaptée in Québec (Hutzler & Sherrill, 2007). Research in the field of APA has been predominantly defined by quantitative methods (Haegele et al., 2015). Qualitative research has also been conducted in the field of APA and it has become more prominent over the past few decades (Haegele et al., 2015; Porretta & Sherrill, 2005). MMR has recently been

developing in APA research. However, its emergence is slow and very few MMR studies seem to have been conducted so far about physical activity (PA) for people with disabilities (Haegele et al., 2015; Harvey et al., 2020). For instance, the scarcity of MMR articles and the dominance of quantitative methodologies in APA were reported in a documentary analysis by Haegele and colleagues (2015). They identified research trends in the *Adapted Physical Activity Quarterly* between 2004 and 2013 by examining a sample of 181 published articles. They observed the dominance of quantitative research methods by identifying that 70% of surveyed articles utilized group research designs. Only 19% of the articles surveyed were based on qualitative research methods and seven articles (4%) were MMR. This last finding is unfortunate given that MMR could greatly benefit APA research. For instance, it could address the issue of small sample sizes often involved in APA research by increasing the amount of data gathered and, consequently, could help advance the field in new directions (Harvey et al., 2020).

Harvey et al. (2020) outlined three challenges surrounding MMR in APA. First, MMR researchers need to have a solid grasp of quantitative and qualitative research paradigms. Second, MMR studies may be difficult to identify through literature searches. Finally, the process of MMR and associated analytical strategies may also be poorly understood. These three challenges can make MMR difficult to discern and comprehend. More recently, Levitt et al. (2018) established guidelines to clearly report MMR and suggested providing clear participant descriptions in MMR designs to add context to the inquiry. For example, Haegele et al. (2015) found that MMR studies in APA often included a wide range of people with physical (De Bressy de Guast et al., 2013; Giacobbi et al., 2008) and intellectual disabilities (Tsai & Fung, 2009), diseases (Giacobbi et al., 2012), and neurodevelopmental disorders (Harvey et al., 2009; Obrusnikova & Dillon, 2011; Obrusnikova & Miccinello, 2012).

Children with Disabilities in Physical Activity

A disability is the interaction between impairment(s) and contextual factors which may limit a person's ability to perform activities and to interact with others (World Health Organization, 2001). It can include physical and intellectual disabilities and may also refer to neurodevelopmental disorders such as Down syndrome, Fragile X syndrome, attention-deficit hyperactivity disorder, and autism spectrum disorder. Approximately 175,000 Canadian children between the ages of 5–14 years and over 96,000 youths, aged 15–19 years, experienced some form of disability (Human Resources and Skills Development Canada, 2011).

Children with a disability engage in less PA than their peers without a disability (Li et al., 2016; Liang et al., 2020). Their engagement in PA is first affected by similar factors as their peers without a disability including PA preferences, levels of intrinsic motivation, and perceived physical abilities (Li et al., 2016). A disability may also generate unique challenges for children (Bloemen et al., 2015; Verschuren, 2012). For instance, low physical abilities and motor skill functioning associated with a disability may lead to lower motivation and self-competence in PA settings (Li et al., 2016). Moreover, children with a disability may not be accepted by their peers and may even be bullied in PA settings which can greatly reduce their involvement in PA (Must et al., 2015; Verschuren et al., 2012). Environmental barriers such as a dearth of community PA programs, adapted to children with a disability, and a deficit in knowledge and experience from coaches may also hinder the involvement in PA of children with a disability (Obrusnikova & Cavalier, 2011; Verschuren et al., 2012).

Research findings do not fully agree on the extent to which the impairing effects of a disability alone impact the PA level of children (Jones et al., 2017; Li et al., 2016). For instance, the results of a study may be swayed by methodological limitations such as child and familial

variables, objective and subjective measures of sedentary and active time, various environmental variables, etc. (Hinckson & Curtis, 2013; Jones et al., 2017). MMR may be a comprehensive approach to provide a thorough understanding of issues that surround children with a disability in PA with holistic and comprehensive results (Woolley, 2009). Therefore, MMR may offer a pragmatic, solution-based approach to learn more about the PA engagement of children and youth with disabilities through comprehensive research and closely related field-based practices.

Purpose of the Study

The purpose of this study was to examine how MMR has been applied in APA research about children and youth with a disability, aged 5–18 years. Therefore, a scoping review was conducted to answer the following overarching research question: how has MMR been conducted for children and youth with disabilities who participated in PA? The following sub-questions were posed to help answer the overarching research question: (1) How have the research objectives been framed? (2) Which categories of disability have been studied? (3) What types of MMR designs have been used? (4) How have the quantitative and qualitative data been analyzed and integrated?

Significance of the Study

Camerino et al. (2012) and Harvey et al. (2020) suggested using mixed methods to conduct research in the fields of movement sciences and APA respectively. However, the methodology has only periodically been utilized in the context of APA (Haegele et al., 2015) and, to the best of our domain knowledge, it has rarely been addressed in academic papers on APA (Harvey et al., 2020). MMR in APA is still developing and methodological inconsistencies may affect the paradigm. Given the infancy of the approach in APA, it is important to explore the ways that MMR has been conducted. However, Harvey et al. (2020) suggested that MMR

studies may be difficult to identify through literature searches. Consequently, successful database search strategies may be identified with this scoping review which could make the identification of MMR articles easier and more convenient for researchers, academics, and practitioners (Harvey et al., 2020). It is also hoped that a better understanding of MMR will lead to new and clearly identified MMR studies in research journals to help with the identification of published MMR studies in the context of APA (Harvey et al., 2020).

Furthermore, pertinent issues need to be addressed regarding the nature of the research questions, the intricate dissemination of the results of MMR studies, and the contribution of MMR to APA literature (Creswell & Tashakkori, 2007a). Moreover, the discussion of these issues may encourage and empower APA academics and researchers to engage more confidently with MMR. Thus, this study is important to better comprehend the role MMR has played in the field of APA. It also helps build the knowledge of MMR and provides a greater understanding of the underlying processes and the methodological strategies that have guided the approach. Moreover, this study aimed to identify the philosophical worldview (i.e., ontology, epistemology, methodology, axiology, rhetoric), where and if possible, that guided researchers throughout the entire research process and how MMR was developed within their research paradigm. This type of craft knowledge may empower APA researchers to expand their research designs through the use of MMR which may, in return, expand the field of APA by providing richer, deeper and more comprehensive answers to diverse applied research questions.

Moreover, MMR could be invaluable for APA researchers because it may counter some of the limitations often faced by researchers in APA. For example, MMR may be an efficient way to utilize and justify small sample sizes (Harvey et al., 2020) by gathering comprehensive and complex data. It may also help increase the sample size of a study and the breadth of study

findings by including other highly relevant participants or interrelated populations (e.g., parents, teachers, siblings). Furthermore, MMR is a pragmatic, real-world approach that may resonate well with the applied perspective held by many APA researchers (Harvey et al., 2020). MMR may provide comprehensive answers to applied research questions that can be immediately employed by APA practitioners in real-world contexts (Harvey et al., 2020). Consequently, MMR is pertinent to the field of APA as it may be a way of designing comprehensive research studies in this area as well as addressing the gap between research and practice. This gap is created by the differences in the multiple environmental variables between the controlled environment of researchers and the real-life context of practitioners (Foster, 2014). Hence, the real-world approach of MMR could encourage evidence-based practice in APA. Practitioners could develop their expertise by applying pragmatic empirical evidence from the literature as a complement to their practical knowledge (Reid et al., 2012), thus potentially developing new skills, saving time, and reducing the likelihood of errors (Jin & Yun, 2010). The applied perspective of MMR could also resonate well with APA researchers. It could provide a depth of understanding that quantitative and qualitative research alone may not be able to (Harvey et al., 2020). Consequently, MMR can help APA researchers develop new knowledge on all topics related to PA and individuals with disabilities.

Delimitations

The following delimitations were considered for this study:

- (1) Six electronic databases were searched: ERIC, SPORTDiscus, Sports Medicine and Education Index, PsycINFO, MEDLINE, Web of Science.
- (2) Only articles published in English were included.
- (3) Only peer-reviewed articles published in academic journals were included.

- (4) Only articles published between January 1, 2003 and December 31, 2020 were included.
- (5) Only original research studies were surveyed. Grey literature, conference proceedings, poster presentations, abstracts, editorials, book reviews, etc., were not considered. Literature reviews were also excluded from the analysis.
- (6) Researchers must have used MMR to investigate PA.
- (7) The articles selected must have predominantly included children and youth with disabilities (i.e., physical disability, intellectual disability, neurodevelopmental disability, etc.), with the average age of the sample between 5 and 18 years.

Limitations

The following limitations were identified for the purpose of this study:

- (1) Some relevant studies may have been missed during the data collection process either because of the choice of databases and search terms or the exclusion of grey literature from the search.
- (2) The review included only published studies and excluded grey literature, therefore reducing the scope of the review for feasibility reasons.
- (3) The age ranges of some studies included in this review partially exceeded the delimitations set for this review. In such cases, the studies were included if the average age of the sample was between 5 and 18 years.
- (4) Some of the review studies were designated as MMR even though they were not originally identified as MMR by the study's authors. As such, some authors may disagree with the MMR label that was attached to their study.

Operational Definitions

For the purpose of this study, the following definitions were used:

Adapted Physical Activity: A cross-disciplinary science interested in the PA experiences of individuals with disabilities throughout their lives (Sherrill, 2004).

Attention-Deficit Hyperactivity Disorder: A neurodevelopmental disorder that affects an individual's learning and daily life and has three main features: (1) inattention, (2) hyperactivity, and (3) impulsivity (World Health Organization, 2019).

Autism Spectrum Disorder: A neurodevelopmental disorder characterized by deficits in social interactions and the presence of restrictive and repetitive behaviours. Persistent social, communication, behavioural, and physical delays are also often observed in individuals with autism spectrum disorder (American Psychiatric Association, 2013).

Developmental Coordination Disorder: A neurodevelopmental disorder that affects physical coordination caused by a lack of concordance between mental intentions and physical abilities (United Kingdom National Health Services, 2018).

Disability: The interaction between impairment(s) and contextual factors which may limit a person's ability to perform activities and to interact with others (World Health Organization, 2001).

Impairment: A problem in a person's body function or structure, or mental functioning (World Health Organization, 2001).

Intellectual Disability: A neurodevelopmental disorder characterized by both significant adaptive malfunctions—difficulties in communication, self-care, social skills, etc.—and an IQ score of 70 or lower (American Psychiatric Association, 2013).

Mixed Methods Research: A research approach characterized by the purposeful and rigorous

collection, analysis and integration of both quantitative and qualitative data within the same study (Creswell & Plano-Clark, 2018).

Neurodevelopmental Disorder: An impaired development of the nervous system leading to abnormal brain functions which may affect self-regulation, cognitive abilities, and memory (Thapar et al., 2017).

Physical Disability: A temporary or permanent condition affecting someone's physical capacity or mobility. It may be caused by an illness, an injury, or a genetic disorder (Albrecht et al., 2001).

Theoretical Rationale: Theories or models used to structure a study in a way that is rigorously based on an existing body of knowledge (Creswell & Plano Clark, 2018).

Worldview: The belief system that guides the researchers and underpins the ontology, epistemology, axiology, methodology and rhetoric of the research study (Creswell & Plano Clark, 2018; Lincoln et al., 2018).

Chapter 2

Literature Review

The purpose of this study was to examine how mixed methods research (MMR) has been applied in adapted physical activity (APA) research about children and youth with a disability, aged 5–18 years. This chapter consists of three sections. The first section provides an overview of literature reviews with an emphasis on scoping reviews and the Arksey and O'Malley framework (2005). The second section outlines MMR and its methodological components. The final section focuses on different categories of disability (e.g., neurodevelopmental disorders, physical disability) and how physical activity (PA) may be affected in school-age children with disabilities.

Types of Literature Reviews

Literature reviews are formal summaries of the evidence available on a particular subject or within a specific domain (Grant & Booth, 2009). They consolidate information from multiple sources to provide empirical evidence to practitioners and researchers to help make informed decisions and guide evidence-based practice and research respectively (Grant & Booth, 2009). Grant and Booth (2009) conducted scoping searches to identify the most common types of literature reviews, provide clear definitions for each type and highlight the differences between the review types. They determined that few types of literature reviews had distinct definitions or precise methodologies that were commonly agreed upon. Consequently, the misperception of terms and concepts may create a disconnect between the terms used by researchers to describe their review and the methodologies actually used to conduct the review. This disconnect may cause researchers to mistakenly establish a lower degree of procedural rigour and systematization for their review than what the approach chosen should entail. It may lead to incomplete

information being used by practitioners for evidence-based practice (Grant & Booth, 2009). The inconsistency in terminology and methodological expectations may also make it challenging for researchers to choose between different types of reviews, particularly between systematic and scoping reviews (Munn et al., 2018). Consequently, systematic and scoping reviews will be examined in greater detail for the purpose of this literature review.

Systematic Review

Systematic reviews involve the search, appraisal, and synthesis of research with the hope of answering specific, clearly formulated research questions and to disseminate the evidence-based information necessary to practitioners and researchers (Grant & Booth, 2009; Smith et al., 2011). The systematic review process is thorough, transparent, and rigorous (Rhoades, 2011). It involves a quality assessment of the identified studies to ensure that the reported evidence meets a minimum standard of methodological quality established by the reviewers (Smith et al., 2011). Thus, this quality assessment process strengthens the review outcomes as it reduces the risks of carrying research biases into the review (Khan et al., 2003). Additionally, a systematic review may include a criterion, as part of its inclusion and exclusion criteria, that dictates the inclusion of only randomized controlled trials to further reduce the risk of biases (Higgins et al., 2019; Grant & Booth, 2009).

Systematic reviews have become the primary source of literature gathering and evidence-based practice in APA research (Hutzler, 2020; Zhu, 2020). For instance, Ruggeri et al. (2020) conducted a systematic review of studies that specifically explored the effects of PA interventions on the motor development of children with autism spectrum disorder (ASD). Their study protocol was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2010), an evidence-based set of items created to guide the

reporting of systematic reviews. They explored six databases with keywords related to ASD, physical therapy, motor intervention and exercise, and performed a manual search of reference lists. The authors established clear inclusion criteria: (1) English-language publications, (2) group study designs, (3) participants under the age of 21 years, (4) studies inquiring into any type of PA intervention, and (5) investigation of the effects of the PA interventions on motor outcomes, including the acquisition, retention and transferability of motor skills. The methodological quality of 41 articles was appraised by the authors. Seven out these 41 studies met the highest quality assessment criteria. The authors identified that some study outcomes were weaker because of the lack of a comparison or control group or because of low statistical power, thus increasing the risks of research biases and weakening the outcomes. They determined that motor skills improved with increased PA. Body functions and structures also showed some improvement with PA interventions. The authors suggested that more motor skill interventions with controlled designs and bigger sample sizes were necessary to draw stronger conclusions.

Therefore, specific research questions are answered through a rigorous search, appraisal and synthesis process in systematic reviews. The outcomes are valuable to inform evidence-based practice. However, systematic reviews are not designed to meet objectives related to a broad mapping of literature which could inform future research. Scoping reviews may then be a valid and rigorous approach to consider.

Scoping Review

A scoping review is a preliminary evaluation of the scope of literature available in a specific field (Grant & Booth, 2009). It is usually undertaken for at least one of four objectives: (1) to map out and examine a field of study, (2) to determine if undertaking a systematic review

is relevant, (3) to encapsulate and communicate research findings, and (4) to identify gaps in the literature (Arksey & O'Malley, 2005). While a scoping review is similar to a systematic review in its methodological and transparent procedures, its scope is broader. The purpose is to map out the nature and characteristics of the relevant literature more than to answer specific and detailed questions (Pham et al., 2013). Consequently, a scoping review usually includes a greater range of study designs than systematic reviews do. Moreover, the quality appraisal process of systematic reviews is often bypassed in scoping reviews (Brien et al., 2010). Scoping reviews may be viewed as less rigorous because of the absence of the quality appraisal process. However, a scoping review is a different entity on its own, with different objectives and expectations (Brien et al., 2010). For instance, the omission of the appraisal process allows researchers to obtain a broader view of all the literature and determine gaps in the body of research available (Arksey & O'Malley, 2005).

Pham et al. (2014) conducted a scoping review of scoping reviews to provide an overview of what a scoping review entails and to understand better the methodological implications. They used a search strategy that included a database search, a web search, a reference list search and a follow-up database search. They identified 2,003 unique scoping reviews during the study identification phase and 335 studies were included in the analysis that followed a selection process based on inclusion and exclusion criteria. The authors identified discrepancies in the use of (1) terminology and (2) framework and methodological procedures.

First, terminology was inconsistently used by the authors of the scoping reviews. For instance, approximately 60% of the reviews used the expression “scoping review” to identify the methodology (Pham et al., 2014). Other terms such as “scoping study” and “scoping exercise” were also used. The term “systematic mapping” was used predominately for some scoping

reviews in the field of engineering to suggest a meticulousness often associated with systematic reviews (Pham et al., 2014). Moreover, the terms used to describe the rigour of the review process throughout the publications were varied and included terms such as “rigorous”, “transparent”, and “systematic”. Other researchers explicitly acknowledged that their scoping review approach was less rigorous or methodic than the approach of a systematic review (e.g., Cameron et al., 2008; Campbell et al., 2011). This mindset was challenged by Brien et al. (2010) who suggested that scoping reviews and systematic reviews should not be compared because they are two different entities with different methodological expectations.

Second, the methodological procedures used to conduct scoping reviews varied between reviews based on the (1) framework used, (2) study identification procedures, (3) study selection process with its inclusion and exclusion criteria, (4) data charting process, (5) presentation of the results, and (6) outcomes of the review. For example, a little over half of the reviews used a published framework to guide their inquiry (Pham et al., 2014) and most of these reviews followed the Arksey and O'Malley framework (2005). A clear procedure for the identification of studies was also elaborated for all the reviews surveyed. For example, most researchers conducted electronic database searches while close to half performed a reference list search or a search using internet search engines. Additionally, the study selection process of approximately 80% of the scoping reviews included clearly defined inclusion and exclusion criteria. Also, a majority of the researchers used standardized data charting forms that they created to extract the study information necessary to answer their research question. Furthermore, the charted data of the scoping reviews were predominantly presented in tabular form. Lastly, a vast majority of reviews identified gaps in the literature and included recommendations for future research.

Other reviews have also highlighted a lack of consistency in the way that scoping reviews

have been conducted (e.g., Daudt et al., 2013). However, over the past 15 years, meticulous methodological frameworks have been designed to ensure that scoping reviews are conducted following specific quality standards (e.g., Kitchenham & Charters, 2007; Petersen et al., 2015). The Arksey and O'Malley framework (2005) is most frequently used in most fields of research (Pham et al., 2013).

Arksey and O'Malley framework. The Arksey and O'Malley framework (2005) for scoping reviews is divided into six stages: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarizing and reporting the results, and (6) stakeholder consultation.

The first step of the Arksey and O'Malley framework (2005) involves identifying the research question that will lead the investigation. The research question of a scoping review must be broad to provide breadth to the inquiry. The scope of the review must also be articulated at this step of the process (Levac et al., 2010). For instance, the parameters of interest must be established and clearly expressed to give direction to the review. The second step of the framework involves designing a thorough search strategy that ensures the breadth and feasibility of the inquiry remain, without compromising the likelihood of answering the research questions. It is recommended to use multiple sources such as electronic databases, reference lists, and hand-searching of key journals. The third step involves the selection of studies that specifically address the research questions. Studies, identified during the previous step of the process, are surveyed to determine if they match all the inclusion criteria. A set of inclusion and exclusion criteria should be established for study selection before the beginning of the search.

The fourth step of the framework involves the identification of relevant information that must be collected from the studies matching all eligibility criteria, synthesized and charted to

answer the research questions (Arksey & O'Malley, 2005). A systematic coding procedure is typically utilized to collect, synthesize and chart the data and the process is iterative (Wilson, 2009). Researchers first identify categories of interest related to the research questions. They then continuously reflect on and update the key items of information being gathered with these categories of interest as they become more familiar with the nature of the literature being investigated (Levac et al., 2010). Hence, the conclusions should reflect the nature and the breadth of the data in a comprehensive and extensive manner.

