THROUGH THE LOOKING GLASS: THE LOCKER ROOM EXPERIENCE OF PERSONS WITH AUTISM SPECTRUM DISORDER - A SCOPING REVIEW

Sandrine Charlotte Servant B.A. Hons.

Department of Kinesiology and Physical Education

McGill University, Montréal

August 2024

Table of Contents

Abstract

The anxiety associated with public locker rooms has proven to be one of the most substantive barriers to engagement in sports and physical exercise for individuals with autism spectrum disorder (ASD) (Haegele & Maher, 2022). However, little is known about existing and potential accommodations to help improve the locker room experience for individuals with ASD. This presents a troubling dichotomy. On the one hand, exercise has been shown to generate improvements for individuals with ASD with regards to emotional regulation and reducing episodes of aggression and rage (Sowa & Meulenbroek, 2012; Tse, 2020). On the other hand, the unpredictability of locker rooms (e.g., new people, nude bodies, uncertainty locker availability, etc.) renders engaging in regular physical activity difficult for individuals with ASD (Dowdy & Tincani, 2020), especially for those without a home gym or other resources to help relieve this situational anxiety. This scoping review examined the locker room experience for individuals with ASD. The review was guided by the following question: What are the experiences of individuals with ASD within the locker room environment? The primary methodology for this thesis was a formal scoping review of the existing literature on locker rooms and ASD following the six-step framework laid out by Arksey and O'Malley (2005). A search strategy was developed and used to search a total of six academic electronic databases: PsycINFO, EBSCO(ERIC), Sport Medicine & Education Index, MEDLINE, SportDiscus, and Web of Science. Additionally, topical journals in the field of psychology and adapted physical activity were hand-searched and relevant articles were used for citation chasing. The search was conducted by the principal investigator (PI), Sandrine Charlotte Servant, on June 10th, 2024. Screening and data extraction was performed by the PI and reviewed by Dr. Jordan Koch. Out of 1,151 studies, 13 were selected for this scoping review because they focused on the experiences of individuals with ASD in locker room settings. Two trends emerged: (i) most of the studies were conducted in the context of physical education class and (ii) most of the participants in these studies reported negative perceptions of the locker room environment. Both trends deterred physical activity participation among individuals with ASD. The thematic analysis showed that individuals with ASD experienced anxiety, physical vulnerability, and insecurity in locker room environments, leading to their avoidance. By synthesizing subjects' ASD diagnoses, comorbid characteristics, and locker room context, this scoping review identified the challenges and opportunities within locker rooms for individuals with ASD across: (i) sensory and environmental domains, (ii) supervision and structural elements, and (iii) social interactions and implicit rules within the locker room. This thesis project expands on existing scholarship about ASD and provides a framework for a full systematic review in the future (Michaud, 2021). The findings can also be used to guide decision-making about creating more inclusive spaces for the ASD community beyond the locker room.

Résumé

L'anxiété associée aux vestiaires est l'un des obstacles les plus importants à la pratique du sport et de l'exercice physique pour les personnes ayant un trouble du spectre de l'autisme (TSA) (Haegele & Maher, 2022). Cependant, on sait peu de choses sur les aménagements existants et potentiels pour aider à améliorer l'expérience des vestiaires pour les personnes ayant un TSA. Ceci présente une dichotomie troublante. D'une part, il a été démontré que l'exercice physique génère des améliorations pour les personnes ayant un TSA en ce qui concerne la régulation émotionnelle et la réduction des épisodes d'agression et de rage (Sowa & Meulenbroek, 2012 ; Tse, 2020). D'autre part, l'imprévisibilité des vestiaires (par exemple, de nouvelles personnes, des corps nus, l'incertitude quant à la disponibilité des casiers, etc.) rend difficile la pratique régulière d'une activité physique pour les personnes ayant un TSA (Dowdy & Tincani, 2020), en particulier pour celles qui n'ont pas de salle de sport à domicile ou d'autres ressources pour aider à soulager cette anxiété situationnelle. Cette revue exploratoire a examiné l'expérience des vestiaires pour les personnes ayant un TSA. La revue a été guidée par la question suivante : Quelles sont les expériences des personnes ayant un TSA dans l'environnement des vestiaires ? La principale méthodologie de cette thèse a été une revue exploratoire formelle de la littérature existante sur les vestiaires et les TSA, suivant le cadre en six étapes définies par Arksey et O'Malley (2005). Une stratégie de recherche a été développée et utilisée pour rechercher un total de six bases de données électroniques universitaires : PsycINFO, EBSCO(ERIC), Sport Medicine & Education Index, MEDLINE, SportDiscus et Web of Science. En outre, des revues spécialisées dans le domaine de la psychologie et de l'activité physique adaptée ont été consultées manuellement et des articles pertinents ont été utilisés pour la recherche de citations. La recherche a été menée par l'investigateur principal (IP), Sandrine Charlotte Servant, le 10 juin 2024. La sélection et l'extraction des données ont été effectuées par l'IP et revues par le Dr Jordan Koch. Sur 1 151 études, 13 ont été sélectionnées pour cette revue exploratoire parce qu'elles portaient sur les expériences des personnes ayant un TSA dans les vestiaires. Deux tendances se sont dégagées : (i) la plupart des études ont été menées dans le contexte des cours d'éducation physique et (ii) la plupart des participants à ces études ont fait état de perceptions négatives de l'environnement des vestiaires. Ces deux tendances ont dissuadé les personnes ayant un TSA de participer à des activités physiques. L'analyse thématique a montré que les personnes ayant un TSA éprouvaient de l'anxiété, une vulnérabilité physique et de l'insécurité dans les vestiaires, ce qui les conduisait à les éviter. En synthétisant les diagnostics de TSA des sujets, les caractéristiques comorbides et le contexte des vestiaires, cette revue exploratoire a identifié les défis et les opportunités au sein des vestiaires pour les personnes ayant un TSA à travers : (i) les domaines sensoriels et environnementaux, (ii) la supervision et les éléments structurels, et (iii) les interactions sociales et les règles implicites au sein des vestiaires. Ce projet de thèse approfondit les connaissances existantes sur le TSA et fournit un cadre pour une revue systématique complète à l'avenir (Michaud, 2021). Les résultats peuvent également être utilisés pour guider la prise de décision concernant la création d'espaces plus inclusifs pour la communauté TSA au-delà des vestiaires.

Acknowledgements

I would like to thank the individuals listed below, whose contributions were invaluable to the completion of this thesis:

- Firstly, I would like to thank my supervisor, Dr. Jordan Koch, for his support and expert guidance throughout this journey. His willingness to take a chance on me and his trust in my abilities have been instrumental to the success of this thesis.
- Secondly, I would like to thank my committee members, Dr. William Harvey and Dr. Shane Sweet, for their thoughtful feedback and valuable suggestions throughout the development of this thesis.
- Thirdly, I would like to thank Veronica Bergsten, the librarian for the Department of Kinesiology and Physical Education, for her assistance. Her expertise was instrumental in navigating this scoping review.
- I would also like to thank my peers from the EPHECS and CHAMPS labs for their friendship, advice, and guidance throughout this endeavour.
- Finally, to my family, thank you for your love and support throughout this academic journey. And to my boyfriend, Steven, thank you for your help, guidance and support throughout these two years. It would not have been possible without you.

Contribution of Authors

The primary author and principal investigator of this thesis is Sandrine C. Servant.

The thesis was completed under the supervisor of Dr. Jordan Koch. The thesis supervisory committee is composed of Dr. William Harvey and Dr. Shane Sweet.

The first three chapters (Introduction, Literature Review, Methodology) were authored by Sandrine C. Servant, with Dr. Jordan Koch contributing the editorial review. During the colloquium, the chapters were reviewed by Drs. William Harvey and Shane Sweet who offered valuable feedback. Their recommendations were carefully considered, and appropriate adjustments were made in line with their suggestions.

The last three chapters (Results, Discussion, Summary) were authored by Sandrine C. Servant, with Dr. Jordan Koch contributing the editorial review.

List of Figures & Tables

List of Abbreviations

APA : Adapted Physical Activity

ASD = Autism Spectrum Disorder

PA = Physical Activity

PE = Physical Education

PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PRISMA-ScR = PRISMA: Extension for Scoping Reviews

TSA = Trouble du Spectre de l'Autisme

Chapter 1

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by difficulties engaging in social situations, along with restricted and repetitive patterns of behaviour, interests, and activities (Lord et al., 2020). However, as the name implies, ASD manifests along a spectrum, with varying symptoms that manifest at differing levels of severity for everyone (Uljarević et al., 2017). In some cases, ASD may have a profound impact on one's cognitive, emotional, and behavioural functioning, rendering it more challenging for individuals with ASD to live in a neurotypical environment (Lai et al., 2020). Furthermore, hyper-reactivity to sensory and social stimuli is common among individuals with ASD and may contribute to feelings of alienation, exclusion, loneliness, and vulnerability in various environments, particularly communal spaces such as public changerooms or locker rooms (Hazen et al., 2014; Kasari & Sterling, 2013; White & Robertson-Nay, 2009). In addition to struggling with everyday social scenarios, individuals with ASD also face other significant challenges in understanding and thriving within their social environment (Carter et al., 2005). For example, they often experience psycho-emotional symptoms like generalized anxiety, depression, and obsessive behaviours, which are tied to rigid, inflexible, and ritualistic behaviours, making it extremely challenging to engage in social and community-based activities (Seltzer et al. 2003; Solomon et al., 2012).

Research has shown that regular physical activity offers many benefits for individuals with ASD. Not unlike neurotypical persons, individuals with ASD can experience improved physical health and well-being through regular physical activity. For example, regular physical activity has been shown to improve motor skills, thus leading to enhanced coordination, strength, and body awareness, including in individuals with ASD (Healy et al., 2018; Sowa & Meulenbroek, 2012).

Furthermore, physical activity has also been linked to positive behavioural changes that are particularly impactful for individuals with ASD. These include enhanced social interaction skills, which can be challenging to navigate for individuals with ASD, and reduced engagement in stereotypic repetitive movements (Ferreira et al, 2019). Huang et al. (2020) conducted a meta-analysis of the effects of physical activities on children and adolescents with ASD. They concluded that tailored physical activity programs significantly increased their social and communication skills. The meta-analysis further suggested that incorporating regular physical activity into the lives of individuals with ASD can enhance their overall health and well-being, resulting in an overall improved quality of life (Huang et al., 2020).

The potential benefits of regular physical activity for individuals with ASD present an interesting dilemma for both researchers and other members of the ASD community: On the one hand, individuals with ASD who engage in aerobic and anaerobic exercise exhibit improved cognitive and emotional function, most notably by way of fewer episodic lapses in emotional regulation marked by aggression and loss of control (Elliot et al.,1994; Sowa & Meulenbroek, 2012; Tse, 2020). However, on the other hand, individuals with ASD often experience extreme anxiety when entering communal spaces associated with physical activity, such as changing room or locker rooms spaces with new/foreign bodies, bright sounds and strong smells, and other unpredictable variables, e.g., whether a specific locker will be vacant (Dowdy & Tincani, 2020). The potentially alienating variables associated with these spaces are even more pronounced among lower socio-economic demographics who typically do not have access to a home gym or other resources to help relieve this situational anxiety, e.g., a private support worker, private changing rooms, or membership at a private health club with assigned lockers. Consequently, researchers have flagged the locker room itself as one of the most substantive barriers to physical activity for

individuals with ASD (Haegele & Maher, 2022). It is important to note, however, that the challenges of locker rooms extend far beyond the ASD community and may impact various communities, such as LGBTQIA++ individuals and individuals from diverse cultural or religious backgrounds who may face discrimination or exclusion in this space (Herrick & Duncan, 2023).

Adapting social environments to suit the needs of individuals with ASD better is a pressing concern among the ASD community, especially given the challenges reportedly encountered when navigating social environments that involve interpersonal relationships or that require clear communication and boundary setting (Zwilling & Levy, 2022). Despite these concerns, limited research has been conducted on the existing and potential accommodations that could improve the locker room environment for individuals with ASD. Much of the research appears only as secondary observations within more extensive studies focused on adapting schools and other settings, e.g., the swimming pool (Dowdy & Tincani, 2020; Lawson et al., 2019). In fact, while numerous studies have examined the challenges encountered within physical education classes, few studies have addressed the barriers posed by locker rooms themselves (Yu, et al., 2022.) While many studies have recognized the locker room as a challenge for individuals with ASD, it has seldom been thoroughly investigated. In light of this gap in the literature, this thesis seeks to gather and analyze all existing scientific literature on the experiences of individuals with ASD in locker rooms. The goal is to pinpoint obstacles and propose practical solutions to improve accessibility.

Purpose of the Study

The purpose of this study was to gather and analyze scholarly literature on the experience of locker rooms for individuals with ASD. The review emphasized the barriers and practical adaptations to improve accessibility. The following question guided my examination:

1. What are the experiences of individuals with ASD in the locker room environment?

These experiences were further analyzed by considering the following two questions:

1. What are the triggers in the locker room for individuals with ASD?
2. What can be done to improve their experiences?

To address these questions, I conducted a scoping review of the scholarly literature to explore the connection between locker rooms and individuals with ASD. This involved looking at a wide range of studies, including qualitative and quantitative research, case studies, and mixed-methods studies from various academic fields such as education, psychology, architecture, and kinesiology. This kind of review allowed me to thoroughly examine the existing research on this topic, identifying areas that need further study and guiding future research efforts.

Specifically, I followed Arksey and O'Malley's (2005) framework for conducting scoping reviews. This six-step framework has been widely credited as a systematic approach to exploring the literature and identifying gaps in knowledge (Colquhoun et.al., 2014; Michaud, 2021). The framework consists of the following six sequential steps:

1. Identifying and formulating research questions that guide a scoping review.
2. Identifying the relevant studies within the literature.
3. Selecting studies based on relevant criteria.
4. "Charting" or organizing data from the selected studies to lay the groundwork for subsequent analysis.
5. Consolidating, summarizing, and reporting results for thematic analysis.
6. Consulting selected stakeholders and community members to enhance the review with real-world experience.

Following current best practices in systematic reviews and meta-analyses and explicitly following the recommendations outlined by Peters et al. (2020), the present work uses a version of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines adapted specifically for scoping reviews known as the PRISMA-ScR (Tricco et al., 2018). PRISMA guidelines are reporting standards that ensure consistency and transparency in how researchers conduct systematic reviews. These guidelines help to ensure that all the relevant information is included in a systematic review, making it easier for readers to understand and evaluate the findings. PRISMA and the PRISMA-ScR guidelines for scoping reviews will be discussed further in Chapter III – Methodology.

Significance of the Study

This study provides important insight into both the triggers and potential adaptations that may be pursued to improve the locker room experience for individuals with ASD. On a personal note, my motivation for this work stems from a strong desire to help loved ones and others within the ASD community to live healthier and fuller lives by reducing the emotional taxation associated with communal spaces such as locker rooms. Recent studies have shown that adapting environments to support the needs of individuals with ASD can lead to a more authentic expression of their abilities (Courchesne et al., 2019; Fein, 2020). My study hopes to build on these critical insights while also helping to determine (a) whether a full systematic review of the literature is warranted and (b) future research questions that might be asked to help guide additional scholarly research on adapted physical activity.

Chapter 2

Literature Review

This chapter explores research highlighting the relationship between ASD, physical activity, and the locker room environment. I have organized the chapter into three sections. In section 2.1, I draw upon the ASD literature to explain the diagnostic criteria and the implications of living on the spectrum throughout various stages of life. In section 2.2, I explore the scholarship on adapted physical activity to demonstrate the potential impacts of physical activity on the daily lives of individuals with ASD. Finally, in section 2.3, I review the distinctions between scoping and systematic reviews. The scoping review methodology was chosen for this study because it allows for the thorough exploration of the literature on the locker room experience for individuals with ASD. Crucially, this methodology will offer an overview of the literature on ASD and locker rooms, leading to a better understanding of the current situation and potentially establishing the need for a systematic review.

2.1 Autism Spectrum Disorder

ASD is a neurodevelopmental condition that shapes how a person views, interprets, and navigates the world. The most common behaviours associated with ASD include difficulty engaging in social interactions as well as repetitive sensory-motor behaviours known as stimming or stimulation (Lord et al., 2018). Since its discovery in the early 20th century, ASD has become one of the most researched conditions in medicine, psychology, and developmental disorders (Wolff, 2004). However, despite decades of research, ASD still puzzles the scientific community in many respects. For example, fundamental questions surrounding the biological, genetic, and environmental causes of ASD remain largely unanswered as the disorder presents differently

among a growing number of people from all walks of life (Landrigan, 2010; Ratajczak, 2011). In fact, not only does ASD present differently among individuals, but the associated symptoms and comorbidities may also evolve as a person experiences puberty and enters adulthood (Boyd & Shaw, 2010; Napolitano et al., 2022).

In a longitudinal study of nearly 200 children with ASD aged three to eleven, Einat Waizbard-Bartov et al. (2022) found that most children with ASD did not exhibit stability in terms of neurofunctional symptoms such as social functioning, motor control, speech richness, self-care, and attention span, among others. Specifically, the authors determined that individuals with ASD can be categorized as "stable," "decreased," or "increased" in symptom severity over their lifespan (Waizbard-Bartov et al., 2022, p. 697). The researchers further recognized that an individual's progression category may be mainly attributed to broader sociodemographic factors such as parental education, socioeconomic status, and household income, i.e., where increased levels of familial support and education were associated with improved functionality and vice versa (Waizbard-Bartov et al., 2022).

Diagnostic Criteria

The DSM-5 diagnostic criteria now include similar diagnoses like Asperger's Syndrome under the same umbrella as ASD to account for the variability in severity and symptoms with which the disorder may manifest (Tanguay, 2011). ASD is an incredibly complex disorder influenced by many genetic, neurological, and sociodemographic factors which can affect how the disorder presents (Rosen et al., 2021). The diagnostic criterion for ASD is presently divided into two main categories:

Category one pertains to a person's struggles with communication and social interactions. This category further divides into a person's difficulties with socio-emotional connections, trouble understanding nonverbal communication, eye contact, meaningful gestures, and body language, and difficulties creating, developing, and maintaining relationships.

Category two pertains to a person's engagement in repetitive and restricted behaviours, actions, and thoughts. This category is further divided into a person's demonstration of repetitive speech or actions, inflexible attitudes and need for routine and ritualistic behaviour, highly intense focus on narrow and inflexible interests, and hypersensitivity to environmental sensory inputs (Hodges et al., 2020). Crucially, a person is not required to exhibit all these symptoms for an affirmed ASD diagnosis; these criteria help to determine the severity of the diagnosis.

Demographically, ASD is most diagnosed among preschool and school-aged children, likely because the school environment exposes specific difficulties in socializing and can also uncover other triggering characteristics associated with ASD (Akshoomoff et al., 2006). Parents or teachers may notice that a child displays repetitive and obsessive behaviours, which may alert them to a potential neurodivergent diagnosis (Lord et al., 2000). Repetitive behaviours, often referred to as stimming in medical and therapeutic discourse, can serve as coping mechanisms for children with ASD and may also be used to express emotions such as anger and sadness (Conn, 2015; Nolan et al., 2015). Limited and focused interests, bordering on obsession, are typical among children with ASD and can also alert professionals to a potential ASD diagnosis (Nowell et al., 2021). These departures from developmentally normative milestones generally become more evident as the child ages into more complex social and learning situations, such as elementary and middle school. A person's entry into adulthood is also accompanied by numerous hormonal and physiological changes, as well as increased social demands, which can generate added pressure

for the young adult with ASD (Picci & Scherf, 2015). Bullying, social exclusion, and difficulties navigating their budding sexuality may also be enhanced for individuals with ASD (Anderson et al., 2011; Billstedt et al., 2005; Picci & Scherf, 2015), all of which correlate with higher rates of anxiety, depression, and other mental health concerns (Holden et al., 2020; Rodriguez et al., 2021).

In terms of gender, ASD tends to affect biological males at a rate of three to four times greater than biological females (Volkmar et al., 2005). However, recent data has discovered an accelerating number of ASD diagnoses across all genders, particularly in Western countries (Volkmar et al., 2005). In 2023, the Centers for Disease Control in the United States indicated that approximately 1 in every 36 children had been diagnosed with ASD, which constituted a 22% increase from 2021 (CDC, 2023). An increase in ASD diagnoses has also occurred in regions beyond the Western Hemisphere. For example, Israel (Dinstein et al., 2023), Africa (Aderinto et al., 2023), and China (Hai et al., 2023) all reported elevated rates of ASD over the past 35 years.

The reasons driving this apparent spike in ASD diagnoses are complex: first, improved assessment tools have helped to identify ASD at an earlier age to facilitate intervention (Matson et al., 2011). Recent innovations in functional MRI (fMRI) and deep learning technology have also become increasingly affordable and can be used to formulate an approach to ASD diagnosis at the neuroimaging level, with the potential to tease out ASD cases that either speech or motor neurological deficits would have otherwise obscured (Guttikonda et al., 2024). Secondly, the causes of ASD involve a combination of genetic, developmental, and environmental factors (Bearman & King, 2009). Hence, ongoing research and discoveries made in these various fields have helped to effectively pinpoint key indicators of ASD among children, teenagers, and even adults, which has led to improved diagnostic criteria and knowledge about ASD.

Treatments & Interventions

In terms of treatments, the earlier an individual is diagnosed with ASD, the better, as the severity of symptomatology and quality of life is highly dependent upon early interventions (Corsello, 2005). However, one of the reasons why ASD is so difficult to treat is the uniqueness with which it presents across individuals. While an ASD diagnosis is based on behavioural characteristics outlined in the DSM-5, it can also present physically through manifestations such as an enlarged brain, speech and learning delays, and epileptic seizures (Landrigan, 2010). The alienating nature of the disorder itself, which renders social or environmental interactions potentially triggering, results in significant and widely reported social isolation among members of the ASD community (Kasari et al., 2013). These feelings of isolation, coupled with the lack of interpersonal relationships, can lead to suicidal ideation and overall increases in ASD symptomatology (Hedley et al., 2018; Pezzimenti et al., 2019). Moreover, poor mental health can also lead to greater social isolation among the ASD population, thereby perpetuating a cycle of diminished mental health (Cage et al., 2018).

Regular therapeutic interventions are critical to improving the overall quality of life for individuals with ASD. However, the scope of therapeutic interventions may evolve as the individual with ASD transitions through various life phases (Guthrie et al., 2013). Indeed, the continued monitoring of developmental milestones among children is essential for determining the most appropriate treatment plan and developing alternative strategies for adapted care (Ketcheson et al., 2020; Kover et al., 2016). For example, customized therapies are incredibly beneficial for individuals with ASD, especially when initiated at an early age and adapted to their symptomology. Moreover, while Applied Behaviour Analysis therapy is considered the gold

standard in ASD treatment (Foxx, 2008; Roane et al., 2016), many therapies remain effective for individuals with ASD, even if they are started later in life (Rosenwasser & Axelrod, 2001).

In the absence of proper support, many adolescents with ASD are at a heightened risk of developing eating disorders and increased social anxiety (Fein, 2020). However, in contrast, these same adolescents with ASD can exhibit pro-social activity and otherwise neurotypical behaviour when given access to inclusive environments and other supportive resources at an early age (McGovern & Sigman, 2005; Seltzer et al., 2004). For these reasons, researchers and community advocates have placed renewed emphasis on developing safe and adapted spaces for individuals with ASD, as well as programs and activities that encourage their participation in broader social life. Indeed, research has shown that inclusive community spaces, as well as strong support networks and positive emotional outlets, can significantly improve the chances of a healthy transition into adulthood for individuals with ASD (McGovern & Sigman, 2005).

2.2 Physical Activity & Autism Spectrum Disorder

For various reasons, an ASD diagnosis is commonly associated with significant weight gain as a person ages, as well as difficulties both accessing and engaging in physical activity (Hill et al., 2015).[1] Consequently, individuals with ASD face a higher risk of developing diseases such as diabetes and other conditions linked to obesity (Curtin et al., 2014; Kahathuduwa et al., 2019). Moreover, ASD is associated with notable motor impairments that may affect a person's gross motor skills (e.g., balancing and running) and fine motor skills (e.g., handwriting and object manipulation). These impairments not only compromise a person's day-to-day functioning but also

[1] Hill et al. (2015) have attributed weight gain among individuals with ASD to a combination of factors, including difficulty maintaining a balanced diet (individuals with ASD often adopt a restrictive diet, preferring processed foods over fruits and vegetables), lack of physical activity, and certain medications.

lead to feelings of frustration and anxiety among individuals with ASD (Ruggeri et al., 2020; Sansi et al., 2021).

The Importance of Physical Activity

Crucially, research has shown that both aerobic and anaerobic exercise can improve muscle strength, coordination, and dexterity in individuals with ASD (Sowa & Meulenbroek, 2012). Physical activities such as swimming, cycling, and running have also been found to help individuals with ASD improve their fine motor skills, for example, by shifting gears on a bicycle (Tse et al., 2021). Furthermore, physical activity has been proven to be helpful in managing and reducing various comorbid conditions associated with ASD, such as diabetes and heart disease (Casanova et al., 2020; Sung et al., 2022). Regular physical activity can help individuals with ASD in managing their weight, improving their everyday functionality, and promoting healthier living practices (Kahathuduwa et al., 2019).

Beyond the physical benefits, researchers have discovered numerous cognitive benefits associated with regular physical activity in the ASD community, including improved mental health (Lochbaum & Crews, 2003). A meta-analysis by Sowa and Meulenbroek (2012) revealed strong evidence of improved executive functioning in individuals with ASD following physical activity interventions, including enhanced attention spans and working memories, better cognitive flexibility and general reasoning skills, and improved planning and problem-solving ability. These cognitive benefits translated into improved academic outcomes for individuals with ASD and improved daily living skills, thus generating a virtuous cycle in which regular physical activity encourages individuals with ASD to continue exercising (Pan et al., 2017).