The fifth step of the framework pertains to the analysis of the data collected from the articles selected. It is divided into two distinct components: a descriptive numerical summary and a thematic analysis (Levac et al., 2010). A descriptive numerical summary presents an overview of the data gathered using descriptive statistics (Levac et al., 2010). A thematic analysis allows the researchers to delve into the studies identified and gather details about the topics investigated (Arksey & O'Malley, 2005). It helps organize the data gathered during the previous step of the process into overarching themes (Daudt et al., 2013). These themes may then provide clear, comprehensive answers to the research questions.

The sixth step of the framework is optional and it involves the consultation of stakeholders where other professionals in the concerned field(s) are asked to contribute and provide insights about the review (Arksey & O'Malley, 2005). Arksey and O'Malley (2005) did not clearly stipulate when, how and why this consultation should occur. However, Levac et al. (2010) suggested that researchers may include a consultation phase when conducting a scoping review and should articulate why this step is necessary.

The Arksey and O'Malley framework (2005) has been thoroughly used in many fields and it has been refined by many authors over the past 15 years. For instance, Levac et al. (2010)

used their own experience and an informal literature search on scoping review methodology to identify challenges related to the framework such as the (1) wide breadth of the inquiry, (2) absence of a quality appraisal process, and (3) use of an iterative team approach. Scoping review questions are often broad and it may be challenging to balance the breadth of inquiry and the feasibility of the review based on the resources and the time available for the research. Thus, Levac et al. (2010) recommended formulating clear research questions and designing an effective search strategy that highlighted the topics, populations and outcomes being searched. Second, similar to systematic reviews, Levac et al. (2010) suggested it was important to include a quality appraisal process with a critical appraisal tool. While they acknowledged it would be a challenging step because of the vast scope of the literature surveyed, the step could identify gaps in the literature created by low-quality research (Feehan et al., 2011) Lastly, Levac et al. (2010) also suggested using an iterative team approach where multiple researchers are involved in the study selection and the data charting phases. This approach allows multiple opinions and points of view to interact and question the process (Daudt et al., 2013).

Bragg and Pritchard-Wiart (2019) used the Arksey and O'Malley framework (2005) to review research on the participation of school-age wheelchair users in group PA and sports. They answered the following broad but clearly formulated question: "What research has been conducted evaluating outcomes associated with group, wheelchair physical activity and sport participation for children and adolescents?" (Bragg & Pritchard-Wiart, 2019, p. 569). They decided to leave out the stakeholder consultation stage, which was considered as optional in the original framework (Arksey & O'Malley, 2005), but recommended by other authors (Daudt et al., 2013; Levac et al., 2010). They searched four databases (i.e., MEDLINE, CINAHL, SPORTDiscuss, and Scopus) using keywords related to wheelchairs, PA, school-age children

and disability. They also performed a reference list search to ensure that as much of the literature as possible was included in their scoping review. Their inclusion criteria included studies published in English, between January 1990 and May 2018, that investigated the outcomes of group PA and sports for participants 18 years or younger. Only 17 out of the 886 studies surveyed matched all the inclusion criteria. This review did not include a quality appraisal phase. Basic information such as research questions/objectives, participant information (i.e., number of participants, age, sex, etc.) and research methods were extracted from each of the 17 studies.

Thirteen quantitative studies were identified for which the outcome measures were reported. These studies explored a broad range of outcomes. For instance, physical abilities (i.e., agility, speed, anaerobic fitness, etc.), social competence and acceptance, and PA participation were identified. The themes of personal development and identity development were predominant in all four qualitative studies surveyed. Bragg and Pritchard-Wiart (2019) determined that current research on the participation of school-age wheelchair users in group PA and sports was lacking. Consequently, future research needs to evaluate the PA participation in organized sports of school-age wheelchair users. It should also inquire into the facilitators and barriers to PA participation. Lastly, future research needs to include more female wheelchair athletes because only 2 out of the 17 studies identified focused on female athletes.

In sum, scoping reviews can help inquire into a field of interest to acquire a better understanding of the research that has been performed but also to identify the gaps in the literature and guide future research. They can also be used to summarize and disseminate research findings to policy makers, researchers and practitioners (Arksey & O'Malley, 2005). For instance, a scoping review on MMR could be very valuable to APA researchers and practitioners as MMR can provide comprehensive, holistic answers to research questions

(Harvey et al., 2020). This methodology is still in its infancy in the field of APA. Consequently, knowledge regarding MMR is necessary to provide a greater understanding of the underlying processes and the methodological strategies that have guided the approach (Harvey et al., 2020).

Mixed Methods Research

MMR originated in Europe during the 1850s where researchers started using a combination of quantitative and qualitative techniques to investigate poverty within families (Hesse-Biber, 2010). Campbell and Fiske (1959) started using MMR in the 1950s to triangulate the results from two different measures investigating a single variable. The emergence of MMR remained rather slow and the methodology started to develop fully in the social and behavioural sciences during the 1980s (Johnson et al., 2007). It became recognized as a distinct research approach in the 1990s (Creswell & Plano Clark, 2018; Mertens, 2017). Despite substantial developments in MMR since the end of the 20th century, the research approach is characterized by debates and disagreements regarding the underlying assumptions and the methodological processes it involves (Creswell & Creswell, 2005). Thus, a need exists to understand MMR better and to clarify its constructs (Creswell & Garrett, 2008).

Foundations of Mixed Methods Research

The definition of MMR remains unclear and misunderstood by researchers (Johnson et al., 2007). Therefore, Johnson et al. (2007) asked 19 mixed methodologists to share their definitions of MMR. They analyzed the answers and identified five components that should be included in a definition of MMR. First, what does mixed mean? A vast majority of the mixed methodologists defined MMR as the combination of quantitative and qualitative research. Second, at what stage of the process does the mixing occur? Three researchers indicated that the mixing happens during the data collection stage, two mentioned that mixing occurs at the data

collection and analysis stages, while four mentioned that it may happen at any stage of the process. Additionally, one researcher mentioned that the mixing should be embedded in the research question. Third, what is the breadth of the mixing? Some researchers suggested the mixing should be limited to the quantitative and qualitative methods of data collection used only while others suggested that some form of mixing should occur at every stage of the research process. Moreover, some researchers mentioned that worldviews may also be mixed in MMR. Fourth, why is mixing carried out in the research? Twelve researchers mentioned either breadth of research or corroboration of results as the two main reasons for conducting MMR. Some also mentioned that MMR can provide a better understanding of the research problem and provide more comprehensive results. Fifth, what is the orientation of the research? Some researchers labelled MMR as a bottom-up approach, meaning that the research questions and objectives drive the use of MMR. One classified it as a top-down approach suggesting that MMR is driven by the researcher's desire to conduct research that is transformative and emancipatory. Consequently, Johnson et al. (2007) suggested that MMR is situated along a top-down/bottom-up continuum.

Following their analysis of the 19 definitions of MMR, Johnson et al. (2007) generated two complementary definitions of MMR that covered all five themes:

- (1) Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purpose of breadth and depth of understanding and corroboration. (p. 123)
- (2) A mixed methods study would involve mixing within a single study; a mixed method

program would involve mixing within a program of research and the mixing might occur across a closely related set of studies. (p. 123)

The Johnson et al. (2007) study findings suggested that the selection of a specific MMR design is the cornerstone of the research process as it determines the underlying mechanisms that will define the data collection, analysis and integration phases.

Mixed Methods Research Designs

Research designs provide a road map for how data will be collected, analyzed, integrated and reported (Creswell et al., 2003; Creswell et al., 2018). They constitute a framework that bonds all the research study components and, ultimately, enables the researchers to answer their questions. The research designs used in MMR have evolved greatly and led to many different attempts at classification by several researchers (Creswell & Plano Clark, 2018; Kroll & Neri, 2009). Creswell et al. (2003) surveyed the literature and identified eight classifications of MMR designs coming from diverse fields and using different terminologies. They proposed a classification system with six designs as an attempt to streamline the existing types of MMR designs. Their designs were based on the implementation sequence, the priority given to qualitative or quantitative methods, the stage at which the integration occurs, and the presence of a theoretical perspective. These designs were first organized based on their implementation sequence, either as sequential designs (i.e., explanatory, exploratory and transformative) or as concurrent designs (i.e., nested, triangulation and transformative; see Appendix A, Table 1).

Sequential designs can be explanatory, exploratory or transformative. They involve at least two distinct asynchronous phases of quantitative and qualitative data collection whose order is determined by the purpose of the research (Creswell et al., 2003). The *sequential explanatory design* focuses predominantly on the quantitative data while relying on qualitative data to

confirm, complement, and explain the quantitative data collected during the first phase (Creswell et al., 2003). For example, Maine et al. (2019) conducted a pilot study of the Walking Away from Diabetes program. Their design involved the collection and analysis of quantitative data using the International Physical Activity Questionnaire and pedometer recordings during a first phase of research. Qualitative data were then gathered in the form of focus groups and analyzed during the second phase of the study. The *sequential exploratory design* involves the gathering and analysis of qualitative data during a first phase of investigation followed by a subsequent quantitative phase. This design focuses on the qualitative data to explore and better understand the area of research or to gather the information necessary to build the subsequent quantitative phase (Creswell et al., 2003). For example, Drigny et al. (2019) developed and validated a questionnaire to assess the barriers to PA after a stroke. Their design involved the collection and analysis of qualitative data from semi-structured interviews during the first phase of the investigation. The data were then used to build a subsequent quantitative phase in the form of a questionnaire and a scale called “Barriers to Physical Activity After Stroke Scale”. The *sequential transformative design* involves two consecutive phases of data collection starting with either the quantitative or the qualitative method. It is anchored in a theoretical framework and is change-oriented (Creswell et al., 2003). For example, Verderber et al. (2003) developed a survey about middle-school students’ intention to interact with children with a severe intellectual disability in a physical education setting. Qualitative data were gathered first through interviews with the students. The interview data were used to identify constructs that then constituted the basis of their quantitative survey for the second phase of the study. This study was transformative because it was anchored in a theoretical framework, the theory of reasoned action (Ajzen & Fishbein, 1980). It was also change-oriented and related to the needs of children with

severe intellectual disabilities.

Concurrent designs are classified as nested, triangulation or transformative and the quantitative data and the qualitative data are collected in parallel (Creswell et al., 2003). The *concurrent nested design* involves the collection and analysis of additional quantitative or qualitative data to complement the dominant qualitative or quantitative method (Creswell et al., 2003). For example, Bremer and Lloyd (2016) evaluated a fundamental movement skill intervention for children with autism-like characteristics. The study design involved the collection and analysis of additional qualitative data from an interview to complement the dominant quantitative methods of data collection: the Test of Gross Motor Skills-2 (TGMD-2; Ulrich, 2000) and the Social Skills Improvement System (SSIS; Gresham & Elliot, 2008). Consequently, the supplemental qualitative data expanded the findings from the dominant quantitative method. The *concurrent triangulation design* involves using more than one method to examine the same dimension of a research problem (Creswell et al., 2003). For example, McNamara et al. (2018) used a quantitative-dominant MMR design to study the social exclusion of children with disabilities during recess. They administered a demographic questionnaire and used variants of the Likert scale to create a quantitative evaluation of the enjoyment, victimization and sense of belonging for 743 students, including 44 children with a disability. Three open-ended questions were also asked and analyzed qualitatively to enable the researchers to seek a convergence of all the data collected and thus enhance the credibility of the findings. The *concurrent transformative design* is similar in its purpose to the sequential transformative design, only the implementation sequence changes. The concurrent transformative design relies on the implementation of simultaneous quantitative and qualitative data collection phases, not asynchronous phases as in the sequential transformative design (Creswell et al., 2003). For

instance, Harvey et al. (2009) concurrently used semi-structured interviews and the TGMD-2 to explore the PA experiences of boys with attention-deficit hyperactivity disorder (ADHD). The design was transformative because the researchers used the knowledge-based approach (Wall et al., 1985) and the inhibitory model of executive functions (Barkley, 1997) as a theoretical lens for their study and identified the needs of a marginalized population (i.e., children with ADHD).

MMR designs have changed and matured over the years. While some designs were added to the typology presented above, more recent typologies suggested a simplified approach to MMR designs with three core designs (Creswell & Plano Clark, 2018). The two remaining core sequential designs are the *explanatory sequential design* and the *exploratory sequential design*. The explanatory sequential design begins with the quantitative data followed by the qualitative data to explain the results from the first quantitative phase. The exploratory sequential design begins with the qualitative data to explore a topic, followed by a developmental quantitative phase. The nested and triangulation concurrent designs were combined into the single *convergent design* (Creswell & Plano Clark, 2018). The convergent design is used when researchers intend to combine and compare the results from the quantitative and qualitative data analysis. The transformative designs have been redefined as a single complex MMR design, the *mixed-methods participatory-social justice design* (Creswell & Plano Clark, 2018).

Thus, MMR designs dictate how the data collection, analysis and integration phases are to be organized to give meaning to the process. However, the integration phase remains challenging and misunderstood by some MMR researchers (Fetters et al., 2013; Plano Clark et al., 2018).

Mixed Methods Integration

The data integration phase is essential to the MMR process and it is defined as the mixing

of the quantitative and the qualitative data in a meaningful and revealing way to provide more comprehensive outcomes than the findings of each separate method alone (Woolley, 2009). The terminology used to define this phase of a MMR design has changed from “mixing” to “integration” because this step of the process goes beyond simply mixing the quantitative and qualitative data but rather suggests the careful and purposeful integration of the data to generate mixed-method results and assure the combined interpretation of the results (Schoonenboom & Johnson, 2017). The integration phase is a challenging, even contentious, practice that has been discussed in the literature since 1989 (Bazeley, 2009; Greene et al., 1989). For instance, some researchers argued that the inclusion of both quantitative and qualitative methods in a complementary or sequenced manner, without proper mixing of the two methods, was not sufficient in MMR (e.g., Yin, 2006). Consequently, Plano Clark et al. (2010) identified core issues associated with this phase of the research process and suggested three integration strategies for complex research data by merging the data in a narrative discussion, a joint display (matrix), and/or data transformation.

First, merging the data in a narrative discussion referred to interpreting the relationship between the two sets of results in the discussion section of a manuscript (Creswell & Plano Clark, 2018). Plano Clark et al. (2010) analyzed their two data sets separately and then identified overlapping topics. They analyzed the data further with these new topics of interest and compared the quantitative and the qualitative results before merging the information in their discussion section. This strategy allowed them to develop more comprehensive results.

Second, merging with a joint display, also called a matrix, referred to using a visual representation of both the quantitative and qualitative results (Creswell & Plano Clark, 2018). Plano Clark et al. (2010) first identified divergent results between the quantitative and qualitative

data. They then created categories of interest related to those divergences and refined their analysis before presenting the results in the form of a matrix. The matrix included their categories of interest, descriptive statistics from the quantitative data and quotes from the qualitative data. This strategy allowed them to find similarities and differences among different dimensions of inquiry and to present them in an organized manner.

Third, merging by data transformation referred to a process of “quantitizing” qualitative data or “qualitizing” quantitative data to facilitate the analysis (Tashakkori & Teddlie, 1998; Creswell & Plano Clark, 2018). During the analysis phase, Plano Clark et al. (2010) developed a rubric to systematically quantitize the qualitative data and used the quantitized data as part of a statistical analysis. Precisely, the quantitative portion of the questionnaire was positively skewed while the qualitative data were more balanced and included more negative perceptions. Therefore, they counted the number of negative statements in the qualitative data to generate a quantitative variable that they could use in their statistical analysis.

Plano Clark et al. (2010) determined that one integration strategy is not better than another. Each one is meant to address different dimensions of inquiry. The selection of one or multiple strategies to integrate the data in a MMR study may ensure that the quantitative and qualitative data do not appear as two different entities but rather as a cohesive whole. Hence, effective data integration may lead to richer, more comprehensive outcomes and may produce knowledge unattainable if the qualitative and the quantitative studies were to be conducted separately (O’Cathain et al., 2007). This richness of results is one of the reasons why MMR is being used increasingly in diverse fields of research. For instance, MMR is slowly emerging in the field of APA although its use is still uneven (Haegele et al., 2015; Harvey et al., 2020). It has immense potential in APA as it could help researchers, academics, and professionals better

understand diverse dimensions of PA and disability (Harvey et al., 2020).

Children with a Disability and Physical Activity

The PA participation of a person with a disability is affected by the interaction between type of disability, physical skills, motor development, individual PA preferences, and family environment (Li et al., 2016). Also, children with a disability engage in less PA than their peers without a disability and this fact is evident across all disability groups (Li et al., 2016; Liang et al., 2020). Furthermore, the impairments linked to disability may also generate unique challenges for individuals in relation to their PA participation. Two major categories of disability in childhood are physical disability (PD) and neurodevelopmental disorders (NDD). Examples of the unique challenges that each group may face in PA are now presented.

Children with a Physical Disability and Physical Activity

PD is a temporary or permanent condition affecting someone's physical capacity or mobility (Albrecht et al., 2001). It may be caused by an illness, an injury or a genetic disorder. Some common forms of PD studied in APA research include spinal cord injury, cerebral palsy, paraplegia, multiple sclerosis and muscular dystrophy (Albrecht et al., 2001). The causes of PD are varied and include genetic defects, premature birth, congenital infections as well as acquired causes such as accidents (Gargiulo, 2015). Canadian children between 5 and 14 years, as well as youths between 15 and 19 years, have a disability rate of 4.6% (Human Resources and Skills Development Canada [HRSDC], 2011). Disabilities related to mobility and agility affect over 60,000 Canadian children and 71,000 youths (HRSDC, 2011).

Children with a PD tend to engage in less moderate-to-vigorous PA (MVPA) than their age-matched peers (Carlson et al., 2013). The PA participation of children with a PD does not seem to be strongly affected by age or gender (Bloemen et al., 2015), although some studies have

suggested that disengagement with PA may increase with age (e.g., Maher et al., 2007; Van Wely et al., 2012). Instead, it is first affected by similar factors as their peers without a disability such as PA preferences, levels of intrinsic motivation and perceived physical abilities (Li et al., 2016).

Bloemen et al. (2015) conducted a systematic review to explore additional factors associated with the PA participation of children and adolescents with a PD. They identified that children with a PD faced personal and environmental barriers. For instance, the researchers found that children's confidence in their physical abilities was an important factor for PA participation. They also suggested PA participation may be greatly affected by the physical and biological impairments associated with their disability. Additionally, researchers determined that children with a PD become more afraid of getting injured in PA settings as they age which, in turn, may lead to a decrease in motivation (Bloemen et al., 2015; Li et al., 2016).

The constraints to PA participation that can impact children with a PD are also often associated with environmental factors. For instance, the influence of family, teachers and peers can play an important role in the promotion of PA (Bloemen et al., 2015). Children with a disability may not be accepted and may be bullied by their peers which may greatly reduce their participation in PA. Conversely, some researchers identified that a positive relationship with schoolmates and teachers can have positive effects on PA participation (e.g., Verschuren et al., 2012). Children with a PD may also be underestimated by coaches. For instance, they are often included in practices but excluded from competitive matches which may greatly reduce their motivation and sense of self-worth (Verschuren et al., 2012).

Verschuren et al. (2012) explored facilitators and barriers to PA participation in youth with cerebral palsy. They conducted focus group interviews with 33 individuals, between 6 and

18 years, as well as their parents. Facilitator and barriers were identified and grouped into four categories related to personal and environmental factors influencing PA participation: personal barriers, personal facilitators, environmental barriers, and environmental facilitators. Physical limitations were a considerable personal barrier for children with cerebral palsy due to the incompatibility between most sports and the functional capacity of children with PD. Fatigue and lack of energy were also mentioned as personal barriers. A strong personal facilitator was the recognition that PA can improve overall health and psychological wellbeing which is a mindset that can promote PA participation. A considerable environmental barrier was low parental interest in PA and sport. The lack of PA opportunities in the community and inaccessibility to transportation were also environmental barriers. However, environmental facilitators included acceptance by the children's peers and good communication and open-mindedness from coaches.

Thus, it is important to consider environmental and personal factors that may influence a child with a PD's willingness and desire to participate in PA. The International Classification of Function, Disability and Health (ICF; World Health Organization, 2001) recognized the importance of promoting PA participation for children with a PD as opposed to PA performance (Rosenbaum & Stewart, 2004). This also holds true for children with a NDD as they often face similar barriers.

Children with a Neurodevelopmental Disorder and Physical Activity

NDD are defined by an impaired development of the nervous system that leads to abnormal brain functions (Thapar et al., 2017). These types of disorders affect self-regulation, cognitive abilities and memory. The causes are very complex and may include genetic disorders and environmental factors (Thapar & Rutter, 2015). NDD include intellectual disability (ID), motor disorders (e.g., developmental coordination disorder), ADHD, ASD, and Fragile X

syndrome (Albrecht et al., 2001). For instance, developmental disabilities (i.e., ASD, Down syndrome, etc.) alone affect over 53,000 Canadian children and 22,000 youths, while 121,000 Canadian children and 57,000 youths experience learning disabilities (HRSDC, 2011).

An ID is defined by significant adaptive malfunctions—difficulties in communication, self-care, social skills, etc.—and an IQ score of 70 or lower (American Psychiatric Association, 2013). An ID is associated with communication and developmental delays affecting more than 180,000 Canadians between 4 and 19 years (HRSDC, 2011). An ID is also one of the most common forms of comorbidity with other NDD such as ASD and Down's syndrome (Matson & Shoemaker, 2009). For instance, 57% of individuals with ASD have an ID with an IQ below 70 or are in the borderline range of IQ between 71 and 85 (Maenner et al., 2020).

Children with a NDD are less physically active than their age-matched peers (Einarsson et al., 2015). In fact, Boddy et al. (2015) investigated the PA behaviours of 33 children with an ID and concluded that only 23% of their sample achieved the recommended 60 minutes of daily MVPA. Einarsson et al. (2015) also identified that none of the 91 children with an ID, 6–16 years, managed to meet the MVPA recommendations for seven consecutive days while 40% of 93 age-matched peers without an ID did. However, researchers do not fully agree on the PA levels of children with a NDD (Frey et al., 2008). For instance, Frey et al. (2008) reviewed 16 studies on the PA behaviours of children with an ID. Eight investigations reported that children with an ID were less active than their peers, one reported that they were more active and two found no difference. This inconsistency of study results can partly be explained by the heterogeneity of the samples (Burack et al., 2004). Although the diagnosis of the participants involved in a study may be similar, the etiology, severity of the symptoms, comorbidities, and impairments may greatly vary and, as a result, samples can rarely represent larger categories of

disability (Burack et al., 2004). Consequently, group designs may offer conclusions about a homogeneous population that does not truly reflect the sample's heterogeneity and would not be generalizable to all individuals in the population (Bouffard, 1993; Burack et al., 2014).

However, multiple barriers to PA for children with a NDD have been identified and appear to be similar across all diagnostic categories (Must et al., 2015; Obrusnikova & Cavalier, 2011). Must et al. (2015) investigated the parent-perceived barriers to PA for 53 children with ASD aged 3–11 years. They identified three levels of barriers: (1) child-level barriers, (2) peer- and family-level barriers, and (3) community-level barriers. First, over 40% of parents reported that their child's poor motor skills constituted a barrier to PA. In fact, studies have shown that intellectual delays can partly explain motor delays in children (e.g., Vuijk et al., 2010; Wuang et al., 2008). Moreover, 53% of parents reported that their child had behavioural issues that limited their involvement in organized PA. Second, 77% of parents reported that social skill difficulties constituted a considerable obstacle to PA. In fact, studies showed that NDD such as ASD and Down's syndrome were associated with poorer social and communication skills in everyday life (Næss et al., 2017; Ratcliffe et al., 2015). In addition, more than 50% of parents believed that coaches and activity supervisors did not have the proper skills to include their child in PA (Must et al., 2015). Lastly, 32% of parents reported a lack of activities available in the community and over 20% of parents reported that the available opportunities were too costly (Must et al., 2015).

Thus, poor motor, behavioural and social skills as well as the need for constant supervision are some of the most recurrent barriers to the PA involvement of children with a NDD (Barr & Shields, 2011; Must et al., 2015). Also, community opportunities remain limited and poorly adapted to the children's conditions (Must et al., 2015). Children with NDD have limited PA options which may be further hindered by the severity of motor, social, cognitive and

behavioural factors associated with the disability.

MMR is a pragmatic way of combining diverse research methods to provide unique information that has not emerged in quantitative and qualitative research studies alone. It may offer a solution-based approach to learn more about the complex issues that surround the PA engagement of school-age children with disabilities through comprehensive research (Woolley, 2009). Thus, a scoping review on how MMR has been applied in APA research on children and youth was deemed necessary to provide a thorough understanding of comprehensive research approaches in APA.

Chapter 3

Method

The purpose of this study was to examine how mixed methods research (MMR) has been applied in adapted physical activity (APA) research for children and youth with a disability, aged 5–18 years. A scoping review was used in the current study because it addressed broad topics by rigorously mapping out a field of interest (Arksey & O'Malley, 2005). It usually involves a large body of literature with diverse research designs and methodologies because the aim is to provide an overview of all existing material (Pham et al., 2013). Arksey and O'Malley (2005) created the first methodological framework for scoping reviews and it is also the most frequently used (Pham et al., 2013). This chapter will begin by explaining the philosophical foundations of the current study, followed by the Arksey and O'Malley (2005) framework and then the methodological integrity of this scoping review.

Philosophical Foundations

This scoping review is situated in a pragmatic worldview which enabled the researchers to identify the strengths and inconsistencies that exist within MMR in APA at a methodological and experiential level (Weaver, 2018). This scoping review falls under a pragmatist ontology where reality is created by individual experiences and, consequently, is ever-changing (Weaver, 2018). This review was not committed to a single reality or philosophy (Weaver, 2018). A pragmatist epistemology guided the creation of knowledge, meaning that the researchers viewed knowledge as a construction based on socially shared experiences with real-world practical implications (Goldkuhl, 2012). Thus, it was naturally informed by the researchers' own experiences, assumptions, and beliefs. Lastly, the axiological perspective driving this scoping review aimed to improve APA research with valuable information about MMR which,

consequently, can enrich the field of APA theoretically and practically (Creswell & Plano Clark, 2018).

Arksey and O'Malley Framework

The current scoping review followed the Arksey and O'Malley framework as outlined by Levac et al. (2010). The framework comprised six steps: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarizing and reporting the results, and (6) stakeholder consultation. The stakeholder consultation exercise was not completed as it was presented as optional in the framework.

Identifying the Research Question

The first step of the Arksey and O'Malley framework (2005) involves identifying the research question that will lead the investigation. The research question of a scoping review must be broad to provide breadth to the inquiry. Thus, the following overarching question established the nature of this review and set up the broad topics that were explored: how has MMR been conducted for children and youth with disabilities who participated in physical activity (PA)? The scope of the review must be articulated at this step of the process (Levac et al., 2010). For instance, the parameters of interest must be established and clearly expressed to give direction to the review. Hence, additional sub-questions were posed to help define the focus of this review: (1) How have the research objectives been framed? (2) Which categories of disability have been studied? (3) What types of MMR designs have been used? (4) How have the quantitative and qualitative data been analyzed and integrated? These questions also helped with the creation of effective search strategies during the next step of the framework.

Identifying Relevant Studies

The second step of the framework involves designing a thorough search strategy that

ensures the breadth and feasibility of the inquiry remain, without compromising the likelihood of answering the research questions. Hence, the current study used three different sources: electronic databases, reference lists, and hand-searching of key journals.

Electronic databases. Six electronic databases were searched (i.e., ERIC, SPORTDiscus, Sports Medicine and Education Index, PsycINFO, MEDLINE, Web of Science) to identify relevant studies, using search terms related to PA, disability, school-age children, adapted physical education and APA (see Appendix B, Table 2). Search terms for each database were selected with the help of a reference librarian. Keywords related to MMR were not used as agreed upon by the reference librarian and the research team comprised of Mathieu Michaud, his supervisor and co-supervisor of his thesis (Dr. William Harvey, Dr. Gordon Bloom). The reason for excluding these keywords is that MMR articles have rarely been identified in APA through keyword searches (Harvey et al., 2020). Moreover, reporting standards for MMR publications have only recently been established (Levitt et al., 2018) and consequently, few MMR publications were identified as MMR in their title, abstract, or keywords (Harvey et al., 2020).

The electronic database search occurred twice for the current study, once at the beginning of the investigation and again before the start of the formal analysis. The goal of this dual database search was to ensure that all relevant and up-to-date articles were included in the review. The references were imported into Endnote, a reference management software. The duplicates were then electronically identified using a function embedded in the software. They were double-checked and confirmed by the principal investigator (PI). The PI also reviewed the outcomes of the database search to remove references that were incongruous with the search parameters established and should not have been identified by the databases. Such references included abstracts, conference proceedings, poster presentations, editorials, announcements,

position statements, book reviews, etc.

Citation chasing of reference lists. The reference lists of 54 relevant literary reviews, identified during the database searches, were checked and missing studies were added to this scoping review. This process led to a saturation point where no new studies were found (Arksey & O'Malley, 2005). The database search strategy would have been revised if several missing studies had been found and a saturation point not reached. The database searches would have been rerun, as needed, to ensure that all relevant articles were found and included in this review.

Hand-searching of key journals. Two key journals, *Adapted Physical Activity Quarterly* (APAQ) and *Journal of Mixed Methods Research* (JMMR), were also hand-searched to identify articles that may have been missed in both the database and the reference list searches. Both journals are recognized leaders in their respective fields.

Study Selection

The third step of the Arksey and O'Malley framework (2005) involves the selection of studies that address the research questions. A set of inclusion and exclusion criteria were established for study selection before the beginning of the searches:

- (1) Only articles published in English were included.
- (2) Only articles published between January 1, 2003 and December 31, 2020 were included.
- (3) Only peer-reviewed articles published in academic journals were included.
- (4) Only original research studies were surveyed. Grey literature, conference proceedings, poster presentations, abstracts, editorials, book reviews, etc., were not considered. Literature reviews were also excluded from the analysis.
- (5) Researchers must have used MMR to investigate PA.

- (6) The articles selected must have predominantly included children and youth with disabilities (i.e., physical disability, intellectual disability, neurodevelopmental disability, etc.), with the average age of the sample between 5 and 18 years.

The year 2003 was established as a starting point for article inclusion in this scoping review because that was the publication year for the first handbook on MMR in social and behavioural research (see Tashakkori & Teddlie, 2003). The handbook provided valuable information necessary to understand MMR and encouraged researchers to design MMR studies.

The study selection stage of this scoping review was iterative where the inclusion and exclusion criteria were revised as the reviewers became more familiar with the literature (Levac et al. 2010). Consequently, criteria changed slightly throughout the process as the PI was reviewing, selecting, and analyzing the studies to ensure that the research questions were answered by the end of the review process. For instance, the research team decided to exclude studies that did not involve children who participated in some form of PA. Consequently, studies about physical education teacher training and therapist training were excluded. Also, additional delimitations regarding disabilities were included. For instance, it was decided that some medical conditions such as obesity, asthma, and epilepsy would not be considered as disabilities in this review.

The software Rayyan was used to help the research team during the study selection process. Rayyan is a web-based software designed to assist researchers working on knowledge synthesis projects in the process of screening and selecting studies. The researcher can use a keyword function, embedded in the software, to quickly identify keywords for inclusion and exclusion in each abstract. The research team developed a keyword and colour scheme strategy in Rayyan for this review. Specific keywords were highlighted with red for quantitative research

methods and in green for qualitative research methods. It helped the identification of the various methods described in each abstract, systematized the approach, and sped up the study selection process to ensure that MMR had been performed. The PI also used Rayyan to review the title, abstract, and keywords of each article and applied the inclusion and exclusion criteria to each study. The method section of a study was read if the eligibility of the article was impossible to determine by only reading the title, abstract, and keywords. All the articles were then read in full to confirm that they should be included in this scoping review.

Charting the Data

The fourth step of the framework, charting of the data, involves the identification of relevant information that must be extracted from the studies matching all eligibility criteria, synthesized, and charted to answer the research questions (Arksey & O'Malley, 2005). A systematic coding procedure was utilized to extract, synthesize, and chart the data (Wilson, 2009). The approach was deductive and concept-driven. The research team first determined variables to be extracted from the included studies based on the concepts suggested by the research questions as well as on categories of analysis from three documentary analyses (Haegele et al., 2015; Porretta & Sherrill, 2005; Reid & Broadhead, 1995). The iterative process led to the creation of seven key categories of interest as criteria to code the articles retrieved. Most categories were also divided into subcategories to obtain additional details on specific topics. Information related to each category and subcategory was collected from each study matching all inclusion criteria as identified during the previous step of the scoping review process. This step of the framework was iterative. The research team continuously reflected on the key items of information being gathered within the seven categories of interest during the data charting (Levac et al., 2010). The researchers updated them as they became more familiar

with the nature of the literature being investigated. Hence, the conclusions reflect the nature and the breadth of the data in a comprehensive and extensive manner. The charting process for this study was done twice by the PI to increase the trustworthiness of the data. The first round of charting was within-category and across-studies where the PI extracted data for each category individually across all the identified studies. The second round of charting was across-categories and within-study where the PI extracted additional data across all the categories for each individual study. A triangulation process was also used during the charting of the data to ensure that the data charting strategy was in line with the research questions and the purpose of the study. Levac et al. (2010) recommended that two researchers take part in this process. For this review, the PI and a member of the research team with extensive experience in MMR and APA confirmed if MMR was used in studies where it was not explicitly stated by the original authors. They also reflected on the relevance of the data charted in relation to the research questions.

Seven categories of interest were created by the research team for the charting of the data: (1) *publication information*, (2) *content area*, (3) *study objectives*, (4) *mixed methods research design*, (5) *participants' information*, (6) *data integration*, and (7) *research context* (see Appendix C, Table 3). The first category pertains to the publication of MMR articles about APA. It includes the publication journal, the year of publication, and the country of university affiliation of the first author.

The second category relates to the content areas of interest of each study. The research team initially created a list of nine labels that were adapted from documentary analyses of *APAQ* articles (Haegele et al., 2015; Porretta & Sherrill, 2005; Reid & Broadhead, 1995). A minimum of one label was assigned to each study based on the content area(s) or topic(s) investigated in each study. The label that was deemed by the PI as the most representative of each study was

used for the descriptive numerical analysis if more than one label was assigned to a study. See Appendix D, Table 4, for a complete list and description of the nine labels.

The third category pertains to the manner in which the objectives of the study were framed (Harvey & Reid, 2005; Levitt et al., 2018). It was divided into five subcategories of interest established by the research team based on the *Mixed Methods Article Reporting Standards* by Levitt et al. (2018): (1) the research question(s), (2) the hypotheses, (3) the purpose(s) or objective(s) of the inquiry, (4) the rationale for the use of MMR, and (5) the stated philosophical foundations of the researchers. The first subcategory refers to the research question(s). The research team identified if each article included an explicit statement of the research question(s). The second subcategory identifies the presence of hypotheses in each study. The third subcategory notes the purposes of the study. It highlights if specific objectives were stated for the use of the quantitative and qualitative research methods (Levitt et al., 2018). The fourth subcategory includes the provision of a specific rationale or objective for the use of MMR. The fifth subcategory, the philosophical foundations of the research, was labelled as either present or not present depending on whether the authors described the worldview (i.e., ontology, epistemology, methodology, axiology, rhetoric) and/or the theoretical rationale shaping the research study.

The fourth category encompasses three subcategories related to the research design of the identified studies. The first subcategory included the type of MMR design for each study as identified by the researchers in the published study. The implementation sequence, dominant method, and use of triangulation were also identified as part of the MMR design. The second and third subcategories include the data collection and data analysis methods used in each study. The identification of these methods helped discover patterns in the types of research designs found.

The fifth category concerns the participants involved in each study and their distinctive attributes. The first subcategory identified the sample of each study. The child participants were organized based on three additional subcategories: (1) sex, (2) age range, and (3) type of disability. The age range of the participants was identified for each study and was classified into one of three categories: children (5–12 years), adolescents (13–18 years), or school-age children (5–18 years). Thirteen studies had some participants over the age of 18 years but were included in this review because the average age of the sample was 18 years or younger. The type of disability in each article was classified into one of 16 categories. It should be noted that the research team was aware that some conditions, hearing impairment for example, are not always considered as disabilities by people with the impairment (Hanes, 2018; Harvey, 2008). However, the types of disabilities to be identified were adapted by the research team from a documentary analyses of *APAQ* articles (Haegele et al., 2015; Porretta & Sherrill, 2005; Reid & Broadhead, 1995). They represented the populations of disabilities most often studied by APA researchers, with all research methodologies combined. Please see Appendix E, Table 5, for a list of the categories of disability used in this study.

The sixth category of this scoping review was labelled “data integration” because it determined: (1) how the quantitative, qualitative, and mixed-method data were first presented and organized in the results section, (2) how the quantitative, qualitative, and mixed-method data were presented and organized in the discussion section, and (3) whether the quantitative and the qualitative data sets were integrated in a narrative discussion, with a joint display (matrix), by data transformation, or with a combination of strategies (Creswell & Plano Clark, 2018; Plano Clark et al., 2010). This category is especially valuable information because the integration of the two data sets represents the foundation of MMR. It demonstrates how the components of a

MMR study are related to each other and genuinely integrated or whether they are independent and not necessarily fused at any point in the research (Bryman, 2007).

Finally, the seventh category explored the context surrounding the study. This review identified whether a study was an intervention or a non-intervention study. It also described the environment in which the research took place (e.g., school, clinic, home). Additionally, it was determined whether the participants with a disability were involved in an inclusive or segregated setting. The setting was considered as inclusive if children with a disability and peers without a disability participated in PA together and segregated if only children with a disability were involved in PA (DePauw & Doll-Tepper, 2000).

Collating, Summarizing, and Reporting the Results

The fifth step of the framework pertains to the analysis of the data extracted from the studies selected. It is divided into two distinct components: a descriptive numerical summary and a thematic analysis (Levac et al., 2010). A descriptive numerical summary presents an overview of the data gathered using descriptive statistics (Levac et al., 2010). This type of summary was developed to overview how MMR in APA was conducted for children and adolescents with a disability. Each category of interest has its own chart or table to report the descriptive statistical information gathered about the reviewed studies. For instance, descriptive statistics are provided for the average age range of participants involved in the scoping review, the most prevalent content areas and categories of disabilities studied, and the favoured types of MMR designs.

A thematic analysis allows the researchers to delve into the review studies and gather details about the topics investigated by coding the data and organizing the codes into overarching themes (Braun & Clarke, 2013; Levac et al., 2010). This type of analysis provided clear, comprehensive answers to the overarching research question as well as the sub-questions of

interest that guided this scoping review. The goal was to understand the processes that were used when designing, conducting, and reporting the results of each MMR study identified in this scoping review. Themes related to the four sub-questions of this review were explored by the seven categories of interest defined by the research team.

Consultation

The sixth step of the framework involves the consultation of stakeholders where other professionals in the concerned field(s) are asked to contribute and provide insights about the review (Arskey & O'Malley, 2005). This optional stakeholder consultation exercise (Arskey & O'Malley, 2005) was not completed for the current study. However, it will be completed following the completion of the thesis. A minimum of two experts in the field of APA will serve as stakeholders. The results and the discussion will be summarized in the form of an oral presentation. Stakeholders will be asked to share their opinions on study outcomes and how they recommend the findings should be disseminated. The process will help validate the resonance and usefulness of the results to ensure that the outcomes of this review are meaningful and useful to APA researchers.

Methodological Integrity

The methodological integrity of this scoping review will be discussed based on three frameworks: (1) *The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews* (PRISMA-ScR) checklist (Tricco et al., 2018), (2) the evaluation criteria for qualitative research in APA (Zitomer & Goodwin, 2014), and (3) the recommendations for designing and reviewing mixed methods and qualitative research (Levitt et al., 2017).

The PRISMA-ScR checklist (Tricco et al., 2018) is comprised of 20 items divided into

seven sections, with each one exploring specific conventions that should be followed to ensure the methodological quality of a scoping review. The checklist includes pertinent terminology, important concepts and key items to include in all scoping review publications. It also provides guidelines regarding the data charting procedures and the descriptive numerical summary that were used when collating, summarizing, and reporting the review's findings. These parameters helped establish methodological conventions and ensured the integrity of the outcomes.

The thematic analysis also constitutes part of the cornerstone of this scoping review as it provided detailed and comprehensive answers to the research questions posed for this study. The following quality criteria for qualitative research in APA will be discussed with regard to the thematic analysis: (1) reflexivity, (2) resonance, (3) significant contribution, and (4) coherence (Poucher et al., 2020; Zitomer & Goodwin, 2014).