The Benefits of Organized Team Sports

In addition to both the physical and cognitive benefits, the very nature of physical activity itself affords opportunities for individuals with ASD to engage in structured, positive social interactions with others (Kunzi, 2015). Participating in sports, especially team sports, can make social interactions more accessible for individuals with ASD because it allows them to interact with their teammates in an environment with clear and repeatable rules, which are known to promote social interactions for individuals with ASD (Zhao & Chen, 2018). For instance, a potentially complex social interaction becomes more straightforward in a basketball game: "Pass here, I am open!". In addition, team sports also require constant communication and cooperation among teammates, which can provide individuals with ASD an opportunity to practice learned social cues in a structured and predictable environment (Zhao & Chen, 2018). Finally, physical activities often involve shared goals and collaboration among teammates, promoting a sense of belonging and achievement and nurturing genuine friendships among participants, which is highly beneficial for individuals with ASD who often battle social alienation (Dykens et al., 1998).

Barriers to Physical Activity & Sporting Spaces

Despite the potential benefits, individuals with ASD encounter many barriers when trying to access sporting events, physical activities, and exercise spaces (Menear & Neumeier, 2015). These barriers can be divided into three types that individuals must overcome before starting to exercise: personal, environmental, and social barriers (Brown et al., 2020; Staples et al., 2006).

Personal Barriers: Personal barriers include both financial and sensory components. Regarding the former, the high cost of a gym membership or sporting association fees can render physical activity unaffordable for many individuals with ASD. As to the latter, sensitivity to

sensory stimuli is also very common within the ASD community and can make navigating traditional exercise environments extremely uncomfortable and occasionally unbearable (Duquette et al., 2016). For example, a loud noise in a gym, the tactile sensation associated with specific equipment, or bright neon lights hanging above the pool may prove overwhelming and ultimately deter an individual with ASD from participating in physical activity, thus generating further discouragement and social alienation from their peer groups (Lamb et al., 2016).

Environmental Barriers: Environmental barriers include both material and organizational challenges that limit a person's participation in physical activities (Guest et al., 2017). Most athletic facilities and physical activity programs are not designed to accommodate the sensory needs of individuals with ASD (Streatch et al., 2022). As noted above, the noisy and crowded nature of gyms, community centers, pools, and sports grounds often compound other sensory triggers among individuals with ASD and can lead to their long-term avoidance of these environments (Prupas et al., 2006). In addition, the lack of trained staff or instructors who both understand and are willing to adapt the environment to accommodate the needs of individuals with ASD is a significant barrier to physical activity (Duquette et al., 2016). Many employees and trainers at pools, parks, and recreation centers lack sufficient knowledge about ASD and are unaware of the modifications that can be made to make physical activities more enjoyable for the ASD community (Duquette et al., 2016; Todd & Reid, 2006).

Social Barriers: Social barriers include the complex social dynamics within sports and athletic facilities, which can become even more complicated in competitive sports environments as emotions run high, even in 'friendly' games. For individuals with ASD who often struggle with communication and social interactions, navigating the high-intensity, fast-paced social aspects of physical activities can be challenging (Kunzi, 2015). Participating in team sports also involves

communication with teammates through a mixture of social cues and verbal and non-verbal strategies (Reinders et al., 2019), which can be particularly challenging for individuals with ASD and ultimately lead them to abstain from physical activity (Jachyra et al., 2021). In addition, negative attitudes, bullying, and stigma around ASD can also pose a significant barrier to physical activity (Healy et al., 2013; McMahon et al., 2020). Many individuals with ASD have reportedly experienced bullying or negative attention from their peers, which further dissuades them from physical activity settings (Healy & Garcia, 2019; Jachyra et al., 2021).

The Challenges of the Locker Room Environment

As noted earlier, the locker room can be particularly challenging for individuals with ASD. It is a busy, noisy environment with unclothed individuals, making it difficult to navigate (Haegele & Maher, 2022; Lee, 2011). It is also an environment with unspoken rules and expectations that differ from the norms of general society (Lee, 2011; Houston-Wilson, 2016). For example, making eye contact while talking to a friend may be a social cue taught to someone with ASD that works well in most settings, but is considered inappropriate in the locker room (Endow, 2012). Unfortunately, misunderstandings or missteps, which are common for people with ASD in such an environment, can lead to uncomfortable situations, embarrassment, or conflict. These factors contribute to the anxiety and discomfort associated with the locker room environment and discourage members of the ASD community from using these facilities (Houston-Wilson, 2017).

In summary, although physical activity can offer many benefits for individuals with ASD, there are still several challenges that hinder their full participation and enjoyment. One of the most significant, and overlooked, barriers to physical activity for the ASD community is the locker room (Haegele & Maher, 2022), which is the focal point of my thesis. Despite the critical role that locker

rooms play in accessing physical activity, they are rarely the central focus of the research. Studies on ASD and physical activity frequently focus on sport participation, how to adapt different types of activities, and general barriers to exercise. While these studies are valuable, they often only tangentially address the unique challenges posed by locker rooms, if at all. For instance, discussions about sensory sensitivities might mention locker rooms in passing but fail to delve into the specific challenges and potential solutions. This gap in the literature demonstrates a clear and urgent need for a comprehensive review of the scholarship that specifically examines the locker room experience for individuals with ASD. By focusing on this understudied area, my scoping review aims to fill a critical gap in the existing body of research and contribute to more inclusive practices in physical activity settings. Acknowledging and addressing the barriers within the locker room environment is crucial to providing members of the ASD community with inclusive and accessible physical activity opportunities.

2.3 Types of Literature Reviews

Grant and Booth (2009) identified 14 specific types of reviews, of which literature reviews, systematic reviews, and meta-analyses are a few ways of synthesizing existing knowledge. Each serves a specific purpose in scholarly literature, catering to different research needs and contexts. To this end, this section examines specifically the differences between scoping reviews and systematic reviews. The scoping review methodology was selected for this study as it enables a comprehensive exploration of the existing literature on the locker room experiences of individuals with ASD. This methodology is well-suited to identify key concepts, gaps in the research, and potential adaptations. By providing a broad overview of the current state of the academic knowledge, a scoping review will enhance our understanding of the topic and establish a

foundation for future research. It may also indicate the necessity for a more focused systematic review, should the preliminary findings suggest that specific areas warrant deeper investigation.

Scoping reviews

The strength of scoping reviews is their ability to map the existing literature on a topic (Grant & Booth, 2009). They provide a comprehensive overview of the existing literature, highlighting the themes, methods, and research findings (Grant & Booth, 2009). To that end, scoping reviews help to pinpoint gaps in knowledge (Grant & Booth, 2009), paving the way for future studies. This makes scoping reviews a handy tool for mapping emerging or complex research areas where a knowledge base has yet to be established (Peterson et al., 2017).

Practically speaking, scoping reviews are broad and exploratory and include various studies and research designs (Arksey & O'Malley, 2005). Systematic reviews, in contrast, have a more focused scope, targeting a specific research question and using strict inclusion criteria to select relevant studies (Pollock & Berge, 2018). However, by identifying gaps in the literature, scoping reviews can both serve as a stepping stone to determine if a future systematic review is warranted as well as provide a clear and concise overview of the knowledge on a specific issue to inform policy-making (Arksey & O'Malley, 2005; Pham et al., 2014).

While scoping reviews share similarities with systematic reviews in searching the literature and data extraction, they have critical methodological differences (Munn et al., 2018). Scoping reviews typically use less strict selection criteria than a systematic review, prioritizing a broad understanding of the literature (Arksey & O'Malley, 2005). This methodological difference appears in the search strategy, which often encompasses a broader range of study designs and methodologies than systematic reviews (Levac et al., 2010). Additionally, unlike systematic

reviews, which assess the quality of studies, scoping reviews focus on charting and synthesizing the data to identify themes, gaps in knowledge, and areas for further research (Grant & Booth, 2009; Moher et al., 2009). Hence, the process of a scoping review is iterative, with researchers refining their search strategy and inclusion criteria as they delve deeper into the literature and better understand the existing research landscape (Levac et al., 2010). Finally, scoping reviews usually follow a framework to ensure transparency and replicability of the study and research findings, such as the six-step framework that Arksey and O'Malley (2005) elaborated:

1. Identifying the research questions.
2. Identifying the relevant studies.
3. Study selection.
4. Charting the data.
5. Collating, summarizing, and reporting the results.
6. Consultation with the main stakeholders (optional).

However valuable, scoping reviews can be resource-intensive due to the large volume of studies typically involved. Sorting and analyzing this data can be time-consuming, especially when considering the need for effective coding strategies (Arksey & O'Malley, 2005). As a result, a well-defined search strategy with explicit inclusion and exclusion criteria is crucial to ensure optimal specificity, focusing on articles directly relevant to the research topic (Arksey & O'Malley, 2005; Levac et al., 2010). Moreover, scoping reviews do not assess the quality of studies, limiting their ability to provide an in-depth analysis (Arksey & O'Malley, 2005; Pham et al., 2014).

In summary, scoping reviews are a valuable approach to reviewing literature when the primary goal is breadth, rather than depth, of understanding. This method is beneficial in new or complex research areas, aiming to gain an overview and identify gaps for future research.

Systematic reviews

As noted above, systematic reviews are a powerful tool for researchers looking for a comprehensive and reliable analysis of the existing research on a specific question (Aromataris & Pearson, 2014). Unlike scoping reviews, which offer a broad overview of a topic, systematic reviews delve deeper, employing rigorous and clearly defined methods throughout the research process (Aromataris & Pearson, 2014). This structured approach often follows the completion of a scoping review, offering a more nuanced analysis by synthesizing the best available evidence into statistically robust conclusions, especially when paired with a meta-analysis (Michaud, 2021).

A core feature of systematic reviews is their emphasis on transparency and reducing bias through established frameworks like PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Munn et al., 2018). These guidelines offer authors a structured approach to report their methodology from start to finish. Moreover, they involve setting criteria for identifying and selecting studies, assessing the studies for potential biases and quality, and combining the study findings (Pollock & Berge, 2018; Munn et al., 2018).

The methodology of a systematic review differs from a scoping review in several vital aspects. Firstly, systematic reviews require well-defined, focused research questions, often formulated using the PICO framework (Population, Intervention, Comparison, Outcome) (Papaioannou et al., 2016). This targeted approach ensures that the systematic review focuses on the specific research question. Secondly, a predefined protocol guides the systematic review process by outlining the methods for selecting and reviewing studies. This protocol also includes details such as the search strategies, specific databases to be searched, explicit inclusion and exclusion criteria, and data extraction and analysis protocols (Pollock & Berge, 2018).

Like scoping reviews, systematic reviews involve a comprehensive literature search guided by predefined criteria. However, to further reduce bias and promote objectivity, the selection of studies is typically conducted by at least two independent reviewers (Papaioannou et al., 2016). Once the studies are included, their quality and potential biases are rigorously assessed using the appropriate tools, such as the Cochrane Risk of Bias tools and the Newcastle-Ottawa Scale (NOS) (Deeks et al., 2019; Papaioannou et al., 2016; Wells et al., 2000). Finally, depending on the nature of the research question, a meta-analysis may be conducted to combine data from multiple studies, boosting confidence levels in the conclusions (Papaioannou et al., 2016).

While valuable for informing policy and highlighting research gaps, systematic reviews have limitations (Aromataris & Pearson, 2014). Specifically, their in-depth nature can be time-consuming and require significant resources. Additionally, the quality of a systematic review depends on the quality of the existing research (Garg et al., 2008). If the underlying studies are flawed, the review's results may also be inconclusive or biased (Garg et al., 2008).

Given the differences in research methods between scoping and systematic reviews, and in line with the scholarly aims of this thesis, I have chosen to use a scoping review methodology. This approach has helped me (i) explore the experiences of individuals with ASD in shared sporting spaces such as locker rooms and (ii) analyze the current research on ASD and sports accessibility. By conducting a scoping review, I am also able to provide a comprehensive overview of the existing research on ASD and the locker room experience, identifying gaps in knowledge and paving the way for future studies to delve deeper into this important topic.

2.4 Chapter Summary and Concluding Remarks

This chapter explored the complex relationship between ASD and physical activity. In section 2.1, I drew upon the ASD literature to explain the diagnostic criteria and the implications of living on the spectrum throughout various stages of life. Next, in section 2.2, I examined the benefits and challenges associated with physical activity for individuals with ASD. While research has uncovered numerous benefits associated with regular physical activity, several barriers prevent individuals with ASD from accessing sporting spaces to their fullest potential. Finally, section 2.3 explored the differences between scoping and systematic reviews. The scoping review methodology was chosen for this thesis as it provides a broad map of existing literature on ASD and shared sporting spaces, providing a better understanding of the research landscape. In contrast, the systematic review offers a more focused analysis that synthesizes studies to answer a specific research question. The following chapter will outline the methodology that guided this thesis.

Chapter 3

Methodology

This chapter provides an overview of the methodology that guided this thesis. I have organized the chapter into three sections. In section 3.1, I introduce the study's theoretical framework. Next, in section 3.2, I introduce the Arksey and O'Malley (2005) framework as adapted to this study on the intersection of locker rooms and ASD. Finally, in section 3.3, I examine the PRISMA guidelines, specifically PRISMA-ScR (the extension for scoping reviews), which provides a checklist to ensure the transparent and rigorous reporting of scoping reviews.

3.1 Theoretical Framework

This study utilizes a constructivist methodological framework to highlight the experiences of individuals with ASD within the locker room environment. Constructivism is a research philosophy that theorizes how individuals construct meaning from their experiences, placing greater value on their experience over the cultural or societal contexts surrounding it (Amineh & Asl, 2015). This framework is well suited to this work as it emphasizes the internal processes by which individuals with ASD perceive and interpret the locker room. Additionally, the constructivist lens helps highlight internalized perceptions, most notably regarding sports participation, body image, and social capacity (Tamminen & Poucher, 2020). Constructivism's focus on the individual's construction of meaning allows this work to prioritize the emotions, understanding, and behaviours of individuals with ASD, with less emphasis on broader societal or cultural dynamics that may influence their locker room experiences (Tamminen & Poucher, 2020). Finally, by focusing on the individual's perspective, this framework enables a more nuanced

understanding of how the locker room environment shapes their perceptions and, by extension, their potential participation in sporting spaces.

3.2 Arksey & O'Malley Framework

The Arksey and O'Malley framework (2005) for conducting scoping reviews provides rigour and scientific principles to an otherwise potentially arbitrary endeavour (Colquhoun et al., 2014). The framework consists of the following six key steps.

Step 1: Identifying the Research Question

Scoping reviews are broad by design. Therefore, researchers rely on clear research questions to map the existing literature and develop a focused search strategy. While the initial questions might be broad, they serve to explore and understand the research topic and relevant literature. Additionally, an essential goal of the research questions is to identify the current gaps in the scientific literature, which could present researchers with future avenues for research.

To gain a better understanding of the locker room experience for individuals with ASD, the following question guided this scoping review: What are the experiences of individuals with ASD in the locker room environment? Understanding and categorizing these experiences is critical in identifying how locker rooms can be adapted to better meet the needs of individuals with ASD. Thus, this scoping review was further guided by the following two sub-questions:

1) What are the triggers in the locker room for individuals with ASD?

2) What can be done to improve their experiences?

Once the research questions have been clearly defined, I utilized Boolean operators (AND, OR, NOT) to construct a search strategy to ensure the search captures only the most relevant

literature. This focused search strategy helped create an accurate map of the existing research on ASD and the locker room experience.

Step 2: Identifying Relevant Studies

After formulating the research questions, a comprehensive search strategy was developed to identify relevant studies. Recognizing that the researcher's background often influences the search strategy (Levac et al., 2010), this study's literature review and analysis begins by making transparent my personal and academic background in Liberal Arts and the digital humanities. My psychology and sports sociology training further drives my interest and passion for studying ASD and informs the research strategy. It is important to note that a broad range of studies can be included in scoping reviews relative to systematic reviews due to the absence of explicit quality assessment steps in the scoping review methodology (Cooper et al., 2021). To that end, three literature sources were consulted: electronic databases, key journals, and citation chasing.

Electronic Databases: The databases I have searched to identify the studies composing my scoping review were an even distribution between psychology and adapted physical activity databases. The PsycINFO, Sports Medicine & Education Index, EBSCO(ERIC), Medline, SPORTdiscus, and Web of Science were central in my data acquisition as they are the leading databases in the field of psychology, adapted physical activity, and sports sociology.

Journals: Targeted journals have been searched by hand for studies which may be important to include in this study, including the European Journal of Adapted Physical Activity, Adapted Physical Activity Quarterly, Autism, and the Journal of Autism and Developmental Disorders.

Citation Chasing: I also conducted a reference analysis of key studies. This involved examining the reference section of these studies to identify and include other relevant sources. For example, I carefully reviewed the bibliography of Haegele and Maher's (2022) "*Male autistic youth experiences of belonging in integrated physical education*" and Lee's (2011) "*Cultural factors related to the hidden curriculum for students with autism and related disabilities*" to identify studies that the database and journal searches may have missed.

Table 1, below, outlines the key concepts and their associated search terms used to identify the relevant literature in this scoping review:

Table 1. Search Strategy used During Database Searches

Terms	Associated Search Terms
Autism Spectrum Disorder	"Autism Spectrum Disorder" OR "ASD" OR "Autis*" OR "Asperger"
Locker Room	"Locker Room" OR "Locker*" OR "Changing Room" OR "Vestiaires" OR "Sport Facility" OR "Athletic Facility" OR "Gym" OR "Shower" OR "School" OR "Aquatic Facility" OR "Swimming Pool" OR "Pool" OR "Sensory Spaces"
Adapted Physical Activity	"Adapted Physical Activity" OR "APA" OR "Inclusive Physical Activity" OR "Adapted PE" OR "Physical Education" OR "Physical Activity Participation" OR "Therapeutic Recreation" OR "Adapted Physical Education" OR "Sensory Inclusion" OR "Hidden Curriculum"

Whereas this study's focus is the locker room, reports of the locker room experience are often incidental and "buried" within broader articles on adapted physical activity and sporting spaces. As a result, and in consultation with the liaison librarian, Ms. Veronica Bergsten, the search terms for this scoping review were designed to be sufficiently broad to include studies whose primary focus is beyond the locker room. As such, broader terms like "therapeutic recreation" and "hidden curriculum" were incorporated to encompass the wider experience of individuals with

ASD in sporting or recreational settings, as well as in socially complex environments. To that end, the well-delineated inclusion and exclusion criteria discussed in the following section were essential in filtering out studies that lie beyond the scope of this work.

Step 3: Study Selection

Typically, an effective search strategy will yield thousands of results (Pham et al., 2014); the search for this scoping review yielded more than 1,151 results. Hence, inclusion and exclusion criteria were created to help select studies for further analysis and inclusion in the scoping review (Tricco et al., 2016). Specific criteria utilized to include or exclude studies can be linguistic, geographic, or demographic. For this study, the inclusion criteria were the following:

1) Studies with participants who have ASD.

2) Studies that investigated the locker room, changing room, or shared community sporting space experience for members of the ASD community.

3) Studies that included interventions AND/OR adaptations of the locker room that better meet the needs of persons with ASD.

4) Studies that included participants of all ages. This scoping review aims to assess the locker room experiences of both children and adolescents in a school setting as well as adults who may use locker rooms in community centers or gyms.

4) English and French language publications, as this study is being conducted at McGill University in Quebec, Canada, where many of the researchers are Francophones. Additionally, all public sporting and recreational spaces operate in French and utilize French signage, making it essential to include French studies that address the lived reality of these groups.

5) Qualitative studies. This scoping review aims to understand the subjective and lived experiences of individuals with ASD in locker room settings that can best be reflected in qualitative research.

6) No publication year cutoff. As there is a lack of scholarship on sports in the ASD community, I elected to scope all the available literature to understand the scholarship better.

7) Only peer-reviewed research articles were included. Gray literature such as poster presentations, conference abstracts, theses or dissertations, or governmental reports were not included in this scoping review.

The exclusion criteria were as follows:

1) Studies focusing on the needs and experiences of the neurodivergent community without specifying/including ASD.

2) Studies focusing on the experiences and adaptations of individuals with physical disabilities.

3) Quantitative studies, which, in prioritizing measurable data, can often fail to capture the nuanced, subjective experiences and perceptions of individuals with ASD in locker room settings.

To ensure a strong foundation for my research, I have used EndNote (Version 20.5) to gather and organize all the studies I found in my initial search. The EndNote software compiles all the studies I have found from the various databases and helps organize and sort them within a central location (Michaud, 2021). EndNote's integrated deduplication feature helped eliminate any redundant articles. Once this was completed, and to choose the most relevant studies to include in this scoping review, I used EndNote’s powerful ability to sort, organize, and manage citations to streamline the process of evaluating each study's relevance to my research questions, thus allowing me to efficiently choose the most pertinent ones for further analysis (Michaud, 2021).

Step 4: Charting the Data

This phase of the research involves charting or organizing the data extracted from the selected studies (between 10-30 studies in total) into a format that allows for easy comparison and analysis (Arksey & O'Malley, 2005). The data extracted from these studies includes the names of the authors, the date the article was published, the journal in which the study was published, and key findings (Arksey & O'Malley, 2005; Levac et al., 2010). The selected studies were examined systematically, and their key methodologies, themes, and findings organized in a "data charting form" in Excel. This approach is similar to a narrative review synthesizing research findings (Pawson, 2002). The table 3, in Appendix D guided the extraction of the following information:

i) Publication information

ii) Type of locker room setting (e.g. school vs. community center)

iii) Age bracket of the participants

iv) Gender of the participants

v) Severity of ASD diagnosis (e.g., Asperger's syndrome, Rett syndrome, etc.), if available

vi) Comorbidities of the participants, if available

vii) Barriers to access in the locker room

viii) Adaptations to the locker room space

Critically, the determination of *what* gets extracted from the studies was an iterative process meaning that new data categories could and did emerge to the extent that the review of the selected studies warranted it. The extracted data from the charting process yielded initial themes, which were refined in the thematic analysis and will be further discussed in Chapter 4 - Results.

To ensure the trustworthiness of the data charting process, the PI (Sandrine Servant) was responsible for the initial extraction and organization of the data. Specifically, the PI performed the title and abstract screening, followed by the full-text review and data extraction. Following the recommendations of Levac et al. (2010), a member of the research team with knowledge of ASD and scoping review methodology (Dr. Jordan Koch), independently reviewed the charted data to ensure consistency and replicability. Any discrepancies have been discussed to ensure a final reliable data set.

Step 5: Collating, Summarizing, and Reporting the Results

This step involves synthesizing the results into a cohesive format. Typical scoping reviews may include a numerical summary analysis of the extracted data (e.g. the number of studies identified, the number of participants, and/or the number of countries of publication) and/or a thematic analysis, which seeks to identify common themes and patterns in the data (Levac et al., 2010). In this thesis, the results were analyzed using a thematic analysis paradigm. Specifically, a thematic analysis was conducted to identify recurring barriers, adaptations and themes across the selected studies (Braun & Clarke, 2006). This process involves closely examining the data and identifying segments of text that relate to the research question, in this instance, anything related to changing rooms or locker rooms (Braun & Clarke, 2006). The main findings of each study were charted into themes representing significant patterns across the studies (see Table 3, Appendix D for a complete summary of the selected studies and key findings). In this scoping review, themes surrounding avoidant or negative behaviours, opportunities in locker rooms for individuals with ASD, as well as the substantive barriers faced by this community were cataloged and summarized.

Critically, charting the data allows for the emergence of initial themes. These initial themes provide organized insights into the lived experiences of individuals with ASD navigating locker rooms, from which I could extract the main findings of each study regarding locker room perception (Braun & Clarke, 2006). For example, loud sounds from the dryers were determined to be a trigger for individuals with ASD in the locker room and were thus identified as an obstacle to sport and physical activity in the thematic analysis (Moore et al., 2021). In the thematic analysis, I also paid particular attention to the relationships between themes and the participants' characteristics (e.g., age, gender, diagnosis). For example, social anxiety in the locker room was more prevalent among studies with adolescent participants with ASD. In addition, connecting the results to particular participants (such as young girls) and the setting of the locker room (like changing into a swimsuit) provided a detailed understanding, leading to a more nuanced portrayal of the locker room experience for individuals with ASD (Maher, 2017).

Step 6: Consultation with the Main Stakeholders (Optional)

The last step of the Arkey and O'Malley (2005) scoping review framework is a consultation phase with the main stakeholders in the research area. This step juxtaposes the findings from the scoping review with the real-life experiences of stakeholders with vested interests in the field, bringing depth and context to the scoping review results. However, it is important to note that this step is considered optional by Arksey and O'Malley (2005) and is generally skipped in scoping reviews. For this study, the main stakeholders are members of the ASD community, including medical professionals, the operators of community centers and gyms, and trained professionals who work with the ASD community, e.g., teachers, personal trainers, and support workers. Before publishing the manuscript, I intend to consult with specialized integrated services clinics,

organizations that offer educational, therapeutic, and recreational support to the ASD community, and schools offering special programs and resources to children, adolescents, and adults with ASD. The consultation with the main stakeholders at the conclusion of this scoping review will serve two purposes. Firstly, it will provide an opportunity to share and discuss the findings and seek direct input from members of the ASD community about the relevance and potential impact of the identified adaptations. Secondly, this collaborative dialogue is essential in determining the feasibility of implementing these adaptations in real-world locker rooms. Gathering diverse perspectives and feedback on the findings will help ensure that future research and interventions are both meaningful and achievable for the ASD community.