Reflexivity is a critical self-reflection by the researchers where they inquire into their background, assumptions, beliefs, and motives (Sparkes & Smith, 2013). It elevates the methodological integrity of the research by ensuring a “perspective management” of the researchers’ potential biases during the data collection and analysis and by adding transparency to the research process (Levitt et al., 2017). Journaling was used throughout this study to engage the PI in reflecting on the biases that shaped and guided the entire research process and in critiquing decisions made throughout the research process (Zitomer & Goodwin, 2014). Furthermore, the PI’s experiences and skills made him a credible person to be conducting this study. He holds a bachelor’s degree in Physical and Health Education. As an undergraduate student, he volunteered over 40 hours of time to teach fundamental movement skills to children with disabilities and spent seven weeks teaching at a school for students with intellectual disabilities. During his graduate studies in APA, he also co-authored a textbook chapter on MMR

in adapted physical education (Harvey et al., 2020). Consequently, his academic experience helped him uncover the dearth of information regarding MMR and its pragmatic use in APA.

Resonance refers to the impact the inquiry can have on others and how the outcomes can be transferred to other contexts (de Witt & Ploeg, 2006; Zitomer & Goodwin, 2014). The results of this scoping review help to build knowledge of MMR in APA research and provide a greater understanding of the underlying processes and the methodological strategies that have guided past research studies. This knowledge may encourage APA researchers to perform research that is pragmatic in nature, connected to real-world situations and evidence-based practices.

Significant contribution refers to a study's contribution to its field of research (Zitomer & Goodwin, 2014). This scoping review builds new knowledge, prompts further research on the subject of MMR in APA, and encourages the practical use of the knowledge in the form of an expansion of applied APA research.

Coherence refers to the paradigm where a study is situated, the worldview of the researchers, the methodology used and the extent to which there is consistency throughout the research process (Cohen & Crabtree, 2008). For instance, the worldview of the PI was clearly stated in this review. The links between the philosophical and theoretical foundations and the methodological approaches used also ensured the *groundedness* of the research (Levitt et al., 2017; Poucher et al., 2020).

Chapter 4

Results

The purpose of this study was to examine how mixed methods research (MMR) has been applied in adapted physical activity (APA) research about children and youth with a disability, aged 5–18 years. The introduction of this chapter presents the outcomes of the study selection phase. It is followed by the results from the descriptive numerical analysis and associated thematic analysis which are described within each theme of the scoping review. The Arksey and O'Malley framework (2005) guidelines for scoping reviews were adhered to.

The study selection phase included an initial database search strategy that identified 66,590 studies. From this number, 10,370 were duplicates and another 2,430 studies were categorized as “grey literature” (Auger, 1975) and were thus removed. A study inclusion timeframe of 2003–2020 was added which allowed us to further reduce the number of studies by 8,054. An additional 128 studies were included through a manual search of reference lists. Most studies found during this step of the study selection process used terms not included in the search strategy to identify disabilities (e.g., “mental retardation”, “multisystemic early-onset ataxia”, “cerebellar damage”, “amblyopia”) which, in turn, explains why they were not identified during the initial database search. A total of 45,864 studies were reviewed by the principal investigator (PI) to determine if they matched all inclusion criteria established by the research team comprised of Mathieu Michaud, his supervisor and co-supervisor of his thesis (Dr. William Harvey, Dr. Gordon Bloom). All studies were first assessed based on their title, abstract, and keywords and 44,696 articles were excluded because they did not match all inclusion criteria. Then, the method sections of 1,168 studies were reviewed because an initial decision could not be made after reading only the abstract. This resulted in the exclusion of 1,056 more studies. The

remaining 112 studies were subsequently read in full to confirm their inclusion in the review and this analysis resulted in the exclusion of 15 more studies. At that point, it was still unclear if MMR had been used in 48 out of the remaining 98 studies. Consequently, the PI confirmed the eligibility of these studies with the help of another research team member who had extensive experience in MMR and APA. Sixty-four studies were finally included in the analysis of this scoping review. The complete graphical display of the study selection process can be seen in Appendix L, Figure 1.

Based on the Arksey and O'Malley framework (2005) as outlined by Levac et al. (2010), the research team collectively determined variables to be extracted from the 64 studies to answer the research questions. The process was iterative and led to the creation of seven themes: (1) *publication information*, (2) *content area*, (3) *study objectives*, (4) *mixed methods research design*, (5) *participants' information*, (6) *data integration*, and (7) *research context*. The PI extracted, synthesized, and charted the relevant data. A thematic analysis was conducted to explore the seven study themes. A descriptive numerical summary was also created. The charted data of the review studies are summarized in detail in Appendix F, Table 6.

Publication Information

The first theme, *publication information*, pertained to the journal where the study was published, the year of publication, and country of university affiliation of the first author. The descriptive numerical analysis revealed that the 64 studies were published in 42 different journals (see Appendix G, Table 7). There was an increasing publication trend for MMR studies in APA over the past 10 years (see Appendix M, Figure 2). Lead authors were most often associated with universities in North America (50%), Australia (12.5%), and the United Kingdom (10.9%). The thematic analysis revealed the focus of the publication journals were

varied and included multiple fields related to APA such as therapy and rehabilitation, education, motor development, psychology, and specific disabilities.

Content Area

The second theme was named *content area* because it related to each study's topic of interest. Eight content areas were identified (see Appendix F, Table 6, for details of the content areas assigned to each study). Three of them were most often studied: exercise and physical activity (PA), psychological issues and behaviours, and therapy (see Appendix H, Table 8). The thematic analysis uncovered the exercise and PA label as a broad content area that encompassed PA participation, barriers and facilitators, interventions, and experiences of various children with a disability. Some studies focused on PA participation. For instance, Armila et al. (2018) studied the inclusion of sports as a form of leisure for children with an intellectual disability. PA barriers and facilitators were also identified by some researchers. For instance, Jaarsma et al. (2015) identified barriers and facilitators of sports for children with physical disabilities while Oladunni et al. (2015) inquired into motivational factors as barriers to sports participation for children with disabilities. Other studies investigated PA interventions. For example, Fragala-Pinkham et al. (2010) evaluated the strengths and weaknesses of a community aquatic exercise program for children with disabilities. Lastly, some studies aimed to understand the PA experiences of children with a disability. For instance, Harvey et al. (2009) investigated PA experiences of children with attention-deficit hyperactivity disorder (ADHD). These few examples highlight how researchers have used MMR to research a diverse array of topics related to exercise and PA for children with a disability.

The psychosocial issues and behaviours content area included studies that explored the social and cognitive skills of children with a disability in PA. Some studies investigated the

social skill development of Special Olympics athletes (Alexander et al., 2011), self-regulation skills of boys with developmental coordination disorder (DCD) during a sports problem-solving task (Lloyd et al., 2006) and perceptions of children with disabilities about social interactions with non-disabled school peers (Belley-Ranger et al., 2016).

The content area of therapy was specific to physiotherapy and occupational therapy. Most studies investigated the efficacy or feasibility of clinically based therapeutic programs such as a yoga and meditation therapy program for children with ADHD (Harrison et al., 2004), a yoga and mindfulness program for children with cerebral palsy (Mak et al., 2019), and a motor skills clinical intervention for children with DCD (Miyahara & Wafer, 2004). Other studies investigated aspects of therapy such as barriers to physical therapy services (Maring et al., 2013) and parents' perceptions of occupational therapy (Vertes et al., 2014).

Other content areas included motor behaviour, control, and development. Studies in this content area determined the effects of fundamental movement skills (FMS) interventions (Bremer & Lloyd, 2016) or adapted physical education programs (e.g., Young et al., 2020) on the motor skills of children with a variety of disabilities. Some studies investigated the content area of inclusion, either in a school PA program (Bildiren, 2018) or a physical education (PE) setting (e.g., Butler & Hodge, 2004). Other studies also explored PE but with foci other than inclusion such as the PE experiences of children with CHARGE syndrome (e.g., Lieberman et al., 2012), and the benefits of peer tutors for children with various disabilities in a PE setting (Sands et al., 2019). The content area of assessment and measurement was identified in a study evaluating the feasibility and acceptability of a self-report activity diary (Forseth et al., 2019). Another study investigated the impact of PA on academic success for children with an intellectual disability (Everhart et al., 2020). In summary, MMR studies focused primarily on the

exercise and PA, psychological issues and behaviours, and therapy content areas in APA.

Researchers explored a diverse array of topics as defined by their study objectives.

Study Objectives

The third theme, *study objectives*, related to each study's research question(s), hypotheses, purpose(s), rationale for the use of MMR, and guiding philosophical foundations. The descriptive numerical analysis revealed that approximately 25% of the review studies included research questions, 10.9% included hypotheses, and only one study had both research questions and hypotheses (see Appendix H, Table 9). All 64 studies had a clear purpose statement where 43 of the studies had explicitly stated quantitative and qualitative research objectives. A rationale for the use of MMR was provided in only 18 studies. Information on the theoretical rationale that framed the study was provided in 24 studies.

Research Question

Fifteen studies had research questions that were stated explicitly. The thematic analysis revealed that three of these studies provided a single overarching question (Armila et al., 2018; Ayvazoglu et al., 2015; Harvey et al., 2014). Multiple research questions were offered in five other studies without qualifying one as overarching nor assigning them specific quantitative or qualitative methods of inquiry (e.g., Bildiren, 2018; Walker et al., 2020). Conversely, Kemeny and Arnhold (2012) formulated three research questions that were clearly defined, with one qualitative and two quantitative questions for their study. The use of research questions was not widespread, with researchers favouring the use of research objectives.

Purpose of the Study

All 64 studies had a purpose statement. Forty-three studies had a clearly formulated overarching purpose statement as well as quantitative and qualitative objectives to frame the

study's purpose. A few of the 43 studies identified specific overarching quantitative and qualitative research objectives. For instance, Bremer and Lloyd (2016) identified the main quantitative purpose of their study was to evaluate the FMS performance of young children with autism spectrum disorder (ASD) in a school-based intervention. They also identified a secondary qualitative purpose to appraise the FMS instructional program as perceived by the classroom's special education teacher. Many researchers, who identified quantitative and qualitative objectives, tended to associate specific research objectives to the use of specific quantitative and qualitative methods (e.g., Kozub, 2003; Mak et al., 2019). For instance, Qi and Wang (2018) used a systematic observation method to quantify social interactions between students with and without disabilities, observation notes to describe and complement the quantitative observation data, and interviews to explore factors that influenced social interactions.

Mixed Methods Research Rationale

Researchers provided various rationales or study objectives to justify the usefulness and necessity of MMR in 18 studies. For instance, MMR was used by some researchers to collect additional data to contextualize the investigated phenomenon (e.g., Armila et al., 2018), explain or expand study results with the use of a supplementary method of data collection (e.g., Ayvazoglu et al., 2006; Klavina et al., 2014), determine more holistically the outcomes of an intervention or a pilot study by combining quantitative and qualitative data (e.g., Bremer & Lloyd, 2016; Hind et al., 2017), or to triangulate data (e.g., Howie et al., 2017; Kozub, 2003). Six studies, not identified as MMR by the original researchers, provided a rationale for the combination of quantitative and qualitative methods of inquiry.

Philosophical Foundations

The philosophical foundations of a MMR study begin with the researcher's worldview

(i.e., ontology, epistemology, methodology, axiology, rhetoric) and then shift to the theoretical rationale that shapes the study (Creswell & Plano Clark, 2018). The worldview was not explicitly identified in any of the 64 review studies. However, researchers adopted and presented a theoretical rationale as a basis for the research in 24 studies. For instance, Martin et al. (2020) adopted a critical realist stance as the philosophical research foundation. Multiple studies included information on a theoretical rationale comprised of models and theories that helped to frame the research approach. For example, the structured contact variables of contact theory were used to explain findings (Butler & Hodge, 2004) and the social model of disability was used to frame a study's purpose (Qi & Wang, 2018). Some researchers did not use a theoretical rationale to inform the complete research process but rather only to design components of their research (i.e., data collection instruments, data analysis approach, intervention design, etc.). These components included the creation of a mixed-method survey based on the participation model (Imms et al., 2016 as cited by Howells et al., 2019), the use of photovoice (Obrusnikova & Cavalier, 2011) and the implementation of a grounded theory approach to analyze qualitative data (Rivera et al., 2020). Some researchers also used models and theories to design interventions, evaluations, or tasks.

In summary, each MMR study had a clear purpose, often presented as quantitative and qualitative research objectives that drove each study instead of explicitly formulated research questions or hypotheses. Few researchers justified the necessity to use quantitative and qualitative methods together to reach the research study's expected outcomes. Lastly, none of the MMR studies were explicitly situated in a worldview and theories and models were used infrequently to help frame the purpose of the study or the methods of inquiry used.

Mixed Methods Research Design

The fourth theme, *mixed methods research design*, related to the type of MMR design, data collection methods, and data analysis used in each study. The descriptive numerical analysis revealed that the use of a mixed-method approach was identified in 33 out of the 64 review studies (see Appendix I, Table 10). Only eight studies identified the implementation sequence of their MMR designs with the use of MMR terms such as *sequential* and *concurrent*. Three of these studies, as well as six other investigations, identified a dominant method of inquiry as part of their MMR design. See Appendix F, Table 6, to locate the details for the research study design type as identified by each study's author, including if the authors identified their study as being MMR. Furthermore, a plethora of quantitative and qualitative data collection methods was used. Movement skill assessments were often administered to collect quantitative data while interviews were the most used qualitative data gathering method. Mixed-method surveys and questionnaires were the most used hybrid method.

Type of Design

The thematic analysis revealed that the terminology varied in the 33 review studies where MMR was identified by the original authors. For instance, terms such as “mixed-methods approach”, “mixed method research design”, and “mixed qualitative and quantitative design” were used. Seven of these studies also identified their design using implementation sequence terminology with words such as sequential (Esentürk & Gungor, 2020), concurrent (Harvey et al., 2009), and nested (Hind et al., 2017). Similarly, Lloyd et al. (2006) identified their design as concurrent but not MMR. Further, nine studies identified a dominant method of inquiry. Five of these studies identified the qualitative component of their research as dominant and four studies identified the quantitative component as dominant. Different approaches were used to identify a

dominant method. For instance, Kolehmainen et al. (2015) identified their design as “QUANT + qual” (p. 1376) while Armila et al. (2018) suggested “the qualitative data were framed by the online survey data” (p. 298) and Harvey et al. (2014) mentioned that “the qualitative data were given a higher priority” (p. 205).

Other terms, closely associated with MMR designs, were also used in the review studies but their use was often imprecise. For instance, seven studies were identified as *exploratory* by the researchers but never in relation to the sequential exploratory MMR design (see Appendix A, Table 1). The term was instead used to refer to studies exploring a new area of interest, similar to preliminary research. Moreover, 23 studies mentioned *triangulation* with two main intentions. Some researchers employed the process of triangulation during the analysis phase to enhance the quantitative and qualitative data integration (e.g., Jaarsma et al., 2015; Shields et al., 2019). This approach ties directly to the aims of the concurrent triangulation MMR design (see Appendix A, Table 1). Other researchers used the term with the intent to strengthen study trustworthiness by cross-referencing the data (e.g., Oguzhan & Hunuk, 2017; Sands et al., 2019). MMR designs were never identified as a concurrent triangulation design regardless of the researchers’ intentions behind the use of triangulation.

Data Collection and Analysis

Diverse quantitative data collection methods were used for different purposes in each study. For instance, assessments were conducted with children to measure FMS proficiency or physical fitness (e.g., Test of Gross Motor Development, Movement Assessment Battery for Children, Brockport Physical Fitness Test), social skills (e.g., Social Skills Improvement System), self-esteem (e.g., Burnett Self-Scale), PA participation (e.g., Children’s Assessment of Participation and Enjoyment), and creativity (e.g., Thinking Creatively in Action and

Movement). Systematic observation systems were used to code observations quantitatively (e.g., Belley-Ranger et al., 2016; Oladunni et al., 2015). Also, surveys and questionnaires were administered to collect objective data on a variety of topics such as PA participation (e.g., Armila et al., 2018) and the enjoyment of PA programs (e.g., Howells et al., 2019). The quantitative data analyses were performed using multiple methods common in quantitative research such as descriptive statistics (e.g., Carter et al., 2014; Maring et al., 2013), inferential statistics (e.g., Belley-Ranger et al., 2016; Hinckson et al., 2013), visual analysis (e.g., Bremer & Lloyd, 2016; Oriel et al., 2018) and frequency counts (e.g., Lieberman et al., 2012; Sangster Jokić & Whitebread, 2016).

Interviews were decidedly the most used qualitative data collection method. In fact, they were conducted in 50 studies but only 25 studies included interviews with children. Nine of them were with children only (e.g., Lieberman et al., 2006; Weightman et al., 2010) and 16 studies were with children and other participants, mostly parents (e.g., Forseth et al., 2019; Wingo et al., 2020). The remaining 25 studies involved interviews with adults only (i.e., parents, teachers, health professionals, etc.). Other qualitative data collection methods used included focus groups (e.g., Martin et al., 2020; Wiart et al., 2015), qualitative observations (e.g., Sands et al., 2019; Young et al., 2020) and field diaries (e.g., Gaintza & Castro, 2020; Oguzhan & Hunuk, 2017). The qualitative data analysis was predominantly performed through thematic and content analysis which was tied to the extensive use of interviews as a qualitative data gathering method in the review studies.

Mixed-method surveys and questionnaires were used in 13 of the 64 review studies and they were the only data collection method used in seven of the investigations. A substantial majority of those hybrid surveys and questionnaires were filled out by parents or by children

with the assistance of parents (e.g., Lieberman & MacVicar, 2003; Lyons et al., 2009). As such, hybrid surveys and questionnaires represented a favoured method of data collection in a MMR context.

In summary, MMR designs were inconsistently identified in the review studies. The identification of the research design was rarely precise and did not always follow standard MMR terminology. Common quantitative and qualitative data collection methods were present in the review studies. However, hybrid methods were also used to gather both quantitative and qualitative data with the use of a single survey or questionnaire. Furthermore, data analysis was similar to the strategies used in quantitative and qualitative research. Also, the data collection and analysis methods were intricately linked to the participants involved in each study.

Participants' Information

This theme related to the participants' demographic information, which included their sex, age range, and type of disability. The descriptive numerical analysis revealed that elementary-school-age children made up the greatest percentage of study participants, with a majority of participants being male (see Appendix J, Table 11). Eleven studies included males only while no study included females only. However, the sex of the children was not identified in 10 studies. DCD and ASD were the two types of disability most often studied. See Appendix F, Table 6, for specific details on participants involved in each study.

Children were participants in 58 out of the 64 review studies. Five studies involved only children as participants and explored, for instance, PA experiences (e.g., Brunes et al., 2017; Harvey et al., 2009). Conversely, six studies involved no children as participants. The thematic analysis revealed that data from these studies included adult perspectives on different topics such as PA participation and accessibility, PA interventions, and therapy for children with a disability.

Furthermore, parents provided data in 37 studies that were used for either data triangulation purposes (e.g., Kozub, 2003) or data collection strategies that included assistance in the administration of intervention and the assessment of the children in diverse PA settings (e.g., Alexander et al., 2011). Teachers were involved in 11 studies conducted in PE or school settings. They often provided interview data (e.g., Esentürk & Gungor, 2020), helped design PA interventions (e.g., Gaintza & Castro, 2020), or assisted in running interventions (e.g., Bremer & Lloyd, 2016). Fifteen studies included children and a varied group of multiple adults (e.g., parents, teachers, therapists, health professionals, coaches) where phenomena were viewed from the combined perspective of participants (e.g., Roullet et al., 2014).

Sex

Thirty-three of the sixty-four review studies predominantly involved males across all age groups and disabilities. No study involved only females while 12 investigated males only. Some studies provided specific results and findings based on the sex of the participants either through case studies (e.g., Kozub, 2003; Miyahara & Wafer, 2004), graphs with individual assessment results (e.g., Klavina et al., 2014; Lodal & Bond, 2017), or tables of individual results (e.g., Howie et al., 2017). Some studies also investigated the impact of sex on phenomena such as social interactions among peers with and without a disability in a PE setting (Butler & Hodge, 2004). However, 10 studies did not provide any information on the sex of the children.

Age

Twenty-nine studies involved children between the ages of 5 and 12 years. Twenty-one of these studies were interventions that focused primarily on the content areas of therapy, exercise and PA, and psychosocial issues and behaviours. DCD and ASD were the two categories of disability most often studied with children. Conversely, there were only 12

adolescent-specific studies, seven of which recruited a heterogeneous sample of youth with disabilities. A majority of these studies focused on exercise and PA or psychosocial issues and behaviours with topics such as the PA behaviours of adolescents and young adults with an intellectual disability (Armila et al., 2018) and the social interactions between students with neurodevelopmental disorders and students without a disability in a general PE setting (Qi & Wang, 2018). Moreover, 21 studies involved participants with a broader age range, from childhood to adolescence, and the investigations were not longitudinal in nature.