3.3 PRISMA Guidelines

PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines are a methodological tool used to promote transparency and replicability in systematic reviews and meta-analyses. The guidelines consist of a 27-item checklist and a four-phase flow diagram, specifying important elements for reporting in systematic reviews and meta-analyses across the introduction, methods, results, and discussion sections. The flow diagram visually represents identifying, screening, and including studies in the review (Page et al., 2020). PRISMA guidelines, commonly used for systematic reviews and meta-analyses, have also been adapted to fit the requirements of scoping reviews.

Andrea Tricco et al. (2018) formulated the first PRISMA guidelines for scoping reviews, the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews), to address concerns about consistency in the methodology and the reporting of scoping reviews. Whereas the original PRISMA guidelines are well adapted for binary, hypothesis-driven questions, scoping reviews are by their very nature broader and thus

require an adapted set of reporting guidelines (Tricco et al., 2018). In the end, the PRISMA-ScR reporting guidelines were developed for scoping reviews by scoping review experts, including the many scholars involved in developing extensions to the Arsky and O'Malley framework (Tricco et al., 2018). Additionally, as PRISMA-ScR is grounded in the PRISMA framework, it has been deemed a valid methodological resource for scoping reviews. The resulting 20-item PRISMA-ScR checklist deviates from PRISMA to the extent that it uses inclusion criteria that implement flexible criteria rather than the PICO (Protocol, Intervention, Comparison, Outcome) based frameworks that are a cornerstone of systematic reviews (Tricco et al., 2018).

As a methodological and reporting resource, PRISMA-ScR focuses both the author and reader on mapping the literature and identifying gaps instead of strictly answering questions and testing hypotheses, as is typically the case in other research modalities (Moher et al., 2018). Consequently, using PRISMA-ScR in this study has added additional rigour to the methodology and reporting of findings. It also increases the significance of this work in terms of (1) directions for future study and (2) decision-making regarding modifications to locker room environments for individuals with ASD (Liberati et al., 2009).

3.4 Chapter Summary and Concluding Remarks

This chapter provided an overview of the methodological frameworks guiding this thesis. First, in section 3.1, I explored the theoretical framework central to this thesis. Section 3.2 detailed the six steps of Arksey and O'Malley's (2005) scoping review methodology, which provides a rigorous and systematic approach to assessing the literature on locker room environments and the experiences of living with ASD. The final (optional) step of this scoping review framework, consultation with the main stakeholders, will be conducted following the

submission of this thesis. Finally, in section 3.3, I looked at the PRISMA guidelines, specifically the PRISMA-ScR, which are adapted to the scoping review methodology and will ensure the transparency and replicability of this study. Later chapters will explore the outcomes of the search, highlight the real-life experiences of individuals with ASD in the locker room environment, and discuss potential modifications to this environment to improve access for the ASD community.

Chapter 4

Results

This scoping review collected and examined the scholarly literature to review the locker room experience for individuals with ASD. To that end, I employed the gold standard in scoping review methodologies proposed by Arskey and O'Malley (2005) and Levac et al. (2010). In this chapter, I detail the study selection process and present the results of the literature search, which are summarized in Appendix C, Figure 1. Section 4.1 presents the results of a content analysis performed on the data extracted from the selected studies. This section provides a thematic narrative of the lived experience of individuals with ASD as they engage with locker room and changing room environments. Section 4.2 documents the quality, transparency, and completeness of this study's analysis as delineated by the PRISMA-ScR reporting guidelines for scoping reviews. The PRISMA-ScR checklist is listed in Appendix F (Tricco et al., 2018).

4.1 Summary of Included Studies

From an original hit of 1,151 articles acquired via the database search strategy detailed in Appendix A, 266 studies were excluded through the de-duplication process, and another 199 were excluded on the basis of non-peer-reviewed status. Fourteen articles were identified through hand searching of selected journals, and 0 were identified through the citation chasing of key articles. Furthermore, 610 studies were excluded after screening for title, abstract, and keywords. Fifty-seven studies were excluded after reading the methods sections, and 20 were excluded after a full read-through as they failed to meet the inclusion criteria (see Appendix C, Figure 1). Thirteen articles were then selected for inclusion in this scoping review.

The 13 articles varied in scope, setting, participants, and outcomes concerning the locker room setting. Thematically, the articles examined participants' experiences and interactions in locker rooms across several settings, ranging from regular physical education classes to swim lessons. Additionally, the studies also differed in the severity of the ASD diagnosis in participants as well as their central focus or the areas they set out to study. Therefore, in this chapter, I have examined the articles according to four distinct categories: (i) study characteristics, (ii) participant composition, (iii) context of locker room use, and (iv) findings.

(i) Study Characteristics

Twelve of the 13 articles selected in this scoping review were published in the past decade, with the earliest study published in 2006 and the latest study in 2022. Additionally, the articles provided an international array of perspectives and outcomes reflecting a geographically diverse representation of locker room environments and experiences, including a local glimpse into ASD-locker room interactions in Montréal conducted by Purpas et al. (2006) A total of six different countries were represented, spanning Europe (Sweden, United Kingdom, and Italy), North America (Canada and the US), and Asia (South Korea). Additionally, over half of the selected studies originated from the United States (n=7). A geo chart depicts the geographical location of the included studies in Figure 2, Appendix E. Finally, despite my fluency in English and French and desire to include studies from both languages, all the included studies were published in English.

(ii) Participant Composition & Characteristics

Sample Size: A total of 190 participants were identified across the 13 studies included in the present scoping review. Of these studies, the sample size ranged from 76 to 2 participants. Although the two-participant study, conducted by Dowdy and Tincani (2019), was uncharacteristically small in sample size, it is essential to note that the two adolescent participants were pre-selected from the primary author's patient base for the study due to the unique characteristics of their ASD symptomatology, as discussed below in *diagnosis and comorbidities*. The methodologies used in the three studies did not specify sample sizes. Two of the studies were systematic reviews, and the one by Maher (2017) involved specialized education teachers in their interactions with students with ASD in the classroom, so it did not have student participants.

Age and Biological Sex: The participant age range in the 13 reviewed studies primarily focused on children and adolescents, with significant variability in the age groups that were investigated. When specified, the ages of the participants ranged from toddlers to young adults aged 19 years old. The youngest participants were nursery-level toddlers in the study by Prupas et al. (2006), emphasizing the experiences of newly diagnosed nursery-aged children in communal changing spaces. Conversely, the oldest participants, aged 19, were included in the research by Moore et al. (2021), which addressed the anxiety-provoking aspects of locker rooms for adolescents. Furthermore, among the three articles that omitted sample sizes for methodological reasons, Maher (2017) involved input from adult professionals. Most studies, such as those by Arnell et al. (2017), Lamb et al. (2014), and Napolitano (2017) focused on the developmental period between the ages of 10 and 17.

The biological sex distribution of participants was stated in five of the 13 reviewed studies. There were more males than females across the 13 selected studies, which is in line with the prevalence of ASD diagnoses. A total of 46 males and 25 females were sampled, and there was a

biological sex ratio of 1.84 males to 1 female. The graphical depiction of the biological sex ratio can be found in Figure 3, Appendix E. Both of Haegele and Maher's studies (2021; 2022), as well as Dowdy and Tincani's (2019) article, involved male participants exclusively. The study by Arnell et al. (2017) included a more balanced sample with 17 males and seven females.

Diagnosis and Comorbidities: All participants included in this scoping review had ASD diagnoses. The degree of the ASD severity, i.e. participants' place on the autism spectrum, varied considerably between the studies. Two of the 13 studies – Arnell et al. (2017) and Haegele and Maher (2022) - focused on high-functioning ASD participants or subjects with well-developed verbal skills. On the other hand, Hickingbotham et al. (2021) studied individuals with an ASD diagnosis within an "invisible" psychiatric or neurodevelopmental category. Finally, a study by Prupas et al. (2006) observed newly diagnosed cases of ASD in toddlers and young children.

Out of the three studies, eight participants were found to have specific comorbidities. The co-occurrence of ASD and comorbidities is summarized graphically in Figures 4 and 5, Appendix E. On a study-for-study basis, the most prevalent comorbidity was ADHD, which co-occurred with ASD in three of the included studies. On a participant basis, however, the most frequent comorbidity was anxiety, accounting for over 60% of all comorbidities. Dowdy and Tincani (2019) described complex comorbidities, with participants having intellectual disability, Marfan's syndrome, DiGeorge syndrome, pica, and intermittent explosive disorder in addition to ASD.

(iii) Context of Locker Room Use

The studies reviewed revealed a variety of contexts in which individuals with ASD use locker rooms. Moreover, the meaning of the locker room for individuals with ASD may vary depending on the context and the interactions that occur. In essence, while the locker room

represents the "what," the context of locker room usage may involve the "why," "who," "when," "where," and "how," and this determines the interaction between individuals with ASD and the locker room environment.

In most studies, locker room use was in the context of physical education (PE) classes. Six of the 13 studies were set in PE classes, two in adapted or “inclusive” PE classes (Haegele & Maher, 2021; Thoren et al., 2020). The PE-based article by Arnell et al. (2017) was the only one in which a shower facility was explicitly included in the assessment of interactions between the locker room and individuals with ASD. The rest of the studies in which a specific sporting context was mentioned were exclusively in the context of swimming lessons or recreational swimming, as in Dowdy and Tincani (2019), Lawson et al. (2019), Napolitano (2017), and Prupas et al. (2006). The context-specific use of the locker room is summarized graphically in Figure 6, Appendix E.

On the other hand, Lee (2011) and Moore et al. (2021) did not discuss the interactions in the locker room in any specific sporting or pedagogical setting. Instead, they addressed the locker room as part of a so-called hidden curriculum, an implicit set of behaviours and customs that are acquired informally through socializing and making friends. Hickingbotham et al. (2021) examined the locker room as a complex steppingstone to physical activity and physical education for individuals with ASD and provided insights into the emotional experience of locker room use for individuals with ASD. Finally, Prupas et al. (2006) framed the locker room as neither strictly positive nor negative but a neutral space where essential skills are learned with parental assistance.

(iv) Findings

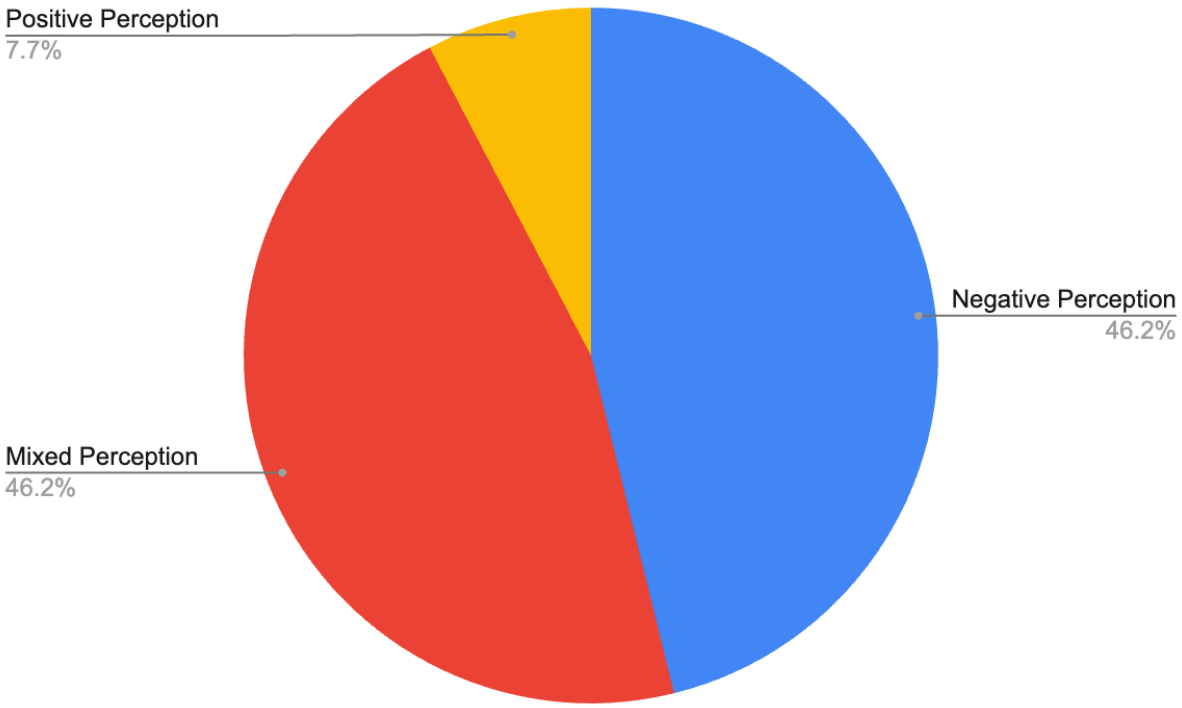
The 13 articles in this review highlighted locker rooms as complex social environments for individuals with ASD. In this section, I detail the central findings regarding the locker room

experience presented in these studies across the domains of (1) perceptions, (2) thematic elements, and (3) obstacles and opportunities.

(1) Perceptions

Of the 13 studies, six viewed the locker room environment as triggering or otherwise challenging for individuals with ASD, six had mixed perceptions, and one, the article by Prupas et al. (2006), had a positive perception of locker rooms. The distribution of locker room perceptions across studies is summarized graphically in Figure 7:

Figure 7. Distribution of Locker Room Perception



The studies that presented a negative view of locker rooms, such as in Arnell et al. (2017) and Hickingbotham et al. (2021), believed that negative locker room experiences have the potential to deter participation and diminish enjoyment in sports and recreation. More specifically, Arnell et al. (2017) discussed how the stresses and anxieties surrounding locker room use can result in

avoidant behavior in individuals with ASD, thus constituting a significant barrier to physical activity. Lawson et al. (2019) mentioned how one of their participants cited difficulties navigating the locker room as the main reason for discontinuing swimming lessons. As such, negative experiences in the locker room deterred physical activity participation for individuals with ASD.

The studies that showed mixed perceptions of the locker room regarding individuals with ASD recognized both the challenges of the environment and the potential enjoyment that sports and recreational activities brought to participants. These studies also recognized the potential for making adaptations to improve the situation. For example, Dowdy et al. (2019) recognized the difficulties that changing rooms presented for participants at the swimming pool while also emphasizing the pleasure of the sports activity. Articles by Heagele and Maher (2022) and Thoren et al. (2020) similarly addressed challenges in the locker room while mentioning the positive aspects of social interaction and peer bonding, which are valuable outcomes for individuals with ASD and their families. To that end, Lamb et al. (2014) and Napolitano (2017) suggested that by making evidence-based adaptations to the locker room environment and implementing positive changes, it would be possible to transform a negative opinion of the locker room to a generally favourable one. In other words, they highlighted that there was room for improvement.

Prupas et al. (2006) conducted the only study in which the authors held a generally positive view of the locker room. In their study, the locker room was viewed as an important transitional space for developing the social aspects of swimming. Simple tasks such as changing clothes and cleaning oneself were considered critical skills that individuals with ASD could develop in the locker room with assistance from parents and other supports.

Articles that viewed the locker room as a negative or ambivalent space spanned all three sporting-specific contexts of adapted PE, regular PE, and swimming. Swimming had an especially

negative perception, constituting 50% of such articles. All three sporting contexts were equally represented across mixed-perception articles. Interestingly, Prupas et al.'s (2006) article that had cast the locker room in a more positive light took place in the context of a swimming facility. The distribution of locker room environments across sporting-specific contexts is summarized graphically in Figure 8, Appendix E.

(2) Key Themes

A recurrent theme surrounding locker room avoidance among individuals with ASD was the physical vulnerability and insecurity associated with this space. Both Arnell et al. (2017) and Haegele et al. (2021) highlighted how nudity, especially in the context of swimming changing rooms, was a significant source of anxiety among individuals with ASD. More specifically, Arnell et al. (2017) mentioned that the sense of insecurity associated with nudity in locker rooms is heightened among adolescents with ASD because of the physical changes associated with puberty, which compounded anxieties around body dysmorphia. Uncertainty about how to behave in the locker room was another concern identified across several studies. Hickingbotham et al. (2021) and Lee (2011) discussed the feelings of confusion that can exist in locker rooms when individuals with ASD are unaware of the unspoken rules and guidelines surrounding locker rooms. Technical aspects, such as the order of events (e.g. showering, changing, and returning items to one's locker) are generally not explicitly explained to locker room users. Behavioral aspects, such as how to manage nudity around others, can also be a source of confusion and anxiety. Taken together, the unspoken rules of locker room usage are what Lee (2011) referred to as the hidden curriculum of the locker room environment. In this context, the hidden curriculum describes an implicit set of behaviours and customs that are acquired informally through socializing and making friends. In

other words, the locker room is associated with complex social rules and rituals, which can cause discomfort and avoidance for those who do not know them.

Lastly, the locker room often presents several different and unfamiliar sensory stimuli to individuals with ASD which can serve as a barrier for sports and physical activity. For example, among the multitude of sensory stimuli present in locker rooms, Moore et al. (2021) identified loud hairdryers and hand dryers as especially triggering for individuals with ASD. Given the elevated anxiety already present when entering the locker room, Moore et al. (2021) discussed how the auditory overload can lead to emotional outbursts among adolescents with ASD.

(3) Obstacles and Opportunities

In the 13 studies reviewed for this thesis, the relationship between individuals with ASD and the locker room environment was analysed through the lens of obstacles and opportunities. Obstacles refer to the physical, environmental, or social aspects of the locker room that hinder or limit engagement. Opportunities are the resources within the locker room that can facilitate the involvement of individuals with ASD, ultimately enhancing their experiences in that setting.

***Sensory and environmental*:** The noise from hair dryers was cited by Moore et al. (2021) as a sensory trigger for negative behavior in individuals with ASD, such as aggression and "freezing". To that end, the proximity of the hair and hand drying station to the main changing area can constitute an obstacle to locker room use for individuals with ASD. Furthermore, the aggressive psychological and emotional responses to the sensory overload, as summarized by Moore et al. (2021), can make the locker room untenable to all locker room users regardless of ASD status. Unfortunately, in the face of such obstacles, many participants opt to withdrawal from the sporting activity altogether, as described by Lawson et al. (2019). As an opportunity for

improvement, Maher (2017) emphasized the value of private changing facilities for individuals with ASD, especially for those with acute sensitivities to the sensory aspects of the locker room.

With regards to environmental obstacles, Arnell et al. (2017), Haegele and Maher (2021), and Lamb et al. (2014) cited the lack of personal space, overcrowding, proximity of nude bodies in shower areas, and generalized "chaos" of the environment as important obstacles to locker room use for individuals with ASD. Interestingly, both Lamb et al. (2014) and Haegele and Maher (2021) elaborated on the ways individuals with ASD often adapt to these realities of locker room environments, such as changing quickly in a stall outside of the designated changing areas to avoid being seen by their peers. In acknowledgement of this obstacle, Napolitano (2017) proposed taking the time to prepare individuals with ASD for the locker room, even doing dry runs, where they can familiarize themselves with the environment across a range of different times (e.g. during off hours and peak hours) before formally entering this space as a user. Maher (2017) emphasized the importance of changing facilities that limit exposure, especially for girls with ASD in the context of PE class. As a practical strategy, Dowdy and Tincani (2019) proposed the use of positive reinforcement strategies, such as the provision of treats or other rewards, upon successful completion of tasks like changing into one's first item of clothing.

Supervision and structure: Haegele and Maher (2022) noted the potential for locker rooms to serve as targeted sites of abuse and bullying for individuals with ASD due to lack of supervision. Whilst it is unreasonable, and probably undesirable, to expect total supervision in changing facilities, the article by Prupas et al. (2006) proposed a useful approach to guiding and supervising young children with ASD. Specifically, the authors explained the importance having parents accompany their child in the locker room as a means of fostering positive initial encounters with the locker room environment and establishing a baseline level of oversight and anti-bullying both

for their own child and for the locker room community. In a similar vein, Haegele and Maher (2022) suggested that a locker room environment free of bullying can be a place of social interaction and peer bonding for individuals with ASD.

Social interactions & implicit rules: Specific normative behaviors expected within a locker room, which can be at odds with social rules outside the locker room, can be a steep learning curve for individuals with ASD. Hickingbotham et al. (2021), Lawson et al. (2019), and Lee (2011) described how this steep learning curve, and the anxiety and ambiguity it brings, can be an obstacle to participation in sports and recreation. Lee (2011) described the locker room as an environment of cultural co-construction and likened it to a classroom or religious environment, where rules and meaning are mutually constructed and understood among users. To that end, individuals with Aspergers Syndrome or ASD who do not fully comprehend the complex unspoken rules of the locker room, such as when and where to undress, are at a major disadvantage with regards to their ability to fit in (Lee, 2011). Lawson et al. (2019) demonstrated the consequences of this inability to fit in, whereby one of their participants withdrew from swimming entirely due to his difficulties with navigating the unwritten rulebook of the locker room. As an opportunity for positive experiences, Prupas et al. (2006) extolled the value of parents mentoring their child to help delineate and define the social norms that govern locker room environments. Thoren et al. (2020) offered a tangible approach to modify the locker room: the presence of visual aids and pictograms can be used to help guide students with ASD through the locker room and its various steps. By clearly explaining the implicit rules and standards of behavior within the locker room, individuals with ASD can find structure and predictability in an otherwise confusing and chaotic place. Visual aids and pictograms have the additional benefit of effectively communicating with individuals from all linguistic backgrounds.

4.2 PRISMA-ScR Analysis

The PRISMA reporting items were assessed for completion across this thesis. The PRISMA-ScR checklist for the present scoping review can be found in Appendix F.

All designated items specified by PRISMA guidelines are present in the present study except for items 12 (cultural appraisal) and 22 (funding). The cultural appraisal of individual sources of evidence has not been done at the time of writing as I am waiting for final submission of the scoping review to my thesis program before a consultation with the main stakeholders can take place. Additionally, funding of the present scoping review is not reportable per PRISMA-ScR guidelines as it has been conducted in the context of an M.A. thesis and no funding was acquired.

4.3 Chapter Summary and Concluding Remarks

In conclusion, this chapter has provided an overview of the results of this scoping review. The chapter explored in detail the 13 studies which were selected and highlighted the lived experiences of individuals with ASD in locker and changing room environments. In Section 4.1, I summarized the included studies and the process by which they were selected. I began by breaking down the study selection process and the studies themselves, highlighting similarities and differences. I then performed a content analysis of thematic elements that shape the lived experiences of individuals with ASD in locker and changing room settings. A central component of this thematic analysis is a dissection of the complex locker room environment into the various obstacles and opportunities that emerged from the included studies. Finally, in section 4.2, I presented a comprehensive evaluation of the scoping review's quality, transparency, and completeness, as prescribed by the PRISMA-ScR reporting standards for scoping reviews.

Chapter 5

Discussion

This scoping review examined 13 peer-reviewed research articles that investigated the relationship between individuals with ASD and locker room environments. The following discussion aims to identify the barriers and opportunities in locker room environments and their impact on participation in sports and physical activity for individuals with ASD. Overall, the studies highlighted the complexity of the locker room experience for individuals with ASD and emphasized the need for adaptations to enhance their comfort and participation in these settings. In section 5.1, I shed light on demographic trends, specific contexts of locker room use, and the ways in which individuals with ASD interact with the locker room environment. In section 5.2, I highlight the recommended adaptations to the locker room environment. Finally, in section 5.3, I assess implications for practice and discuss limitations and directions for future research in this important area of sporting accessibility.

5.1 Synthesis of Findings

Participant composition

The consistent inclusion of both pre-adolescents and adolescents across the selected studies suggests a heightened vulnerability of these age groups to adverse social and sensory environments in locker rooms. This reality is showcased in Haegele and Maher's studies (2021, 2022), where the young participants' physical insecurities are made worse by the nature of adolescence itself, in which developmental differences across people can foster bullying and potentially unrealistic body standards. These findings were echoed in public health research conducted by Dodd-Reynolds et al. (2024), which demonstrated that insecurity about one's physical appearance can be a source of

insecurity and discomfort in young people across the neurodivergent spectrum, particularly for members of the LGBTQIA++ community. Young people are especially susceptible to the hazards associated with the locker room environment as immaturity and experiences of racism, sexism, homophobia, and ableism tend to go unchecked, creating a perfect time and place for bullying and other forms of abuse to occur. Additionally, adolescents and young adults usually partake in physical activity in gyms, sports clubs, and school environments, which are places where unrealistic or unattainable standards of physical appearance and performance can pervade. In this capacity, Dodd-Reynolds et al. (2024, p. 4) suggested that locker rooms can contribute to what they call "physical activity insecurity." This refers to a feeling of discomfort, insecurity, or lack of safety that prevents someone from engaging in physical activity.

Not unlike food insecurity or housing insecurity, physical activity insecurity disproportionately affects certain demographics. The studies included in this scoping review assessed the locker room experiences of males predominately. On one hand, this reflects the higher prevalence of ASD diagnoses in males; Napolitano et al. (2022) estimated that 70% of ASD cases occur in biological males. On the other hand, the underrepresentation of female participants across most studies in this scoping review suggests a potential gap in understanding the unique challenges faced by females with ASD in locker room environments. This potential gap in the scientific literature is especially concerning considering the evidence that girls with ASD may experience unique difficulties in these settings. The study by Arnell et al. (2017), which featured the highest female-to-male sex ratio of all the selected studies, found that feelings of anxiety and stress in the locker room were most acute among female participants, for whom insecurities about body image and appearance were most prevalent. Interestingly, however, female participants had a greater appreciation for the benefits of physical activity with respect to weight control and improved

mental health (Arnell et al., 2017). As such, the absence of girls in the selected studies constitutes a significant loss as despite being overlooked in sports and physical activity research, females with ASD show the greatest awareness of the benefits of physical activity all the while being the most susceptible to harm in locker rooms.