Type of Disability

ASD and DCD were by far the most studied disabilities (total of 25% of review studies), followed by cerebral palsy and intellectual disability. Physical disabilities and motor disorders were most often investigated in terms of therapies (e.g., Lodal & Bond, 2017; Weightman et al., 2010). Neurodevelopmental disorders and intellectual disabilities were most often studied in relation to psychosocial issues and behaviours (e.g., Rivera et al., 2020; Zhao & Chen; 2018). DCD, ASD and ADHD were more often researched with younger children while studies with adolescents tended to recruit heterogeneous samples. Heterogeneous samples were composed of participants with a variety of disabilities and incorporated in 23 studies. Six heterogeneous samples were composed of participants with intellectual disabilities and neurodevelopmental disorders and three other samples were comprised of a variety of physical disabilities. Fourteen heterogeneous samples were a mixture of neurodevelopmental disorders, intellectual and physical disabilities.

In summary, MMR has been used in APA with many different samples of participants including children with a disability, parents, teachers, peers, and health specialists. Younger children and males were more studied than adolescents and females. Multiple disability

categories were investigated with the use of MMR. ASD and DCD were the two most studied disability types. Lastly, numerous studies were conducted with heterogeneous samples where wide ranges of disabilities, ages and developmental periods were included.

Data Integration

The sixth theme of this review was named *data integration* because it determined (1) if and how the quantitative and qualitative data were integrated within the results section of each study, (2) if and how the quantitative and qualitative data were integrated within the discussion section, and (3) the specific strategy that was used to integrate the data (i.e., narrative discussion, joint display [matrix], data transformation; Plano Clark et al., 2010). The descriptive numerical analysis revealed that the quantitative and the qualitative data were integrated in the results section of 23 studies while the other 41 studies presented the quantitative and qualitative data separately. All but one study purposefully integrated the quantitative and the qualitative data in their discussion section (see Appendix K, Table 12). The integration strategy of data transformation was used in 15 studies. Five studies included matrices integrating both quantitative and qualitative data in a table form. See Appendix F, Table 6, for details on where the data integration was presented in each study (i.e., results section, discussion section) and the integration strategy that was selected by the researchers.

Data Integration – Results

The thematic analysis revealed that there was no relationship between specific MMR designs and the integration of the quantitative and qualitative data in the results section. For instance, data integration was performed in the results section of only one out of the four studies with a sequential research design. Instead, the data of the few studies with sequential designs were systematically presented in the order of the methodological implementation. Quantitative

and qualitative data were not integrated in the results section of any of the four studies with a concurrent research design but were rather presented separately for each data collection method. The data for six out of the nine studies with a dominant method were integrated in the results and were most often organized by themes (e.g., Jaarsma et al., 2015). The data of the other three studies were not integrated and were presented separately for each data collection method (e.g., Harvey et al., 2009).

Data Integration – Discussion and Strategy

The integration of the qualitative and the quantitative data occurred in the discussion section of 63 studies. Thus, the strategy of data integration by narrative discussion (Plano Clark et al., 2010) was most often used. Some studies summarized their quantitative and qualitative data in the discussion before integrating and interpreting them (e.g., Oladunni et al., 2015; Zhao & Chen, 2018). Other researchers presented quantitative data and complemented them with qualitative data or quotes (e.g., Lloyd et al., 2006; Scally & Lord, 2019). Moreover, 15 studies used the integration strategy of data transformation (Plano Clark et al., 2010) during which quantitative data was qualitized or qualitative data was quantitized. However, the transformed data of only 3 of the 15 studies were incorporated in the associated analysis (i.e., Kolehmainen et al., 2015; Lloyd et al., 2006; Obrusnikova & Cavalier, 2011). Other times, the transformed data were simply not analyzed and, as such, data transformation was rarely used to facilitate data integration. The strategy of data integration with a joint display (Plano Clark et al., 2010) was also rare. Only five studies used this integration tool where quantitative and qualitative data are presented together in the form of a table (i.e., matrix). Researchers took two different approaches to present their matrices: (1) a convergence coding matrix where themes were identified and supported by quantitative and qualitative findings (Hind et al., 2017; Kolehmainen et al., 2015),

and (2) a matrix that offered quantitative and qualitative information and findings for each individual participant (Ayvazoglu et al., 2006; Harvey et al., 2009; Howie et al., 2017).

In summary, 23 studies integrated the data in the results section and presented mixed-method results. The integration of the quantitative and the qualitative data was also conducted in the discussion section of all but one review study (Oriel et al., 2018). Data transformation was present in some studies but was rarely used to facilitate data analysis and contribute to data integration. Lastly, the use of matrices was rare although two different approaches to the use of matrices were demonstrated.

Research Context

The seventh theme, *research context*, described various contextual variables that included the type of intervention and the research setting. The descriptive numerical analysis revealed there were 39 intervention studies, with 22 studies conducted in a school setting (see Appendix K, Table 13). Eighteen studies were conducted in multiple settings while only two were conducted in a home setting. Lastly, 38 studies took place in segregated settings as opposed to 14 studies in inclusive settings. See Appendix F, Table 6, for details on the research context of each study.

Intervention Types

Intervention studies focused mostly on exercise and PA studies (14 studies), therapy (9 studies) or psychosocial issues and behaviours (11 studies). The thematic analysis revealed that MMR studies investigated diverse types of interventions such as a goal-directed, family-centred PA program at a sports centre for children with a variety of disabilities (Willis et al., 2018), an aquatic therapy for children with Duchenne muscular dystrophy (Hind et al., 2017), and a mindfulness martial arts program for youth with learning disabilities (Milligan et al., 2015).

Twenty-one intervention studies involved only children under the age of 12 years. Moreover, the topics investigated in non-intervention studies were varied and included, for instance, PA participation and PA levels (e.g., Armila et al., 2018; Wakely et al., 2018), barriers and facilitators of PA participation (e.g., Ayvazoglu et al., 2015; Jaarsma et al., 2015), and social inclusion and interactions of children with a variety of disabilities (e.g., Belley-Ranger et al., 2016; Gaintza & Castro, 2020).

Settings

Twenty-two studies took place in a school. Ten studies were in inclusive school settings and explored social interactions and inclusion in school-based PA and PE (e.g., Butler & Hodge, 2004; Qi & Wang, 2018). Eleven studies were in a segregated school setting and explored FMS interventions (e.g., Bremer & Lloyd, 2016; Lodol & Bond, 2017), the effects of adapted PA on academic success (Everhart et al., 2012) and PA participation at a special school (Jaarsma et al., 2015). One study was conducted in both inclusive and segregated classrooms (Lieberman et al., 2012). Similarly, four of the nine studies in community settings were inclusive and five were segregated. Inclusive settings included diverse local sports communities in Finland (Armila et al., 2018) and a wheelchair sports club also accessible to able-bodied children (Carter et al., 2014) while segregated settings included a community pool with aquatic programs for children with disabilities (Fragala-Pinkham, 2010) and community-based recreation centres with PA and nutrition activities for individuals with disabilities (Kemeny & Arnhold, 2012). Moreover, the nine studies that took place in clinics and hospitals involved segregated settings and investigated primarily topics related to therapies (e.g., Maring et al., 2013; Vertes et al., 2014). Lastly, 18 studies investigated multiple settings. Eleven of these studies involved both inclusive and segregated settings. These studies were mostly associated with the content area of exercise and

PA. Most studies investigated the PA behaviours of children with a disability across multiple settings that included home, school, community centres, and clinics (e.g., Brunes et al., 2017; Kolehmainen et al., 2015).

Thus, intervention studies took place mostly in segregated settings while non-intervention studies were divided evenly between inclusive and segregated settings. Schools, clinics, and community centres were often the setting of MMR studies, with many studies that investigated multiple settings (i.e., inclusive and segregated settings combined). The researchers provided limited information regarding geography, socio-economic status, access to health services, etc., particularly in studies conducted in school and community settings. Such key factors may greatly impact the PA experiences of children with disabilities. However, a few researchers mentioned some information about their school setting that included its location (i.e., city, country) and environment (i.e., urban, rural, suburban), but such factors were seldom addressed or analyzed in the results or discussion sections (e.g., Belley-Ranger, 2016; Qi & Wang, 2018). As such, broad contextual discrepancies may have affected the findings of the studies analyzed in this review.

This chapter included the results of a descriptive numerical summary and a thematic analysis to explore seven key themes related to the use of MMR in APA. The upcoming chapter will delve into the meaning and relevance of the results. It will highlight the findings as they relate to the literature review and the research questions for this review.

Chapter 5

Discussion

The purpose of this study was to examine how mixed methods research (MMR) has been applied in adapted physical activity (APA) research about children and youth with a disability, aged 5–18 years. Literature on MMR suggested that this approach to APA research is still in its infancy (Haegele et al., 2015; Harvey et al., 2020). Indeed, the results of the current scoping review indicated that MMR is a novel but developing approach in the field of APA. This chapter consists of five sections to describe the findings of this scoping review. The first section relates to the philosophical foundations of MMR and how APA researchers explicitly articulated the philosophies and theories they used to rationalize their research studies. The second section outlines how the study objectives were stated in each study. These first two sections help to answer one sub-question from this study: how have the research objectives been framed? The third section addresses the MMR designs utilized by APA researchers and how these designs were presented and explained. It answers the sub-question: what type of MMR designs have been used? The fourth section focuses on the participants and research contexts involved in each study. It addresses the sub-question: which categories of disability have been studied? The fifth section outlines how the quantitative and qualitative data were collected, analyzed, and integrated. It answers the sub-question: how have the quantitative and qualitative data been analyzed and integrated?

Philosophical Foundations

The development of a MMR study begins with philosophical foundations which are the researcher's worldview (i.e., ontology, epistemology, methodology, axiology, rhetoric) and the theoretical rationale (i.e., stances, theories, models) that shape the study (Creswell & Plano

Clark, 2018). The findings on philosophical foundations and the subsequent findings on purpose and objectives helped answer the sub-question of this study: how have the research objectives been framed? More specifically, there were two main original findings that emerged about theoretical foundations in this study. First, worldviews were not explicitly stated or discussed in any MMR studies in APA research. Second, a theoretical rationale was presented in only 24 review studies (37.5%) in the form of theoretical lenses, theories, and models.

Our finding on worldviews supports recent suggestions that worldviews were seldom explicitly stated in MMR publications even if they had been discussed and reflected on during the research process (Creswell & Plano Clark, 2018). This finding is reflective of the evolution of MMR as the description of the researcher's worldview has been a recommendation since at least 2011 (Creswell & Plano Clark, 2011). This finding is important because a worldview can help to explain the research assumptions behind decisions made by the researchers during the study development process (Hussain et al., 2013). Additionally, the abstract nature of worldviews may be confusing to novice researchers or researchers may completely disregard their worldview which can, in turn, compromise the integrity of the research design and associated findings (Hussain et al., 2013).

A theoretical rationale is more pragmatic than a worldview because it directly informs elements of the research process such as data collection, evaluation tools and analysis methods. For example, our finding on theoretical rationale identified that 24 APA studies clearly stated and described theories and models (e.g., Butler & Hodge, 2004; Obrusnikova & Cavalier, 2011). This finding demonstrated that a theoretical rationale was not presented or alluded to in 62.5% of the review studies (e.g., Adams et al., 2018; Kozub, 2003). This point is important because theory-driven research has been recommended in MMR since at least 2011 (Creswell & Plano

Clark, 2011) and 1999 in APA research (Sherrill & O'Connor, 1999). Most studies are theory-driven whether the researchers are aware and articulate theory or not (Collins & Stockton, 2018; Guba & Lincoln, 1994). Thus, researchers are expected to clarify relationships between their research study and theory (Merriam, 2009). As such, there is a reason for concern that this suggestion from MMR and APA scholars has not been followed because research should be framed by a theoretical rationale to explain the findings and provide clarity and support to the inferences made by the researchers (Grant & Osanloo, 2014).

Recent MMR publication standards have also been issued to encourage researchers to describe their worldview and theoretical rationale (Levitt et al., 2018). This contemporary MMR recommendation further adds to previous APA guidelines. For instance, Sherrill and O'Connor (1999) recognized that research begins with a philosophy. They suggested that the significance of the study section of a manuscript may highlight the worldview of the researcher, particularly their epistemology, and focus on the importance of the knowledge created. Moreover, the explicit inclusion of a worldview in MMR studies has also been suggested by Harvey et al. (2020) for the APA research community because it provides a foundation to the research process. It informs the theoretical rationale used to frame or build the study which, in turn, will help develop the research process by guiding the methodological approach (i.e., research design) and the data collection methods (Creswell & Plano Clark, 2018; Crotty, 1998). As such, the researcher's worldview, theoretical rationale, methodological approach, and data collection methods are interrelated and constitute the four steps of study design (e.g., Crotty, 1998). The consistency between these steps has been referred to as the coherence of the research (Cohen & Crabtree, 2008), which constitutes a quality standard for qualitative research in APA (Zitomer & Goodwin, 2014). Furthermore, a clearly articulated theoretical rationale may assist other

researchers to replicate studies in order to challenge, refine, extend, and confirm theory (Lamal, 1990; Nosek & Errington, 2020). Consequently, researchers are encouraged to be forthright with the description of their worldview and theoretical rationale. Hence, we recommend that researchers reflect on and explicitly identify the philosophical foundations of their research based on this study's findings as well as the MMR literature and reporting standards. Their worldview and theoretical rationale should be included at the beginning of the published study to address specifically how the philosophical foundations guided the development of their research study. They should also describe the theory or model used when appropriate.

Study Objectives

The introduction of a MMR study should include a statement describing the overall intent of the research study (Creswell & Plano Clark, 2018). Researchers are usually expected to formulate both quantitative and qualitative purpose statements or objectives corresponding to the two MMR design components (Creswell & Plano Clark, 2018; Levitt et al., 2018). A rationale for the use of MMR is also needed to inform the reader about what is to be gained from the integration of quantitative and qualitative data (Levitt et al., 2018). Thus, the findings on study objectives complement the findings on philosophical foundations to help answer the sub-question of this study: how have the research objectives been framed?

Four main original findings were identified regarding study objectives. First, all studies had a purpose statement that referred to the overall intent of the study. Second, a majority of the studies (67.2%) stated clear quantitative and qualitative research objectives that helped delineate the overall intent of the study. Third, approximately one quarter of all review studies (28.1%) included an explicit rationale for the use of MMR. Finally, researchers rarely stated research questions or hypotheses (research questions: 23.4%; hypotheses: 10.9%).

The first and second original findings on study objectives highlighted some consistencies between the purpose statements and objectives in the review studies and recommendations from MMR literature. We suggest that this finding emerged because MMR literature has long recommended the inclusion of an overarching purpose statement and the delimitation of the overarching purpose statement with quantitative and qualitative objectives (Creswell & Plano Clark, 2007). Purpose statements have also long been recommended in quantitative and qualitative research methods literature (e.g., Creswell & Creswell, 2017; Thomas et al., 2015). In fact, purpose statements have been identified as the most important statements in MMR research projects (Creswell & Plano Clark, 2011, 2018) which, in turn, may explain their widespread presence in the review studies for this scoping review.

However, the third and fourth original findings on study objectives highlighted a few inconsistencies with the MMR literature and publication standards. First, the widespread omission of a rationale for the use of MMR was unexpected because it has been recommended in MMR literature since at least 2007 (Creswell & Plano Clark, 2007). It is a possibility that rationales for the use of MMR were rarely explicitly stated in MMR publications even if they had been formulated during the research process due to the continually evolving nature of MMR procedures and the lack of MMR publication standards before 2018. Second, the use of quantitative, qualitative, and MMR questions and hypotheses to narrow down study objectives was not evident in the scoping review studies. However, these questions and hypotheses have been recommended in MMR literature since at least 2007 (Creswell & Plano Clark, 2007). While the inclusion of research questions or hypotheses is not new in APA research (e.g., Sherrill & O'Connor, 1999), the publication standards for MMR are recent and likely not well known which may also explain some of the inconsistencies observed between the review studies and

literature on MMR and APA. The latest MMR publication standards have recommended the inclusion of three study objectives (i.e., quantitative, qualitative, and mixed methods) either in the form of purpose statements, research questions, or hypotheses (Appelbaum et al., 2018; Levitt et al., 2018). Further, Levitt et al. (2018) suggested ordering the quantitative and qualitative objectives to reflect the design of the MMR study, either based on chronology and/or methodological priority. Thus, based on the study findings, as well as on MMR literature and reporting standards, we recommend that researchers address the inconsistencies in the way MMR study objectives have been framed in APA research by including (1) a purpose statement describing the overall intent of their research, (2) a quantitative research question, objective or hypothesis, (3) a qualitative research question or objective, and (4) a MMR question, objective, or rationale to be answered by the integration of the quantitative and qualitative data.

Research Design

The typology of MMR designs has evolved much over the past 30 years. Some confusion has been created about the terminology used to describe MMR designs due to the plethora of existing typologies (Creswell & Plano Clark, 2018). Thus, this study's findings on MMR designs helped answer the sub-question of this study: what type of MMR designs have been used?

Four main original findings were ascertained regarding MMR designs. First, approximately half of all studies (51.6%) were identified as MMR by the original authors. Second, we also found that the type of MMR designs used was rarely stated. Third, the findings of this review demonstrated that only nine out of 64 research studies identified a dominant method of inquiry. Lastly, data triangulation was present in approximately one third of the review studies (34.4%).

The first finding determined that the use of a MMR approach was inconsistently

identified and it may be explained by the evolving nature of MMR. For example, the explicit mention of MMR in the title and/or in the introduction section of articles has been recommended in the MMR literature since at least 2007 (Creswell & Plano Clark, 2007). However, MMR and its terminology have been changing, evolving, and maturing over the years (Creswell & Plano Clark, 2007, 2011, 2018; Greene et al., 1989). For instance, Ayvazoglu et al. (2006) were the first authors to explicitly identify MMR in an APA study. The frequency at which the mixed-method approach was identified in publications remained rare until 2013 but changed annually between 2013 and 2020 when over 50% of the MMR studies were explicitly identified as MMR by the authors.

Perhaps one of the reasons for this finding is that researchers may have published their distinct quantitative and qualitative findings in two separate journal articles. Yet, researchers should ensure that such articles refer to the use of the MMR approach when describing the research design and methods. For example, Martin and colleagues designed a MMR study in three phases. They published the qualitative results of phases 1 and 2 (Martin et al., 2017) and the quantitative results of phase 3 (Martin, Taylor, et al., 2020) separately before publishing the integrated results in the article that was included in this scoping review (Martin, Graham, et al., 2020). Please note the use of MMR was mentioned in only two of the three articles (Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020). However, the quantitative article should be referenced in the qualitative article and vice versa (Creswell & Plano Clark, 2018; Stange et al., 2006). If necessary, Stange et al. (2006) also suggested writing a third article to discuss the integrated results and the overarching outcomes of the MMR study (Stange et al., 2006). Please see Stange et al. (2006) for a thorough discussion of publication strategies for MMR studies.

The second finding established that few researchers identified the specific MMR design

used. The implementation sequence (i.e., sequential, concurrent) was the design component most often identified. This observation aligns with previous MMR design typologies that suggested to focus on the timing of the quantitative and qualitative research components (Creswell et al., 2003; Creswell & Plano Clark, 2018). Previous recommendations also encouraged researchers to identify their design beyond its implementation sequence by specifying the dominant method of inquiry (i.e., either the quantitative or qualitative method), the stage of data integration or the theoretical perspectives (Creswell et al., 2003; Creswell & Plano Clark, 2018). This distinction was rarely made in the review studies which limited the information provided to the reader about how the design was conceived and implemented (Creswell & Plano Clark, 2018).

The third finding of this review ascertained that nine studies identified a leading method of inquiry which suggested that these specific researchers were aware of recommendations from MMR literature. Four of these studies identified the prioritization of the quantitative method while the five other studies prioritized the qualitative method. Hence, quantitative and qualitative methods were used evenly as dominant methods which may be distinct to the field of APA. For instance, it was discovered in other fields of research that quantitative methods were mainly used as a dominant method in MMR rather than qualitative methods (e.g., Walker & Baxter, 2019). The identification of a dominant method is still recommended today, when relevant, but the emphasis on the intent of the design (i.e., explanatory, exploratory, and convergent designs) has recently emerged as a developing typology to identify MMR design (Creswell & Plano Clark, 2018). As such, it was determined in our scoping review that the intent of the design was often omitted in favour of the identification of the implementation sequence which reflects the accepted methodological procedures at the time as well as the continual evolution of MMR design typology since 1989 (Greene et al., 1989).