Contexts & perceptions of locker room utilization

Most of the studies employed in this scoping review are centered on PE environments, followed by swim lessons and recreation spaces. This trend in locker room utilization reflects two facets of the locker room experience for individuals with ASD: (i) the mandatory and/or unavoidable nature of the locker room experience and (ii) the level of nudity.

To this effect, PE class *requires* the use of the locker room in order to fulfill two functions. The first function is largely practical, i.e., to provide students with a space in which to change into workout clothes and store their school clothes. In this capacity, the use of locker rooms in PE is required as students *must* change before PE class. The second function of the locker room in PE class has to with the hidden curriculum, where the locker room is an extension of the pedagogical environment of the school itself (Lee, 2011). The unspoken rules, norms, and methodologies of the locker room, as well as the social guidelines that govern them, constitute the hidden curriculum of the locker room environment. Interestingly, according to Jackson (1968), teaching students this hidden curriculum falls within the educational mandate of schools, i.e., to teach students how to behave with each other beyond the confines of the classroom. Similar hidden curricula exist in the cafeteria, the playground, restrooms, and other school spaces not under the direct supervision of persons of authority (Lee, 2011). As such, in making the locker room environment a prerequisite to PE class, individuals with ASD are forced to engage with this hidden curriculum and do so at a

marked disadvantage as compared to their neurotypical peers. Lamb et al. (2014) detailed the methods used by individuals with ASD to make sense of and cope with the locker room environment, where nebulous rules and a lack of structure present a great deal of confusion. The findings from this scoping review are also echoed by Cox (2022), Dodd-Reynolds (2023), and Holder (2014), who agreed that locker rooms can be harmful to both marginalized persons (e.g. LGBTQIA++) and individuals with ASD as they create a sink-or-swim approach to social learning in an environment where normative definitions of physical appearance can foster feelings of stress, vulnerability, and self-loathing.

Regarding the level of nudity in locker rooms, the four articles in swimming lesson contexts acknowledged that these contexts generally demanded greater nudity than in a typical PE class. According to Scott (2010), the near nude state of swimmers can bring a pseudo-sexual aspect to the locker room environment, fracture the norms of civil society, and even create an environment where one's physique is subject to extreme scrutiny and the harshest of social critique.

To this effect, the only study in this scoping review where the locker room was so triggering as to deter an individual with ASD from engaging in physical activity altogether was in a swimming pool context (Lawson et al., 2019). The swimming pool locker room is notably the most challenging environment for participants, with most negative perceptions occurring in this setting. Paradoxically, the only study where participants held a generally positive perception of the locker room was also in a swimming context. Prupas et al. (2006) structured the swimming experience for young children with ASD in parent-child dyads, enabling the formation and strengthening of the bond between the parent and child throughout the activity, extending into the locker room space. The parent-child dyads enabled an understanding of the locker room experience for these children as parents assisted their children and other children in developing social skills through

simple tasks such as getting changed together (Prupas et al., 2006). The combination of early exposure to aquatics and strong parental involvement in this study helped create positive feelings in the participants surrounding the locker room, curbing the trend observed in this scoping review surrounding negative experiences in the locker rooms of aquatic environments. Kraft (2019) echoed the importance of parental/guardian involvement in swimming pool locker rooms as a means of facilitating socialization and reducing the emotional risks, and even beyond the locker room by improving swimming technique and overall safety.

Implications for Locker Room Design

Building on the successes reported by Prupas et al. (2006), changing room environments across both general recreational and swimming-specific contexts would benefit from adaptations for individuals with ASD based on the obstacles identified in the results section.

Sensory and environmental adaptations: Maher's (2017) suggestion to prevent the triggering caused by loud noises like hair dryers is to separate individuals with ASD from neurotypical persons. While this may be technically effective, it is practically difficult and at odds with other studies included in this scoping review highlighting the importance of locker rooms as a site of inclusion and social development for individuals with ASD (Haegele et al, 2021; Hickingbotham et al., 2021; Lee, 2011). Moreover, what constitutes an adaptation remains unclear in the literature. For example, in their exploration of locker room uses among transgender athletes, Cunningham et al. (2017) put the onus on the athlete to adapt to uncomfortable or discriminatory situations. This idea was similarly presented in the articles by Lamb et al. (2014) and Haegele and Maher (2021), where individuals with ASD often change quickly in a stall outside of the designated

changing areas to avoid being seen by their peers. However, relying on the individual to adapt to the locker room environment may be impractical or impossible in most situations.

Considering the scholarship reviewed, this thesis proposes that the best approach to adapting the locker room for individuals with ASD is not single-facete. On the one hand, simply segregating individuals with ASD from their peers amplifies differences. On the other, putting the entire onus on individuals with ASD to navigate the complex locker room environment can be an unreasonable ask. To that end, the definition of "adaptation" for which this thesis advocates is one that has been formulated by Forgeot d'Arc et al. (2020), where the responsibility for adaptations is distributed among the locker room user and the locker room environment. Concretely, individuals with ASD learn how to navigate the complex locker room environment through the different means discussed throughout the thesis, such as the parental guidance discussed by Prupas et al. (2006). At the same time, modifications to the physical locker room environment can take place to better accommodate the needs of individuals with ASD. In short, the best approach to helping individuals with ASD better use the locker room is a combination of personal adaptations and environmental adaptations. To illustrate, the dry runs proposed by Napolitano (2017) and positive reinforcement strategies in Dowdy and Tincani (2019) omit an important environmental component. The addition of ultra quiet low decibel hairdryers, such as the Panasonic Low-Noise IONITY Hair Dryer (Appendix G, Figure 9), or enclosed floor to ceiling changing pods, would constitute a true adaptation, where intrapersonal strategies for navigating the locker room harmonize with environmental modifications to the space.

Social & supervisory adaptations: Considering this combined individual and environmental approach to improving the locker room experience for individuals with ASD, Haegele and Maher's (2022) recommendation for a bullying-free locker room is useful but lacks

clarity about how to execute that vision. A zero-harassment environment is an important goal but requires tangible guidelines to be effectively implemented in locker room environments. Prupas et al. (2006) offer practical guidance on how to create a safe locker room environment for individuals with ASD by emphasizing parental involvement and educating youth about the unspoken rules underpinning locker room interactions. However, as their approach hinges on early parental involvement, this raises questions about the timing and lasting impact of such interventions. More specifically, how do individuals with ASD who do not have highly involved parents learn to navigate these environments? Furthermore, how well do these interventions prepare individuals with ASD to function independently in locker rooms without parental or adult supervision?

To address these concerns, shifting the responsibility of socialization and supervision in locker rooms from parents/guardians to include the wider community is essential. Thus, sharing information about the challenges faced by individuals with ASD in locker rooms can raise awareness and educate the public and locker room users about the needs of the ASD community. Widespread access to detailed information about the needs of individuals with ASD in locker rooms could potentially be the key to improving their experiences and reducing the effort and emotional taxation required by parents and other family members. Increasing the level of societal awareness regarding the needs of the ASD community to a level similar to, for instance, the social expectation of offering a seat on a bus to someone with a physical disability, offers a sustainable and long-term solution to making locker rooms more accessible to individuals with ASD.

5.2 Recommendations for Future Research & Practice

This scoping review identified two areas in which future research and social action are needed. The first area involves contemporary understandings about ASD in females in sports and

locker room settings. Across all studies included in this review, insufficient attention was given to differences in the locker room experiences across sexes and genders. Future research should consider sex and gender differences pertaining to locker room experiences among individuals with ASD. Additionally, a focus on the female ASD experience in locker rooms is warranted based on marked differences in symptomatology which may greatly affect how the locker room setting is experienced by participants. For instance, Napolitano (2022) noted that females with ASD exhibit differences in sensory needs, avoidance patterns, and language and motor learning compared to males with ASD. These differences may help to explain variances in locker room functionality and overall sports and recreation engagement among females with ASD.

Additionally, a deeper examination of gendered experiences within the locker room may also shed light on inequalities in physical performance between males and females with ASD. In their analysis of gender differences among individuals with ASD, Kassee et al. (2022) found increased body mass index (BMI), concentration of inflammatory markers, and endocrine disorders in women with ASD in comparison to their male counterpart. Thus, the fact that girls with ASD face more physical health challenges than boys with ASD and neurotypical girls is possibly due to barriers to physical activity, like locker rooms (Kassee et al., 2020). The authors of this study also called for improved attention and access to physical activity opportunities for girls/women with ASD, especially with regards to the social and psychological hazards of body dysmorphia and unrealistic beauty standards that disproportionately affect females (Kassee et al., 2020). There is a pressing need for more comprehensive research efforts to address the experiences of all genders in locker room environments.

Another avenue for future work pertains to the need for improved education and sensitization to the needs of individuals with ASD within the locker room setting. The lack of

consistent, evidence-based protocols surrounding the locker room for individuals with ASD precludes the creation of effective and lasting adaptations to this space. Bremer et al. (2020) acknowledged the lack of training across both homeroom teachers and PE teachers with regards to the unique needs of individuals with ASD. This gap in training among educators may partially explain the reduced levels of physical activity participation of children with ASD compared to their neurotypical peers. Since the locker room is a required aspect of almost all PE classes, there is an urgent need for evidence-based pedagogical training for both general and PE-specific teachers to help foster a sense of comfort and belonging among individuals with ASD within the locker room setting (Bremer, et al., 2020). Additionally, neurotypical students should also participate in learning about tolerance, respect, and patience towards their peers and friends with ASD both inside and outside the locker room. This collective approach aims to create a unified social network in which educators and peers work together to create a safe locker room environment for individuals with ASD from childhood to adulthood.

5.3 Study Limitations

Several authors appeared multiple times across the 13 studies included in this scoping review. Notably, Haegele and Maher (2021, 2022) appeared twice, and Maher appeared a total of three times amongst the 13 studies. The reoccurrence of scholars across so few studies indicates that our understanding of the locker room experience is still limited, making this topic largely underexplored. Studying and including diverse perspectives would help provide a deeper understanding of the locker room experience for individuals with ASD and better communicate the needs of this underrepresented community.

Another limitation, perhaps also partially due to a lack of research, is the marked absence of specific recommendations for locker room adaptations for individuals with ASD. While several studies in this scoping review proposed general modifications to the locker room, only Thoren et al. (2020) proposed a tangible strategy to improve the locker room experience for individuals with ASD using pictograms that illustrate appropriate behaviour in this environment. The lack of actionable strategies for educators, administrators, and managers of locker room spaces hinders their ability to provide improved physical activity opportunities for the ASD community.

Finally, of concern to the present work and, more importantly, to the ASD community, is that not one of the 13 studies featured in this scoping review was exclusively centred on the locker room. The assessment of locker room experience for individuals with ASD was often an incidental finding in studies focused on sports or physical education. Furthermore, none of the studies that assessed the locker room experience examined the apparent connection between loud noises, bullying, or social exclusion in the locker room and similar behaviours in the sporting environment proper. In this sense, the way individuals with ASD interact with the locker room is disconnected from their experiences in the sporting and recreation environment itself. As a result, the extent to which maladapted locker rooms can bleed into the sporting environment and thus, deter physical activity participation in individuals with ASD is underassessed. Disregarding this locker room-sporting environment connection also overlooks the potential for positive changes on the field, like team building, to lead to improvements off the field and into the locker room.

5.4 Chapter Summary and Concluding Remarks

In conclusion, this chapter discussed the obstacles and opportunities reported in the selected studies for individuals with ASD in the locker room. In this chapter, I explored the diverse

experiences that individuals with ASD may have in locker rooms. This highlights the need for adaptations that promote inclusivity and well-being in these complex spaces. In section 5.1, I examined the participant information (e.g. age, diagnosis, etc.), the various contexts in which locker rooms were examined in the scholarship, and how individuals with ASD interacted with these environments across the studies. In section 5.2, I evaluated the adaptations to locker rooms suggested in the selected studies. Finally, in section 5.3, I identified the study limitations encountered conducting this research and proposed avenues for further research in the field of adapted locker rooms and accessible sports participation for individuals with ASD.

Chapter 6

Summary

ASD is a neurodevelopmental disorder that significantly affects the way individuals perceive and interact with the world, impacting almost all aspects of their lives (American Psychiatric Association, 2013). The characteristics associated with an ASD diagnosis can lead to challenges in navigating social or public environments, particularly those related to physical activity (Pan, 2017). However, engaging in physical activity is crucial for individuals with ASD, as it offers numerous physical and mental health benefits, improving their overall quality of life (Lang et al., 2010). On the other hand, the locker room environment, with its unique social and sensory elements, is a significant barrier to physical activity participation for members of the ASD community (Haegele & Maher, 2022). Despite the importance of accessing physical activity and the known challenges associated with locker rooms environments, there is a glaring lack of research examining the experiences of individuals with ASD in these settings. Therefore, the purpose of this scoping review was to conduct a comprehensive mapping of the existing scientific literature to summarize the experience of locker room environments of individuals with ASD and to determine the extent of existing scholarship on this topic.