The fourth finding on MMR design affirmed that triangulation or cross-referencing was clearly identified and used in approximately one third of the studies. A MMR design that incorporated triangulation, the concurrent triangulation design, was included in MMR design typologies by Creswell and colleagues between 2003 and 2011 (Creswell et al., 2003; Creswell & Plano Clark, 2011). However, the MMR design of the review studies, where triangulation was used, was never explicitly identified as a concurrent triangulation design. Triangulation is a procedure that many researchers are familiar with because it may lead to the validation of findings that are corroborated by multiple research approaches (Creswell et al., 2008). It has also been discussed and used in quantitative and qualitative research for many years (e.g., Campbell & Fiske, 1959; Thomas et al., 2015). However, it has never been identified as a type of design in those two methodological paradigms which may explain why it was never identified as a design in the MMR studies reviewed. While triangulation has been explored, questioned, and critiqued, more in-depth discussions may be necessary to support its use in the context of MMR (Mertens & Hesse-Biber, 2012).

Thus, the terminology to identify the MMR approach and MMR designs were seemingly unclear to researchers. The inconsistent identification of MMR studies constituted a considerable obstacle for this review as the studies included in the analysis were difficult to find and retrieve. Our database search strategy was efficient at identifying articles related to APA. However, a database search strategy for the identification of MMR studies in APA could not be devised by the research team, with the help of a reference librarian. As such, the selection of MMR publications out of the APA articles identified during the database search had to be done manually. Hence, the current findings align with Harvey et al.'s (2020) suggestion that a search strategy to identify MMR does not exist because of the absence of uniformity in the way MMR

studies have historically been identified by their authors. Consequently, based on the findings of this study, as well as MMR literature and reporting standards, we recommend that researchers identify MMR in the title of their study. It should facilitate database searches and help with the identification of a successful search strategy for future MMR publications in APA. Researchers should also name the MMR design used based on the intent of the design (i.e., exploratory, explanatory, convergent) as defined by the terminology used in contemporary scholarly texts and publication standards. The type of design should also be included in the abstract and as a keyword if possible. In addition, the design should be defined in the publication with information relating to the dominant method of inquiry, implementation sequence and the rationale for the use of MMR. Lastly, the use of a triangulation design should be identified and justified when appropriate. We encourage the reader to consult the *Journal of Mixed Methods Research* (volume 6, issue 2) to gain more knowledge on the use of triangulation which we recommend as a way to conduct comprehensive research studies with potentially small sample sizes.

Participants

It is essential to describe participants with ample details in APA research because the generalizability of findings may be impacted by group and individual differences associated with sex, age, and disability type (Hodge et al., 2007; Sherrill & O'Connor, 1999). The findings of this scoping review on the study participants helped to answer the sub-question of this study: which categories of disability have been studied?

Five original findings were identified regarding children's sex, age, and disability. First, this review established that boys were recruited considerably more in MMR studies in APA than girls. Second, 15.6% of the review studies did not specify the sex of the child participants involved. Third, 32.8% of the study samples had wide age ranges from early childhood to the

end of adolescence and early adulthood. Fourth, we identified that autism spectrum disorder (ASD) and developmental coordination disorder were the two disability groups most often studied (i.e., 12.5% of the review studies for each of the two disability groups). Lastly, heterogeneous samples of disability types were identified in 35.9% of the review studies.

The first finding affirmed a predominance of male participants in the study samples. This may be related to the recurring use of non-random sampling procedures in APA research (Haegele & Hodge, 2015; Karkalets et al., 2012). Some authors in this scoping review mentioned their use of a convenience sampling procedure (e.g., Milligan et al., 2015; Walker et al., 2020). For instance, Obruchnikova and Cavalier (2011) justified the higher ratio of boys in the sample as reflective of the higher prevalence of ASD in boys. Boys are, indeed, four times more likely to be diagnosed with ASD (Maenner et al., 2020). Males are also diagnosed more than females with other disabilities such as learning disabilities, attention-deficit hyperactivity disorder, and Down syndrome (Quinn & Wagner, 2015; Ramtekkar et al., 2010; Shin et al., 2009). As such, it is expected that boys would be more involved in APA research. This finding is important because it highlighted that sex differences were not always fully addressed in the scoping review studies by excluding females with disabilities as study participants. Similarly, the second finding affirmed that 15.6% of the review studies did not identify the sex of the child participants involved and, as such, the studies' outcomes did not consider nor reflect sex differences. This finding is highly relevant because some researchers have identified differences between sexes in various studies conducted in APA (e.g., Aslan et al., 2012; Nielsen et al., 2011). Therefore, it is essential to describe the sex of each participant as a way to be mindful of individual differences (Hodge et al., 2007; Jones et al., 2020). In addition, studies that involve females with disabilities are needed in the field of APA to gain a better understanding of their

physical activity experiences, as previously recommended (i.e., Bragg & Pritchard-Wiart (2019).

This review determined that all, but two, review studies followed the recommended APA publication guideline to indicate participant age ranges (e.g., Hodge et al., 2007; Sherrill & O'Connor, 1999). More specifically, participants' ages varied widely in many of the review studies. This third finding has two important implications for APA research. First, the effects of maturation should be considered when recruiting samples because children develop diversely over time which, in turn, may jeopardize the internal validity of a study (Burrack, 2018; Thomas et al., 2015). Second, the number of participants within each chronological age band may be low, especially if the sample size is small. Thus, the statistical power of the quantitative results may be jeopardized. As such, the chances of detecting a significant effect for a specific age or age group and the strength of any inferences made from the analysis are substantially reduced (Thomas et al., 2015). For instance, Shields et al. (2019) identified their small heterogeneous sample (i.e., 19 participants, ages 13–30 years) as a limitation of their study because it made it impossible to determine differences in outcomes relative to age. Hence, Harvey and Reid (2005) recommended using as narrow an age range as possible when recruiting participants to address the issues of development and maturation which was not always observed in the review studies. Yet, the use of lenient convenience sampling procedures may explain the wide age ranges identified in some APA studies.

The fourth finding affirmed that ASD and developmental coordination disorder were the two disability groups that were the most studied with the use of MMR. This finding diverged from research that identified physical disability as the group most often studied in APA, irrespective of the methods used (Haegele et al., 2015). The percentage of studies on ASD was higher in our scoping review than in the documentary analysis by Haegele et al. (2015). Thus,

MMR may be a useful approach to research ASD in the field of APA because it allows the researchers to recruit small- and medium-sized samples of varying participants (e.g., parents, siblings, etc.) while also utilizing quantitative and qualitative data collection methods to comprehensively investigate the research phenomenon of their interest.

The fifth finding determined that 23 review studies recruited heterogeneous samples of disabilities. For instance, Shields et al. (2019) included children with various disabilities such as cerebral palsy, Down syndrome, spina bifida, ASD, and spinal cord injury in their study. Samples with dissimilar subgroups (i.e., heterogeneous disabilities and/or a wide age range) tend to be used in APA research (Haegele et al., 2015; Lavay & Lasko-McCarthy, 1992) and sample sizes are often small (Bouffard, 1993; Watkinson & Wasson, 1984). However, researchers should provide a rationale for their use related to the purpose of the research because comparing across disability or age groups may not be effective (Bouffard, 1993). Also, it is essential to take individual differences into consideration when analyzing the data and interpreting the findings (Bouffard, 1993). The issue of heterogeneous samples can be explained in part by the challenges of participant recruitment in APA research (Lavay & Lasko-McCarthy, 1992). For instance, finding and recruiting individuals with a specific diagnosis or severity of symptoms can often be challenging (Haegele et al., 2015; Zhang et al., 2006). Also, the cooperation of children with a disability and/or their parents may be difficult to obtain and maintain for the entire duration of the study (Lavay & Lasko-McCarthy, 1992). Hence, challenging recruitment procedures and the high prevalence of heterogeneous samples are two of the reasons why some academics such as Harvey et al. (2020) have recently encouraged researchers to use a MMR approach in studies with smaller sample sizes as it may allow researchers to gather a considerable amount of information on the research phenomenon of interest and the participants.

In sum, this scoping review identified a lack of consistent identification of participants in many studies. This conclusion is important because guidelines regarding the participants involved in APA research and how they should be thoroughly described in publications have been well defined for a long time (Hodge et al., 2007; Jones et al., 2020; Sherrill & O'Connor, 1999). Yet, many studies were still missing precise information on each participant's sex, age, or diagnosis. Consequently, based on the findings of this study, as well as APA literature and MMR reporting standards, we recommend that researchers describe their participants by identifying all relevant demographic variables. Researchers should also refrain from combining dissimilar subgroups in their sample (e.g., heterogeneous disabilities, wide age ranges). If researchers decide to combine dissimilar participants, they should provide a rationale why this sampling technique is being used. In addition, they should ensure that the results are clearly presented to the readers by highlighting individual differences. Lastly, females should be more involved as participants in MMR studies in the field of APA because this review identified that they were considerably less recruited than males.

Data Collection, Analysis, and Integration

Data collection and analysis in MMR should abide by the same standards used in quantitative and qualitative studies (Creswell & Plano Clark, 2018). The procedures of data collection and analysis should be reported in detail to ensure that readers understand them in relation to the MMR design (Creswell & Plano Clark, 2018; Levitt et al., 2018). It is also essential to explain the strategy used to integrate the quantitative and the qualitative data (i.e., narrative discussion, data transformation, joint display) as well as to report and interpret the mixed-method results (Creswell & Plano Clark, 2018). The findings of this review answered the sub-question: how have the quantitative and qualitative data been analyzed and integrated?

Three main original findings were identified regarding data collection, analysis, and integration. First, researchers often excluded children with a disability from interviews during data collection. Instead, they chose to interview adults who were related to the youngsters. Second, the mixed-method results were reported in only 35.9% of the review studies. Lastly, integration strategies were seldom identified and, as such, the data integration approach was rarely explained by the researchers.

The first finding ascertained that 50 out of 64 review studies (78.1%) included interviews as a data collection method and children were involved in only half of them. Instead, parents, teachers, and health professionals were interviewed at a higher rate (82% of the studies with interviews) to gain insight into the phenomenon of interest. However, interviews with children represent a means to obtain first-hand experiential knowledge in APA research, a means that seemed to be underutilized based on the results of this scoping review. We concur that there may be diverse challenges related to interviewing children in general (Gill et al., 2008) which may also be influenced by the impairing effects of disability (Teachman & Gibson, 2013). For example, there have been suggestions that not all children possess the cognitive and verbal skills necessary to provide quality interview data (Deatrick & Faux, 1991; Docherty & Sandelowski, 1999). For instance, some children with severe cognitive impairments may not possess a notion of time which may greatly affect their ability to recall past events (Bedoin & Scelles, 2015). Yet, recent research has suggested that interviews can be conducted with most children, including children with a disability, that yield trustworthy data (Bedoin & Scelles, 2015; Christensen, 2004; Gill et al., 2008). As such, we suggest that interviews should be conducted with children with a disability to gain real-life qualitative data. This suggestion is supported by literature on disability research that has encouraged researchers to consider alternative ways that participants

can express and represent themselves, including the use of visual research methods during interviews (Christensen, 2004; Teachman & Gibson, 2013). In fact, this review identified interviewing methods that incorporated photographs as prompts for gathering qualitative data. For instance, children with ASD were asked to reflect on photographs they had taken (photovoice methodology; Obrusnikova & Cavalier, 2011) while children with attention-deficit hyperactivity disorder were asked to recall and reflect on physical activity experiences with their own photographs (scrapbook interviewing; Harvey et al., 2014).

The second finding identified that many researchers did not report their mixed-method results. Instead, only the quantitative and the qualitative results were reported separately. Mixed-method results are the outcome of the data integration phase of MMR (Creswell & Plano Clark, 2018). Creswell and Plano Clark have been encouraging researchers since 2007 to first analyze the quantitative and qualitative data and report the results. Researchers should then integrate the results by comparing, combining, and/or connecting the quantitative and qualitative results with the use of one or multiple integration strategies (i.e., narrative discussion, data transformation, joint display). The ensuing mixed-method results should be reported in the results section and the mixed-method findings should be interpreted in the discussion section of publications. However, this scoping review identified that the mixed-method results were not reported more frequently in recent studies even though MMR literature had been recommending it for quite some time. The absence of mixed-method results also supported the suggestion by O’Cathain et al. (2007) that researchers were not always rigorous in the way they proceeded with the data integration. For instance, researchers regularly integrated findings at the interpretation stage of the study (i.e., discussion section) without first utilizing an integration strategy to generate mixed-method results such as transforming the data (i.e., quantitizing the qualitative data or qualitzing the

quantitative data) and/or presenting the mixed-method results in a joint display. As such, the accepted integration procedures at the time (e.g., Creswell & Plano Clark, 2007) were not always followed, which represents missed opportunities to develop a more comprehensive picture of many research phenomena.

The varying integration practices and related outcomes observed in this scoping review may be explained by the continual evolution of data integration procedures. The data integration phase and its methodological processes and strategies have often been discussed by scholars in the past three decades (e.g., Caracelli & Green, 1993; O’Cathain et al., 2007; Woolley, 2009). However, it has been argued that the data integration phase has been poorly described in the literature and rarely applied in research (Creswell & Plano Clark, 2018), thus providing incomplete or even conflicting information to researchers. Recent MMR publication standards have encouraged the inclusion of mixed-method results (Levitt et al., 2018) which may lead to future changes in data integration and reporting practices.

The third finding asserted that data integration strategies, used to integrate the quantitative and qualitative data, were rarely explicitly stated and defined. Creswell and Plano Clark (2007) identified three integration strategies to help researchers better integrate their data (i.e., narrative discussion, data transformation, and joint display). Yet, these strategies were seldom explicitly identified by the authors of the review studies. Please note MMR publication guidelines were only published as of 2018 (Levitt et al., 2018). Also, there is a lack of exemplars of successful data integration strategies (Bryman, 2007). As such, researchers may need clearer demonstrations of how the data integration phase should occur which may have restricted the development of rigorous integration practices in research as was observed in this scoping review. Subsequently, scholars such as Plano Clark et al. (2010) offered concrete examples where they

integrated the same quantitative and qualitative datasets using narrative discussion, data transformation, and joint display to help researchers gain a better understanding of how integration strategies can be used. Unfortunately, this scoping review did not identify any change in the identification and the use of data integration strategies over time. Consequently, data integration was not always used to its full potential and researchers may have missed an opportunity to identify more comprehensive and holistic findings.

Based on the findings of this study, as well as MMR literature and reporting standards, we recommend that researchers provide an explanation of their data collection and analysis methods. Also, the research procedures should be presented chronologically to explain the rigorous process established by the MMR design. In addition, we urge researchers to interview children with a disability if it aligns with the purpose of their research as children can provide rich, real-life knowledge. Please consult Bedoin and Scelles (2015), Teachman and Gibson (2013), and Underwood et al. (2015) to gain a better understanding of the methodological implications of interviewing children with a disability. We also recommend researchers to be more explicit about how the quantitative and qualitative data were integrated. The data integration strategies used should be stated and explained. The mixed-method outcomes should be reported and interpreted in the results and discussion sections of publications respectively. We also recommend the use of matrices to represent the quantitative and the qualitative data and to highlight the connections made during the integration phase if and when appropriate. We encourage researchers to refer to Creswell and Plano Clark (2018) to gain information on the theory behind the MMR data integration phase. This book includes clear procedures specific to each MMR core design, excerpts from research articles, and examples of matrices. Researchers can also consult Plano Clark et al. (2010) for guidance on how to implement pragmatic data

integration strategies in MMR. This article provides clear explanations of the processes involved in three integration strategies (i.e., narrative discussion, data transformation, joint display) as well as examples of how the results should be reported and the findings interpreted.

Recommendations on the strategies and procedures involved in MMR were provided in this chapter. They may lead to a better understanding of MMR and its methodological components, which, in turn, may help researchers create strong MMR studies in the field of APA. Practical applications of these recommendations for future research will be provided in the next chapter.

Chapter 6

Summary

Mixed methods research (MMR) has recently been developing in the field of adapted physical activity (APA). However, its emergence is slow and very few MMR studies have been conducted so far about physical activity (PA) for people with disabilities (Haegele et al., 2015; Harvey et al., 2020). MMR may be a comprehensive approach to provide a thorough understanding of issues that surround children with a disability in PA with holistic and comprehensive results (Woolley, 2009). It may also offer a pragmatic, solution-based approach to learn more about the PA engagement of children and youth with disabilities through closely related field-based practices. Therefore, the purpose of this scoping review was to examine how MMR has been applied in APA research about children and youth with a disability, aged 5–18 years.

This scoping review followed the Arksey and O'Malley framework as outlined by Levac et al. (2010). The framework comprised six steps: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarizing, and reporting the results, and (6) stakeholder consultation. The stakeholder consultation exercise was not completed as it was presented as optional in the framework. Three sources were used to identify articles: electronic databases, reference lists, and hand-searching of key journals (i.e., *Adapted Physical Activity Quarterly*, *Journal of Mixed Methods Research*). Specifically, six electronic databases were searched (i.e., ERIC, SPORTDiscus, Sports Medicine and Education Index, PsycINFO, MEDLINE, Web of Science) to identify relevant studies. Search terms related to PA, disability, school-age children, adapted physical education and APA were used. A total of 45,864 studies were reviewed by the principal investigator to determine if they matched all

inclusion criteria established by the research team. Sixty-four studies were included in the final analysis of this scoping review.

A systematic coding procedure was utilized to extract, synthesize, and chart the data (Wilson, 2009). The research team first determined variables to be extracted from the review studies based on the concepts suggested by the research questions as well as on categories of analysis from three documentary analyses (Haegele et al., 2015; Porretta & Sherrill, 2005; Reid & Broadhead, 1995). The iterative process led to the creation of seven key categories of interest: (1) *publication information*, (2) *content area*, (3) *study objectives*, (4) *mixed methods research design*, (5) *participants' information*, (6) *data integration*, and (7) *research context*. First, *publication information* pertained to the publication journal, the year of publication, and the country of university affiliation of the first author. Second, *content area* referred to the topic of interest of each study from a list of nine labels that were adapted from documentary analyses of *APAQ* articles (Haegele et al., 2015; Porretta & Sherrill, 2005; Reid & Broadhead, 1995). Third, *study objectives* discussed the manner in which the objectives of the study were framed, either with research question(s), hypotheses, purpose statement(s), rationale for the use of MMR, and/or philosophical foundations. Next, *mixed methods research design* outlined the MMR design as well as the data collection and analysis methods used in each study. The fifth category of interest concerned the *participants' information* which included sex, age range, and type of disability of the participants. Sixth, *data integration* discussed the ways the quantitative and qualitative results were integrated and how the mixed-method results and findings were presented in the results and discussion sections respectively. Lastly, *research context* referred to whether a study was an intervention or a non-intervention study, described the environment in which the research took place (e.g., school, clinic, home), and determined whether the

participants with a disability were involved in an inclusive or segregated PA setting.

Conclusions

Publication Information

- Lead authors of the studies were most often associated with universities in North America (50%), Australia (12.5%), and the United Kingdom (10.9%).
- The publication journals were varied and included multiple fields related to APA such as therapy and rehabilitation, education, motor development, psychology, and specific disabilities.
- There was an increasing publication trend for MMR studies over the past 10 years.

Content Areas

- The three content areas most often studied were exercise and PA, psychological issues and behaviours, and therapy.

Study Objectives

- All studies had a purpose statement that referred to the overall intent of the study.
- A majority of the studies (67.2%) had clearly formulated quantitative and qualitative objectives to frame the study's purpose.
- The use of research questions was not widespread (23.4% of studies) and hypotheses were seldom used (10.9% of studies).
- Only 18 studies (28.1%) included a rationale or study objective to justify the usefulness and necessity of the MMR approach.
- Worldviews were not explicitly stated or discussed in any of the review studies.
- A theoretical rationale was presented in only 24 review studies (37.5%) in the form of theoretical lenses, theories, and models.

Mixed Methods Research Design

- The use of a mixed-method approach was identified by the original authors in approximately half of the review studies (52.6%).
- The terminology used to identify MMR and/or components of the MMR design was inconsistent and often imprecise.
- Only 9 out of 64 research studies (14.1%) identified a dominant method of inquiry; five were qualitative and four were quantitative.
- A data triangulation strategy was implemented in approximately one third of the review studies (34.4%) to enhance the quantitative and qualitative data integration and/or to strengthen study trustworthiness by cross-referencing the data.
- Interviews were the most used qualitative data collection method (78.1% of studies). However, children were involved in only half of them. Instead, researchers chose to interview adults who were related to the youngsters (82% of the studies with interviews).
- Hybrid surveys and questionnaires represented a favoured method of data collection in a MMR context and were utilized in 13 studies (20.3%).

Participants' Information

- Review studies predominantly involved males across all age groups and disabilities.
- Eleven studies (15.6%) did not provide any information on the sex of the participants.
- Twenty-nine studies (45.3%) involved children between the ages of 5 and 12 years, while there were only 12 adolescent-specific studies (18.8%). Twenty-one studies (32.8%) involved participants with a broader age range, from childhood to adolescence. Thirteen of these studies contained samples where some of the participants were older than 18 years old. However, the average age of each sample was below 18 years of age.

- Fifty-seven studies (89.1%) also included adults (e.g., parents, teachers, health professionals) as participants.
- Two studies (3.1%) did not provide any information on the age of the participants.
- Developmental coordination disorder and autism spectrum disorder were the two types of disability most often studied (i.e., 12.5% of the review studies for each of the two disability groups).
- Heterogeneous samples were composed of participants with a variety of disabilities and incorporated over one third of the review studies (23 studies, 35.9%).

Data Integration

- The quantitative and the qualitative data were integrated to generate mixed-method results in the results section of only 23 studies (35.9%).
- The integration of the qualitative and the quantitative data to generate mixed-method findings occurred in the discussion section of 63 studies (98.4%).
- The integration strategy of narrative discussion was frequently used (63 studies; 98.4%). Fewer researchers also utilized the integration strategies of data transformation (15 studies; 23.4%) and/or joint display (5 studies; 7.8%).
- The integration strategies used by the researchers were seldom explicitly stated.

Research Context

- Thirty-nine of the sixty-four review studies (60.9%) were interventions.
- Three settings were most often studied; twenty-two studies took place in a school setting (34.4%), while nine studies (14.1%) took place in community settings and nine other studies (14.1%) took place in a clinical setting.
- Eighteen studies (28.1%) took place across multiple settings that included home, school,

community centres, and clinics.

- A majority of the studies took place in a segregated setting (59.4%).

Practical Applications

This study is one of the first to explore the emergence of MMR as a research paradigm in the field of APA. The results from this study add to the literature on MMR by providing insights into the methodological practices involved in past MMR studies in APA. Its findings and suggestions may be valuable to MMR researchers in APA.

The findings of this scoping review align with Harvey et al.'s (2020) suggestion that MMR studies may be difficult to identify through literature searches. Our recommendations to identify MMR in the title and the MMR design in the abstract and keywords should facilitate database searches to help with the identification of successful search strategies for the retrieval of future MMR publications in APA. Successful database search strategies could make the retrieval of MMR articles easier and more convenient for researchers, academics, and practitioners (Harvey et al., 2020). It may also facilitate the identification of exemplars of successful MMR studies in APA and related research procedures and strategies.

Second, the findings of this study identified the widespread omission in the review studies of a rationale for the use of MMR. Such a rationale is essential to inform the reader of what is to be gained from the integration of quantitative and qualitative data. Our recommendation to include a MMR question, objective, or rationale to be answered by the integration of the quantitative and qualitative data could highlight the value of using objective-driven mixed methods in research. A rationale would also highlight the usefulness and the merits of using MMR and, in turn, more APA researchers may be encouraged to engage with MMR as a way to provide depth to their inquiry that quantitative and qualitative research alone may not be

able to.

Moreover, this study aimed to identify the worldviews that guided researchers throughout the entire research process (i.e., ontology, epistemology, methodology, axiology, and rhetoric). Our finding on worldviews supported recent suggestions that these deeply rooted views and assumptions were seldom explicitly stated in MMR publications even if they had been discussed and reflected on during the research process (Creswell & Plano Clark, 2018). However, this scoping review identified that philosophical foundations (i.e., worldviews and theoretical framework) need to be explicitly presented in MMR studies. Consequently, we encouraged researchers to reflect on and explicitly identify the philosophical foundations of their research to help other researchers and academics gain a better understanding of how MMR studies can be situated in worldviews or guided by theoretical rationales, a topic that has often been discussed in MMR literature (e.g., Ghiara, 2020; Greene & Caracelli, 2003).

The findings of this scoping review also ascertained that the types of design used in the review studies rarely followed MMR guidelines and were often incompletely described. Consequently, we encouraged researchers to name the MMR design they used based on the intent of the design (i.e., exploratory, explanatory, convergent) as defined by the terminology used in contemporary scholarly texts and publication standards. As such, researchers who want to engage in MMR would be able to easily identify the design used in previous studies which, in turn, would facilitate the conception of future MMR studies in APA. It could also help identify exemplars of the MMR designs created and conducted in contemporary APA literature.

This review also identified that many researchers did not report their mixed-method results, thus suggesting that researchers were not always rigorous in the way they proceeded with the data integration. Consequently, we recommended researchers to be more explicit about how

the quantitative and qualitative data were integrated, state and explain the integration strategies used, and report the mixed-method results in the results section of publications. Robust data integration procedures represent an opportunity for researchers to identify comprehensive and holistic findings than quantitative and qualitative methods alone may be able to. As such, it may be possible to use MMR to investigate APA topics in unprecedented ways which could yield new and valuable findings.

The findings of this scoping review also identified that diverse populations were studied in APA with the use of MMR. Samples include participants with diverse age ranges and disabilities as well as other interrelated populations (e.g., parents, teachers, siblings, health professionals). We suggested that MMR could be valuable for APA researchers because it may counter some of the recruitment limitations often faced by researchers in APA, such as small sample sizes (Harvey et al., 2020). Further, we also recommended that researchers fully describe their participants by identifying all relevant demographic variables and present their results by highlighting individual differences.

The discussion of these issues is important to better comprehend the role MMR has played in the field of APA. Therefore, this study helps build the knowledge of MMR and provides a greater understanding of the underlying processes and the methodological strategies that have guided the approach in APA. It may encourage and empower APA academics and researchers to engage more confidently with MMR. MMR is a pragmatic, real-world approach that may expand the field of APA by providing rich, deep, and comprehensive answers to diverse applied research questions.

Limitations and Recommendations

This scoping review offers many important insights into MMR and provides valuable

strategies and recommendations for future research. Yet, some limitations should be addressed. First, some relevant studies may have been missed during the data collection process because of the choice of databases and search terms. Future research should expand the database search strategy to include more keywords related to specific disabilities. In addition, the process of screening and selecting studies could be performed by two independent reviewers to ensure a more impartial review of the studies. Hence, we also recommend reviewers establish a systematic screening strategy that involves the use of the software Rayyan as was done in this review to guard against this type of study limitation. Second, the scoping review included only published studies and excluded grey literature (i.e., reports, policy literature, conference proceedings, posters, etc.). Grey literature is often included in scoping reviews because it can provide data not found in published literature and, as such, it may increase the comprehensiveness of a review. Yet, the research team did not recommend the inclusion of grey literature due to the challenges related to the lack of search keywords that would have made this scoping review not feasible. Third, the age ranges of some of the review studies partially exceeded the delimitations that were set. For example, adults with a disability were also included in the sample of a few review studies. Hence, some data were included in this scoping review that were not exclusively related to children with a disability between the ages of 5 and 18 years. In such cases, the studies were included in the review if the average age of the sample was between 5 and 18 years. This approach helped increase the number of studies included in this review and provided a broader, potentially more complete, picture of the use of MMR in APA. Lastly, some of the review studies were designated as MMR on the basis of the research team's knowledge and expertise as well as MMR guidelines even though they were not originally identified as MMR by the study's authors. As such, some authors may disagree with the MMR

label that we attached to their study. This limitation highlights how challenging the identification of MMR can be which is why we encourage researchers to clearly identify the use of MMR in future publications.

In conclusion, this scoping review is among the first to explore the emergence of MMR as a research paradigm in the field of APA. It identified consistencies and inconsistencies between the review studies and the recommendations from MMR literature and publications guidelines. Thus, the scoping review illustrated how this developing research approach has been used in APA over the past two decades. Therefore, it expanded our understanding of the use of MMR in APA and allowed us to provide suggestions for future research to align with current methodological procedures, strategies, and standards related to MMR. Finally, the scoping review may encourage APA researchers to engage positively with MMR and develop new knowledge on all topics related to PA and individuals with disabilities.

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Appendix A

Table 1

Types of Mixed Methods Research Designs

Design type		Implementation sequence	Details
Sequential	Explanatory	QUANT → qual	Quantitative findings are explained or contextualized by the qualitative component
	Exploratory	QUAL → quant	Qualitative data are used to build a subsequent quantitative phase
	Transformative	QUANT → QUAL or QUAL → QUANT	Particular theoretical, critical or advocacy lens
Concurrent	Nested	QUANT + QUAL	To gather additional data regarding the main topic of interest or a subtopic
	Triangulation	QUANT + QUAL	To validate the findings from one method with another method
	Transformative	QUANT + QUAL	Particular theoretical, critical or advocacy lens

Note: Adapted from *Advanced mixed methods research design* by J. W. Creswell, V. L. Plano

Clark, M. L. Gutmann & W. E. Hanson, 2003, SAGE Publications, Inc.

Appendix B

Table 2
Database Search Strategy

Database	Keywords	
ERIC, Sports Medicine and Education Index, SPORTDiscus, Web of Science	(((“physical education” OR “motor skills” OR “object control” OR exercise OR “physical activity” OR sports OR “motor activity” OR recreation OR leisure) AND (“special needs” OR disability OR disabled OR disabilities OR impair* OR handicap* OR disorder* OR “cerebral palsy”) AND (child* OR student* OR adolescent* OR youth* OR kid* OR teen*)) OR (((“adapted physical activity” OR “adapted physical education”) AND (child* OR student* OR adolescent* OR youth* OR kid* OR teen*)))	
PsycINFO	• Physical Education • Motor Skills • Object Control (.mp*) • Exercise • Physical Activity • Recreation • Leisure (.mp) • Special Needs • Handicap (.mp)	• Disabilities • Impairment (.mp) • Disorders • Adapted Physical Activity (.mp) • Adapted Physical Education (.mp) • Child (.mp) • Youth (.mp) • Adolescent (.mp) • Students
MEDLINE	• Physical Education and Training • Motor Skills • Object Control (.mp) • Exercise • Sports • Physical Activity (.mp) • Recreation • Leisure Activities • Special Needs (.mp) • Handicap (.mp)	• Disabled Persons • Disabled Children • Impairment (.mp) • Disorder (.mp) • Adapted Physical Activity (.mp) • Adapted Physical Education (.mp) • Child • Youth (.mp) • Adolescent • Students
*.mp: Stands for multi-purpose. No subject heading was found. Searched as a keyword in the default field of the database.		

Appendix C

Table 3

Data Charting Categories

Main category	Subcategory
Publication information	Journal Year Country
Content area	Labels
Study objectives	Research question Hypothesis Purpose of the study Mixed methods research rationale Philosophical foundations
Mixed methods research design	Type of design Data collection Data analysis
Participants' information	Participants Sex Age range Disability
Data integration	Data integration – results Data integration – discussion Data integration – strategy
Research context	Intervention types Settings Inclusion/segregation

Appendix D

Table 4

Classification of Content Areas

Content area	Details
Physical education	Topics related to physical education, teachers, coaches or schools
Therapy	Topic related to clinically based therapeutic programs (physical therapy, sensory integration therapy, psychological therapy, etc.)
Inclusion	Topics related to the inclusion of individuals with disability into settings with neurotypical peers, disability awareness and acceptance
Assessment and measurement	Topics related to measurement instruments or disability classification
Biomechanics	Topics related to the mechanical aspects of the human body.
Exercise and physical activity	Topics related to exercise, physical activity levels, participation, accessibility, etc.
Motor behaviour/control/development	Topics related to the development and performance of movement skills
Psychosocial issues and behaviours	Topics related to psychological or social issues, behaviours and self-regulation
Other	Topics that cannot be categorized into any of the other content areas

Appendix E

Table 5

Categories of Disability

Category of disability	Details
Intellectual disability	IQ under 70 and deficits in at least two adaptative behaviours
Physical disability	Amputation, spinal injuries, muscular dystrophy, physical limitations, Duchenne muscular dystrophy
Cerebral palsy	Spastic, ataxic, dyskinetic and mixed cerebral palsy Diplegic, hemiplegic and quadriplegic cerebral palsy
Developmental Coordination Disorder/ Physical awkwardness	Including motor skill delays and motor problems
Autism Spectrum Disorders	Including Asperger syndrome, Rett syndrome and Childhood disintegrative disorder (Heller's syndrome)
Visual impairment	Including blindness
Hearing impairment	Deafness and hearing loss
Medical condition	Including heart diseases, multiple sclerosis, chronic obstructive pulmonary disease, cystic fibrosis, etc.
Emotional/behavioural disorder	Depression, eating disorders, conduct disorder, anxiety
Learning disability	Including dyslexia, dyscalculia and dysgraphia
Genetic disorders	Including Down syndrome, Duchenne muscular dystrophy, all chromosomal disorders
Attention-Deficit Hyperactivity Disorder	Including inattentive, hyperactive impulsive, and combined subtypes
Heterogeneous samples	Multiple populations of disabilities
Multiple disabilities	Participants with multiple disabilities
Other	Other type of disability
Not specified	No clear classification of disability

Appendix F

Table 6

Summary of Included Studies

Authors	Content area	Design type ^a	Participants	Data integration		Context
				Section	Strategy	
Adams et al. (2018)	Exercise and PA	MMR Sequential	Children (<i>n</i> = 9; M, 9-12 yrs, DCD) Physical therapists (<i>n</i> = 243) Parents (<i>n</i> = 9)	Discus.	Discus.	Non-intervention Various settings (inclu. & seg.)
Alexander et al. (2011)	Psychosocial issues and behaviours	N/A	Children (<i>n</i> = 4; M, 14-24 yrs, HS) Parents (<i>n</i> = 4)	Rslt & Discus.	Discus.	Intervention Various settings (segregated)
Armila et al. (2018)	Exercise and PA	Triangul. DM (QL)	Children (<i>n</i> = 48; M-F, 12-29 yrs, HS) PA practitioners (<i>n</i> = 16) Coaches (<i>n</i> = 15) Parents (<i>n</i> = 9)	Rslt & Discus.	Discus.	Non-intervention Community (inclusive)
Ayvazoglu et al. (2015)	Exercise and PA	MMR Triangul.	Children (<i>n</i> = 6; M-F, 4-13 yrs, ASD) Parents (<i>n</i> = 6) Siblings (<i>n</i> = unspecified)	Discus.	Discus. Transform.	Non-intervention Various settings (inclu. & seg.)
Ayvazoglu et al. (2006)	Exercise and PA	MMR Triangul.	Children (<i>n</i> = 6; M-F, 6-14 yrs, VI) Siblings (<i>n</i> = 6) Parents (<i>n</i> = 5)	Discus.	Discus. Transform. Matrix	Non-intervention Various settings (inclu. & seg.)
Belley-Ranger et al. (2016)	Psychosocial issues and behaviours	MMR	Children (<i>n</i> = 47; sex NS, preschool-21 yrs, HS) School personnel and parents (<i>n</i> = 49)	Rslt & Discus.	Discus.	Non-intervention School (inclusive)
Bildiren (2018)	Inclusion	N/A	<i>Pre/Post-test</i> Children (<i>n</i> = 45/46; sex NS, 2-7 yrs, HS) Parents (<i>n</i> = 60/51) Volunteer partners (<i>n</i> = 119/107)	Discus.	Discus.	Intervention School (inclusive)
Bremer & Lloyd (2016)	Motor behaviour/ control/develop.	MMR	Children (<i>n</i> = 5; M-F, 3-7 yrs, ASD) Teacher (<i>n</i> = 1)	Discus.	Discus.	Intervention School (segregated)
Brunes et al. (2017)	Exercise and PA	N/A	Children (<i>n</i> = 2; M-F, 12 and 23 yrs, VI)	Discus.	Discus.	Non-intervention Various settings (inclu. & seg.)

Authors	Content area	Design type ^a	Participants	Data integration		Context
				Section	Strategy	
Butler & Hodge (2004)	Inclusion	Triangul. DM (QL)	Children (<i>n</i> = 2; M-F, 13 yrs, HS) Peers (<i>n</i> = 16)	Rslt & Discus.	Discus.	Non-intervention School (inclusive)
Carter et al. (2014)	Exercise and PA	MMR DM (QL)	Children (<i>n</i> = 25; M-F, age NS, PD) Stakeholders (<i>n</i> = 14) Parents (<i>n</i> = 10) Siblings (<i>n</i> = 2)	Rslt & Discus.	Discus.	Non-intervention Community (inclusive)
Clapham et al. (2018)	Exercise and PA	N/A	Child (<i>n</i> = 1; M, 12 yrs, ASD) Mother (<i>n</i> = 1)	Discus.	Discus.	Intervention Other (beach) (segregated)
Esentürk & Gungor (2020)	Psychosocial issues and behaviours	MMR Sequential	Children (<i>n</i> = 8; sex NS, age NS, ID) Peers (<i>n</i> = 8) Teachers (<i>n</i> = 4)	Discus.	Discus. Transform.	Intervention School (inclusive)
Everhart et al. (2012)	Other (academic success)	N/A	Children (<i>n</i> = 7; sex NS, K-5 th grade, ID) Teachers (<i>n</i> = 2)	Discus.	Discus.	Intervention School (segregated)
Forseth et al. (2019)	Assessment and measurement	N/A	Children (<i>n</i> = 36; M-F, 4-18 yrs, HS) Parents (<i>n</i> = 36)	Discus.	Discus. Transform.	Non-intervention Various settings (inclu. & seg.)
Fragala-Pinkham et al. (2010)	Exercise and PA	N/A	Children (<i>n</i> = 16; M-F, 6-11 yrs, HS) Parents (<i>n</i> = unspecified) Pool administrators (<i>n</i> = 2)	Discus.	Discus.	Intervention Community (segregated)
Gaintza & Castro (2020)	Inclusion	MMR Triangul.	Children (<i>n</i> = 1; M, 14 yrs, GD) Peers (<i>n</i> = 48) Teacher (<i>n</i> = 1)	Discus.	Discus.	Non-intervention School (inclusive)
Harrison et al. (2004)	Therapy	N/A	Children (<i>n</i> = 48; M-F, 4-12 yrs, ADHD) Parents (<i>n</i> = 61)	Rslt & Discus.	Discus.	Intervention Various settings (segregated)
Harvey et al. (2009)	Exercise and PA	MMR Sequential Triangul. DM (QL)	Children (<i>n</i> = 6; M, 9-12 yrs, ADHD) Peers (<i>n</i> = 6)	Rslt & Discus.	Discus. Transform. Matrix	Non-intervention Clinic (segregated)
Harvey et al. (2014)	Exercise and PA	MMR Sequential Triangul. DM (QL)	Children (<i>n</i> = 10; M-F, 9-12 yrs, ADHD)	Discus.	Discus. Transform.	Non-intervention Clinic (segregated)
Hinckson et al. (2013)	Exercise and PA	N/A	Children (<i>n</i> = 17; M-F, <i>M</i> = 14 yrs, HS) Parents, teachers (<i>n</i> = unspecified)	Discus.	Discus. Transform.	Intervention School (segregated)

Authors	Content area	Design type ^a	Participants	Data integration		Context
				Section	Strategy	
Hind et al. (2017)	Therapy	MMR Concurrent Triangul. DM (QT)	Children (<i>n</i> = 12; M, 7-16 yrs, GD) Parents (<i>n</i> = 8) Health professionals (<i>n</i> = 8)	Discus.	Discus. Matrix	Intervention Clinic (segregated)
Howells et al. (2019)	Exercise and PA	MMR Triangul.	Children (<i>n</i> = 15; M-F, 5-11 yrs, HS) Parents (<i>n</i> = 15)	Discus.	Discus.	Intervention Various settings (segregated)
Howie et al. (2017)	Therapy	MMR Triangul.	Children (<i>n</i> = 21; M-F, 10-12 yrs, DCD) Parents (<i>n</i> = unspecified)	Discus.	Discus. Matrix	Intervention Home (segregated)
Jaarsma et al. (2015)	Exercise and PA	MMR Triangul. DM (QT)	Children (<i>n</i> = 30; M-F, 8-20 yrs, HS) Parents (<i>n</i> = 38) Teachers, health professionals (<i>n</i> = 17)	Rslt & Discus.	Discus.	Non-intervention School (segregated)
Kemeny & Arnhold (2012)	Exercise and PA	MMR	Children (<i>n</i> = 660; M-F, 4-29 yrs, HS) Adults (<i>n</i> = 1,006)	Discus.	Discus.	Intervention Community (segregated)
Klavina et al. (2014)	Psychosocial issues and behaviours	MMR	Children (<i>n</i> = 4; M, 7-10 yrs, HS) Peers (<i>n</i> = 37) Teachers (<i>n</i> = unspecified)	Discus.	Discus.	Intervention School (inclusive)
Kolehmainen et al. (2015)	Exercise and PA	MMR DM (QT)	Children (<i>n</i> = 195; sex NS, 6-8 yrs, DCD) Parents (<i>n</i> = 152) Therapists (<i>n</i> = unspecified)	Rslt & Discus.	Discus. Transform. Matrix	Non-intervention Various settings (inclu. & seg.)
Kozub (2003)	Exercise and PA	Triangul.	Children (<i>n</i> = 7; M-F, 13-25 yrs, ID) Parents (<i>n</i> = 7)	Discus.	Discus.	Non-intervention Various settings (inclu. & seg.)
Lieberman et al. (2012)	Physical education	N/A	Children (<i>n</i> = 26; sex NS, 6-19 yrs, GD) ^b Parents (<i>n</i> = 26)	Rslt & Discus.	Discus.	Non-intervention School (inclu. & seg.)
Lieberman & MacVicar (2003)	Exercise and PA	N/A	Children (<i>n</i> = 54; M-F, 3-22 yrs, deaf-blind) Parents (<i>n</i> = 51)	Discus.	Discus. Transform.	Non-intervention Various settings (inclu. & seg.)
Lieberman et al. (2006)	Exercise and PA	N/A	Children (<i>n</i> = 22; M-F, 9-13 yrs, deaf-blind)	Discus.	Discus.	Non-intervention Camp (segregated)
Lloyd et al. (2006)	Psychosocial issues and behaviours	Concurrent Triangul.	Children (<i>n</i> = 10; M, 10-12 yrs, DCD) Peers (<i>n</i> = 10)	Discus.	Discus. Transform.	Non-intervention School (segregated)

Authors	Content area	Design type ^a	Participants	Data integration		Context
				Section	Strategy	
Lodal & Bond (2017)	Motor behaviour/control/develop.	MMR Sequential	Children (<i>n</i> = 4; M, 7-10 yrs, DCD) Teacher (<i>n</i> = 1) Group leader (<i>n</i> = 1)	Discus.	Discus.	Intervention School (segregated)
Lyon et al. (2009)	Exercise and PA	N/A	Children (<i>n</i> = 42; sex NS, 4-17 yrs, HS) ^b Parents (<i>n</i> = 42)	Discus.	Discus.	Intervention Community (inclusive)
Mak et al. (2019)	Therapy	MMR	Children (<i>n</i> = 42; M-F, 6-16 yrs, CP) Parents (<i>n</i> = 42)	Rslt & Discus.	Discus.	Intervention Various settings (segregated)
Maring et al. (2013)	Therapy	MMR	Children (<i>n</i> = 30; M-F, 9-17 yrs, CP) ^b Parents (<i>n</i> = 30)	Rslt & Discus.	Discus.	Non-intervention Clinic (segregated)
Martin et al. (2020)	Therapy	MMR Triangul.	Children (<i>n</i> = 32; sex NS, 5-17 yrs, HS) Parents (<i>n</i> = 29) Therapeutic horse riding providers (<i>n</i> = 16)	Rslt & Discus.	Discus.	Intervention Other (segregated)
May et al. (2018)	Exercise and PA	N/A	<i>Phase 1</i> Children (<i>n</i> = 15; M, 4-7 yrs, ASD) Parents (<i>n</i> = 15) <i>Phase 2</i> Children (<i>n</i> = 13; M, 4-11 yrs, ASD)	Discus.	Discus.	Intervention Community (segregated)
Milligan et al. (2015)	Psychosocial issues and behaviours	N/A	Children (<i>n</i> = 7; M-F, 12-17 yrs, LD) Parents (<i>n</i> = 5)	Rslt & Discus.	Discus. Transform.	Intervention Various settings (segregated)
Miyahara & Wafer (2004)	Therapy	N/A	Children (<i>n</i> = 7; M-F, 5-8 yrs, DCD) Fourth-year undergraduate students (<i>n</i> = 7)	Rslt & Discus.	Discus.	Intervention Clinic (segregated)
Obrusnikova & Cavalier (2011)	Exercise and PA	N/A	Children (<i>n</i> = 12; M-F, 8-14 yrs, ASD) Parents (<i>n</i> = unspecified)	Rslt & Discus.	Discus. Transform.	Intervention Various settings (inclu. & seg.)
Oguzhan, & Hunuk (2017)	Physical education	Triangul.	Children (<i>n</i> = 7; M-F, 6th graders, HS) Peers (<i>n</i> = 5) Teacher (<i>n</i> = 1)	Rslt & Discus.	Discus.	Intervention School (inclusive)
Oladunni et al. (2015)	Exercise and PA	N/A	Children (<i>n</i> = 120; M-F, 10-27 yrs, HS) Teachers (<i>n</i> = 6) Principals (<i>n</i> = 6)	Discus.	Discus.	Non-intervention School (segregated)
Oriel et al. (2018)	Exercise and PA	MMR	Children (<i>n</i> = 10; M-F, 10-18 yrs, ASD) Parents (<i>n</i> = 8)	Not integrated	Not integrated	Intervention Community (segregated)

Authors	Content area	Design type ^a	Participants	Data integration		Context
				Section	Strategy	
Qi & Wang (2018)	Psychosocial issues and behaviours	MMR Triangul.	Children (<i>n</i> = 3; M, 13-14 yrs, HS) Peers (<i>n</i> = 42) Teacher (<i>n</i> = 1)	Rslt & Discus.	Discus.	Non-intervention School (inclusive)
Rivera et al. (2020)	Psychosocial issues and behaviours	MMR	Children (<i>n</i> = 25; M-F, 8-17 yrs, ASD) Parents (<i>n</i> = 25)	Discus.	Discus. Transform.	Intervention Clinic (segregated)
Roult et al. (2014)	Exercise and PA	N/A	Children (<i>n</i> = 10; sex NS, primary and secondary school age, PD) School administrators (<i>n</i> = 16) Teachers (<i>n</i> = 18) Parents (<i>n</i> = 8)	Discus.	Discus.	Non-intervention School (inclusive)
Sands et al. (2019)	Physical education	MMR Triangul.	Children (<i>n</i> = 8; M-F, 12-14 yrs, HS) Peers (<i>n</i> = 8) Teachers (<i>n</i> = 2)	Discus.	Discus.	Intervention School (inclusive)
Sangster Jokić & Whitebread (2016)	Psychosocial issues and behaviours	MMR	Children (<i>n</i> = 15; M-F, 7-8 yrs, DCD)	Rslt & Discus.	Discus.	Intervention School (segregated)
Scally & Lord (2019)	Exercise and PA	MMR	Children (<i>n</i> = 53; M-F, 5-15 yrs, VI) Family members (<i>n</i> = unspecified)	Rslt & Discus.	Discus. Transform.	Intervention Home (segregated)
Shields et al. (2019)	Exercise and PA	Triangul.	Children (<i>n</i> = 19; M-F, 13-30 yrs, HS) Parents (<i>n</i> = 8)	Rslt & Discus.	Discus.	Intervention Community (segregated)
Tzanetakos et al. (2017)	Motor behaviour/ control/develop.	N/A	Children (<i>n</i> = 10; M-F, 17-19 yrs, HI) Parents (<i>n</i> = 5) Instructors (<i>n</i> = 5)	Discus.	Discus.	Intervention School (segregated)
Vertes et al. (2014)	Therapy	N/A	Children (<i>n</i> = 43; M-F, 5-12 yrs, sensory processing disorder) ^c Parents (<i>n</i> = 43)	Discus.	Discus.	Intervention Clinic (segregated)
Wakely et al. (2018)	Exercise and PA	MMR	Children (<i>n</i> = 34; M-F, 5-18 yrs, HS) ^b Parents (<i>n</i> = 34)	Discus.	Discus.	Non-intervention Various settings (inclu. & seg.)
Walker et al. (2020)	Exercise and PA	N/A	Children (<i>n</i> = 7; M-F, 14-21 yrs, CP) Parents (<i>n</i> = 8)	Discus.	Discus.	Intervention Various settings (inclu. & seg.)
Weightman et al. (2010)	Therapy	MMR Sequential	Children (<i>n</i> = 15; M-F, 5-12 yrs, CP) Peers (<i>n</i> = 37) Parents (<i>n</i> = 9)	Discus.	Discus.	Intervention Various settings (segregated)

Authors	Content area	Design type ^a	Participants	Data integration		Context
				Section	Strategy	
Wiat et al. (2015)	Exercise and PA	N/A	Children ($n = 13$; sex NS, 7-17 yrs, HS) ^b Representatives of fitness facilities ($n = 61$) Parents ($n = 13$)	Discus.	Discus.	Non-intervention Community (inclusive)
Willis et al. (2018)	Exercise and PA	MMR Triangul.	Children ($n = 92$; M-F, 6-17 yrs, HS) Parents ($n =$ unspecified)	Discus.	Discus. Transform.	Intervention Clinic (segregated)
Wingo et al. (2020)	Exercise and PA	MMR	Children ($n = 65$; M-F, 6-17 yrs, HS) Parent ($n = 65$)	Discus.	Discus.	Intervention Various settings (segregated)
Wright et al. (2004)	Psychosocial issues and behaviours	Triangul.	Children ($n = 5$; M, 4-11 yrs, CP) Physicians ($n = 2$) Therapists ($n = 2$) Parents ($n = 5$)	Rslt & Discus.	Discus.	Intervention Clinic (segregated)
Young et al. (2020)	Motor behaviour/ control/develop.	MMR Triangul.	Children ($n = 19$; M-F, 2-6 yrs, GD) Parents ($n = 19$)	Discus.	Discus.	Intervention School (segregated)
Zhao & Chen (2018)	Psychosocial issues and behaviours	Triangul. DM (QT)	Children ($n = 50$; M-F, 5-8 yrs, ASD) Teachers, parents, volunteers ($n =$ unspecified)	Discus.	Discus.	Intervention School (segregated)
Zwicker (2015)	Therapy	MMR	Children ($n = 11$; M-F, 7-12 yrs, DCD) Parents ($n = 9$)	Rslt & Discus.	Discus.	Intervention Camp (segregated)

Notes. ADHD: attention-deficit hyperactivity disorder; ASD: autism spectrum disorder; CP: cerebral palsy; DCD: developmental

coordination disorder; Discus.: discussion; DM: dominant method; F: female; GD: genetic disorder; HI: hearing impairment; HS:

heterogeneous sample; ID: intellectual disability; LD: learning disability; M: male; MMR: mixed methods research; N/A: not

available; PA: physical activity; PD: physical disability; QL: qualitative; QT: quantitative; Rslt.: results; Transform.: data

transformation; Triangul.: triangulation; VD: visual impairment.

^a Design as identified by the original authors of the study.

^b Did not provide data in this study.

Appendix G

Table 7*Publication Information*

Subcategory	Details	<i>n</i>	%
Journal	<i>Adapted Physical Activity Quarterly</i>	4	6.3
	<i>Disability and Health Journal</i>	3	4.7
	<i>Disability and Rehabilitation</i>	3	4.7
	<i>Education and Training in Autism and Developmental Disabilities</i>	3	4.7
	<i>Journal of Visual Impairment and Blindness</i>	3	4.7
	<i>Physical and Occupational Therapy in Pediatrics</i>	3	4.7
	<i>Research in Developmental Disabilities</i>	4	6.3
Years	2003–2005	6	9.4
	2006–2010	7	10.9
	2011–2015	19	29.6
	2016–2020	32	50
Country	Australia	8	12.5
	Canada	9	14.1
	New Zealand	3	4.7
	The Netherlands	3	4.7
	Turkey	3	4.7
	United Kingdom	7	10.9
	United States of America	23	35.9

Note. Only journals and countries with more than two publications were included in the Journal and Country subcategories of this table.

Appendix H

Table 8

Content Areas

Subcategory	Details	<i>n</i>	%
Labels	Assessment and measurement	1	1.6
	Biomechanics	0	0
	Exercise and physical activity	31	48.4
	Inclusion	3	4.7
	Motor behaviour/control/development	4	6.3
	Other	1	1.6
	Physical education	3	4.7
	Psychosocial issues and behaviours	11	17.2
	Therapy	10	15.6

Table 9

Study Objectives

Subcategory	Details	<i>n</i>	%
Research question	Present	15	23.4
	Not present	49	76.6
Hypothesis	Provided	7	10.9
	Not provided	57	89.1
Purpose of the study	Clearly formulated with quantitative and qualitative objectives	43	67.2
	Clearly formulated with quantitative objective	1	1.6
	Clearly formulated with qualitative objective	5	7.8
	Clearly formulated without quantitative and qualitative objectives	15	23.4
	Not clearly formulated	0	0
Rationale	Provided	18	28.1
	Not provided	46	71.9
Theoretical rationale	Specified	24	37.5
	Not specified	40	62.5

Appendix I

Table 10*Identification of Research Design*

Subcategory	Details	<i>n</i>	%
Mixed methods research	Identified (mixed methods research)	33	51.6
	Identified (quantitative or qualitative design)	1	1.6
	Not identified	30	46.9
Implementation sequence	Specified (sequential)	4	6.3
	Specified (concurrent)	4	6.3
	Not specified	56	87.5
Dominant method	Identified (quantitative)	4	6.3
	Identified (qualitative)	5	7.8
	Not identified	55	85.9
Triangulation	Triangulated data or results	22	34.4
	Not triangulated data or results	42	65.6
Interviews	Children only	9	14.1
	Children and others	16	25.0
	Others only	25	39.1
	No interviews	14	21.9

Appendix J**Table 11***Participants' Information*

Subcategory	Details	<i>n</i>	%
Participants	Children	5	7.8
	Children and parents	24	37.5
	Children and peers	2	3.1
	Children and teachers	10	15.6
	Children and various adults	17	26.6
	No children	6	9.4
Age range	Children (5–12 years)	29	45.3
	Adolescents (13–18 years)	12	18.8
	School-age children (5–18 years)	21	32.8
	Not specified	2	3.1
Sex	Majority male	33	51.6
	Only male	12	18.8
	Majority female	7	10.9
	Only female	0	0
	Even number of males and females	2	3.1
	Not specified	10	15.6
Disability	Attention-deficit hyperactivity disorder	3	4.7
	Autism spectrum disorders	8	12.5
	Cerebral palsy	5	7.8
	Developmental coordination disorder/Physical awkwardness	8	12.5
	Emotional/behavioural disorder	0	0
	Genetic disorders	3	4.7
	Hearing impairment	1	1.6
	Heterogeneous samples	23	35.9
	Intellectual disability	3	4.7
	Learning disability	2	3.1
	Medical condition	0	0
	Multiple disabilities	2	3.1
	Other	1	1.6
	Physical disability	2	3.1
	Visual impairment	3	4.7
	Not specified	0	0

Appendix K

Table 12

Data Integration

Subcategory	Details	<i>n</i>	%
Data integration – results	Integrated	23	35.9
	Not integrated	41	64.1
Data integration – discussion	Integrated	63	98.4
	Not integrated	1	1.6
Data integration – strategy	Narrative discussion	46	71.9
	Narrative discussion and joint display	2	3.1
	Narrative discussion and data transformation	12	18.8
	Narrative discussion, data transformation, and joint display	3	4.7
	Not integrated	1	1.6

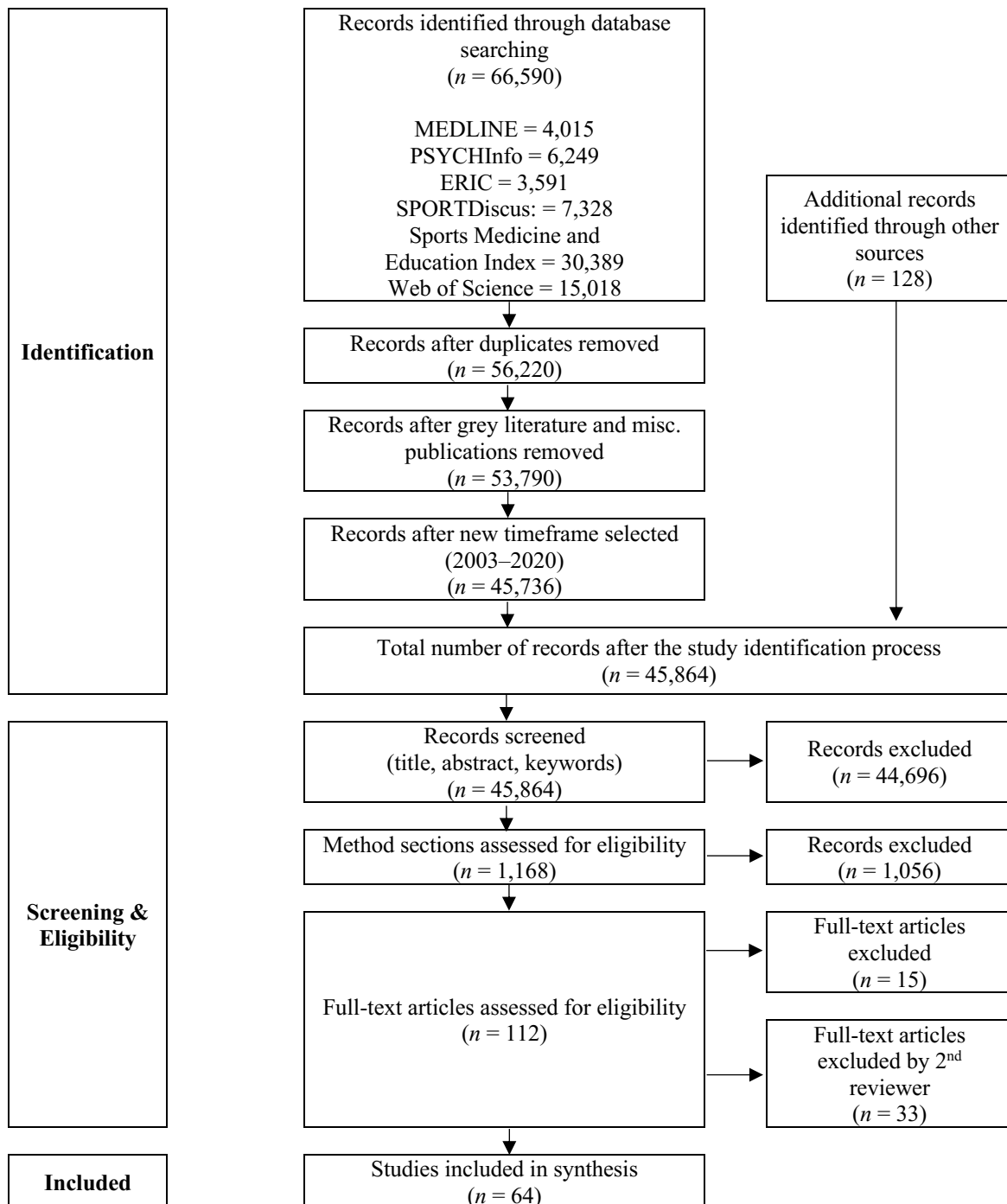
Table 13

Research Context

Subcategory	Details	<i>n</i>	%
Intervention	Intervention	39	60.9
	Non-intervention	25	39.1
Setting	Camp	2	3.1
	Clinic, hospital, university	9	14.1
	Community	9	14.1
	Home	2	3.1
	Multiple settings	18	28.1
	Other	2	3.1
	School	22	34.4
Inclusion/Segregation	Inclusive	14	21.9
	Segregated	38	59.4
	Inclusive and segregated	12	18.8

Appendix L

Figure 1

Flow Diagram of the Study Selection Process

Appendix M**Figure 2***Mixed Methods Research Studies in Adapted Physical Activity*