This scoping review was conducted following the framework laid out by Arksey and O'Malley (2005), the gold standard in scoping review methodologies, in combination with the suggested additions by Levac et al. (2010). The Arksey and O'Malley framework is a six-step approach, consisting of, in order, (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarizing, and reporting the results, (6) consultation with the main stakeholders (optional). Each one of these stages of the research protocol was carefully adapted to the objectives of the present work. While the sixth and

optional step, consultation with the main stakeholders, was not conducted before the initial thesis submission, I have full intentions of consulting with professionals working with the ASD community in Montreal before publishing this research in an academic journal.

Three different approaches were used to locate 1,151 relevant studies, from which 13 were selected to comprise the analysis for this study. Firstly, I conducted a database search of the following six databases: ESBSO (ERIC), Ovid MEDLINE, APA PSYCInfo, SPORTDiscus, Sport Medicine and Education Index, and Web of Science. Secondly, I hand searched key journals such as the European Journal of Adapted Physical Activity, Adapted Physical Activity Quarterly, Autism, and the Journal of Autism and Developmental Disorders. Finally, I citation-chased seminal studies in the field. Key terms related to ASD, locker rooms and adapted physical activity were formulated with the help of the reference librarian; while the present scoping review focuses on locker rooms specifically, discussions of locker room experiences were found as secondary topics within broader articles on adapted physical activity and sports facilities. As a result, and to ensure a comprehensive review, the search terms were intentionally broad, encompassing studies that focused on adapted physical activity, physical education, and swimming in which the locker room was mentioned. Given this broader scope, strict inclusion and exclusion criteria were essential in identifying the 13 relevant studies and ensuring the research focus remained on locker room experiences. Analytically, the categories used to organize the studies and their findings were as follows: (i) publication information (ii) participant information, (iii) locker room information, and (iv) findings. Publication information referred to the authors, language, year and country of publication. The participant information pertained more specifically to the age, gender, diagnosis, and comorbidities of the participants. Locker room information identified the type of locker room and the context of use (i.e. school, swimming pool, etc.) and the findings referred to the

conclusions surrounding the locker room environment. From these categories and the data extracted from the selected studies, I was able to come to the following conclusions regarding the experiences of individuals with ASD in locker room environments.

The 13 studies included in the present scoping review spanned six countries, with the United States being the most frequently represented. A total of 190 participants aged 2 to 19 were sampled across the 13 studies, of whom 65% were males, which is consistent with the prevalence of ASD diagnoses. The young demographic represented in this study highlights the vulnerability of children and adolescents to the adverse social and sensory environments of the locker room. In fact, this review is especially relevant to the experiences of young persons with ASD as experiences of racism, sexism, homophobia, and ableism tend to go unchecked in the locker room thereby enabling abuse to go unabated.

Six of the 13 studies looked at the experience of locker rooms in PE classes. The other studies observed locker rooms in the context of adapted physical activity, swimming pools and recreational spaces. These studies emphasized the mandatory nature of the locker room as a significant barrier to physical activity as well as the complex hidden curriculum that underpins locker room interactions. Taken together, these factors place individuals with ASD at a marked disadvantage compared to their neurotypical peers. Of note, the four articles that were set in swimming lesson contexts noted that these contexts typically demanded greater nudity in the locker room. This is of consequence because locker room nudity fosters an environment where an individual's physique is subject to extreme scrutiny and the harshest of social critique, which can trigger feelings of body dysmorphia among individuals with ASD. Due to the complicated nature of the locker room environment, most of the studies reported a negative view of locker rooms. In fact, many participants reported that their experience of the locker rooms had the potential to deter

their participation in and the enjoyment of sporting or recreation. Only one study had a positive view of the locker room. This study focused on the experiences of young, newly diagnosed toddlers and children who were accompanied by their parents.

The main goal of this scoping review was to identify the triggers and opportunities present within the locker room environment for individuals with ASD. The triggers in the locker room can be physical, environmental, or social factors that might make it difficult for individuals with ASD to engage. On the other hand, opportunities are resources within the locker room environment that can help individuals with ASD engage and have better experiences in that setting. The obstacles and opportunities were broken down into the three following categories: (1) sensory and environmental, (2) supervision and structure, (3) social interactions & implicit rules.

Finally, the PRISMA-ScR guidelines were followed throughout this scoping review to ensure a rigorous, transparent, and replicable methodology and to enhance the quality and trustworthiness of the findings. All but two of the required PRISMA items were present in this study: item 12 (cultural appraisal) and item 22 (funding). Cultural appraisal of individual sources of evidence was not completed as I am awaiting final submission of the scoping review to my thesis program before consultation with key stakeholders. Funding was not included as this scoping review was conducted as part of a master's thesis without external funding.

References

*Indicates a study selected in the scoping review

Aderinto, N., Olatunji, D., & Idowu, O. (2023). Autism in Africa: prevalence, diagnosis, treatment and the impact of social and cultural factors on families and caregivers: a review. Annals of Medicine and Surgery, 85(9), 4410-4416.

Akshoomoff, N., Corsello, C., & Schmidt, H. (2006). The role of the autism diagnostic observation schedule in the assessment of autism spectrum disorders in school and community settings. The California School Psychologist, 11(1), 7-19.

Amineh, R. J., & Asl, H. D. (2015). Review of constructivism and social constructivism. Journal of social sciences, literature and languages, 1(1), 9-16.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). American Psychiatric Publishing.

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. International journal of social research methodology, 8(1), 19-32.

*Arnell, S., Jerlinder, K., & Lundqvist, L. O. (2020). Parents' perceptions and concerns about physical activity participation among adolescents with autism spectrum disorder. Autism, 24(8), 2243-2255

Aromataris, E., & Pearson, A. (2014). The systematic review: an overview. AJN The American Journal of Nursing, 114(3), 53-58.

Bearman, P., & King, M. (2009). Author's response commentaries on diagnostic accretion and the increased prevalence of measured autism. International journal of epidemiology, 38(5), 1243-1244.

Bennett, M., Webster, A. A., Goodall, E., Rowland, S., Bennett, M., Webster, A. A., ... & Rowland, S. (2018). Establishing social inclusion the autism way: denying the "They Don't Want Friends" myth. Life on the autism spectrum: Translating myths and misconceptions into positive futures, 173-193.

BMJ (OPEN ACCESS) Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Boyd, B. A., & Shaw, E. (2010). Autism in the classroom: A group of students changing in population and presentation. Preventing School Failure: Alternative Education for Children and Youth, 54(4), 211-219.

Brown, D. M., Arbour-Nicitopoulos, K. P., Martin Ginis, K. A., Latimer-Cheung, A. E., & Bassett-Gunter, R. L. (2020). Examining the relationship between parent physical activity support behaviour and physical activity among children and youth with autism spectrum disorder. Autism, 24(7), 1783-1794.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101.

Bremer, E., Martin Ginis, K. A., Bassett-Gunter, R. L., & Arbour-Nicitopoulos, K. P. (2020). Factors Associated with Participation in Physical Activity Among Canadian School-Aged Children with Autism Spectrum Disorder: An Application of the International Classification of Functioning, Disability and Health. *International journal of environmental research and public health*, *17*(16), 5925. https://doi.org/10.3390/ijerph17165925

Cage, E., Di Monaco, J., & Newell, V. (2018). Experiences of autism acceptance and mental health in autistic adults. Journal of autism and developmental disorders, 48, 473-484.)

Carter, A. S., Davis, N. O., Klin, A., & Volkmar, F. R. (2005). Social development in autism. Handbook of autism and pervasive developmental disorders, 1, 312-334.

Casanova, M. F., Frye, R. E., Gillberg, C., & Casanova, E. L. (2020). Comorbidity and autism spectrum disorder. Frontiers in psychiatry, 11, 1273.

Centers for Disease Control and Prevention. (2023). Data & Statistics on Autism Spectrum Disorder. Retrieved [January 9, 2024], from https://www.cdc.gov/ncbddd/autism/data.html

Cooper, S., Cant, R., Kelly, M., Levett-Jones, T., McKenna, L., Seaton, P., & Bogossian, F. (2021). An evidence-based checklist for improving scoping review quality. Clinical Nursing Research, 30(3),

Courchesne, V., Girard, D., Jacques, C., & Soulières, I. (2019). Assessing intelligence at autism diagnosis: Mission impossible? Testability and cognitive profile of autistic preschoolers. Journal of autism and developmental disorders, 49, 845-856.

Colquhoun, H. L., Levac, D., O'Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., ... & Moher, D. (2014). Scoping reviews: time for clarity in definition, methods, and reporting. Journal of clinical epidemiology, 67(12), 1291-1294.230-240.

Conn, C. (2015). ‘Sensory highs’,‘vivid rememberings’ and ‘interactive stimming’: children’s play cultures and experiences of friendship in autistic autobiographies. Disability & Society, 30(8), 1192-1206.

Corsello, C. M. (2005). Early intervention in autism. Infants & young children, 18(2), 74-85.

Cox, H. (2022). Interactive Addressing of Body Insecurity in Adolescent Females.

Cunningham, G. B., Buzuvis, E., & Mosier, C. (2018). Inclusive spaces and locker rooms for transgender athletes. *Kinesiology Review*, *7*(4), 365-374.

Curtin, C., Jojic, M., & Bandini, L. G. (2014). Obesity in children with autism spectrum disorders. Harvard review of psychiatry, 22(2), 93.

Dehqonova, M., & Tagonova, G. (2022). The Importance of Didactic Games in Speech Therapy in the Development of Speech in Children with Autism and the Ability to Choose Effective Methods. European Journal of Innovation In Nonformal Education, 2(1), 133-137.

Deeks, J. J., Higgins, J. P., Altman, D. G., & Cochrane Statistical Methods Group. (2019). Analysing data and undertaking meta-analyses. Cochrane handbook for systematic reviews of interventions, 241-284.

Dinstein, I., Solomon, S., Zats, M., Shusel, R., Lottner, R., Ben Gershon, B., ... & Shmueli, D. (2023). Two-fold increase in the prevalence of autism in Israel between 2017 and 2021. medRxiv, 2023-04.

Djordjević, M., Memisevic, H., Potic, S., & Djuric, U. (2022). Exercise-based interventions aimed at improving balance in children with autism spectrum disorder: A meta-analysis. Perceptual and Motor Skills, 129(1), 90-119.

Dodd-Reynolds, C., Griffin, N., Kyle, P., Scott, S., Fairbrother, H., Holding, E., Crowder, M., Woodrow, N., & Summerbell, C. (2024). Young people's experiences of physical activity insecurity: a qualitative study highlighting intersectional disadvantage in the UK. *BMC public health*, *24*(1), 813. https://doi.org/10.1186/s12889-024-18078-9

*Dowdy, A., & Tincani, M. (2020). Assessment and treatment of high-risk challenging behavior of adolescents with autism in an aquatic setting. Journal of applied behavior analysis, 53(1), 305-314.

Duquette, M. M., Carbonneau, H., Roult, R., & Crevier, L. (2016). Sport and physical activity: Facilitating interventions with young people living with an autism spectrum disorder. Physical Activity Review, (4), 40-49.

Dykens, E. M., Rosner, B. A., & Butterbaugh, G. (1998). Exercise and sports in children and adolescents with developmental disabilities: positive physical and psychosocial effects. Child and adolescent psychiatric clinics of North America, 7(4), 757-771.

Eaves, L. C., & Ho, H. H. (2008). Young adult outcome of autism spectrum disorders. Journal of autism and developmental disorders, 38, 739-747.

Elliott Jr, R. O., Dobbin, A. R., Rose, G. D., & Soper, H. V. (1994). Vigorous, aerobic exercise versus general motor training activities: Effects on maladaptive and stereotypic behaviors of adults with both autism and mental retardation. Journal of autism and developmental disorders, 24(5), 565-576.

Endow, J. (2012). Learning the hidden curriculum: The odyssey of one autistic adult. AAPC Publishing.

Evans, K., van der Meer, L., Eggleston, M. J., Taylor, L. J., Thabrew, H., Waddington, H., & Whitehouse, A. J. (2021). A survey of autistic adults from New Zealand on the autism diagnostic process during adolescence and adulthood. Journal of Autism and Developmental Disorders, 1-11.

Featherstone, C. (2024). Social Prescribing for Autistic Adults (Doctoral dissertation, University of Plymouth).

Fein, E. (2020). Living on the spectrum: Autism and youth in community (Vol. 8). NYU Press.

Foxx, R. M. (2008). Applied behavior analysis treatment of autism: The state of the art. Child and adolescent psychiatric clinics of North America, 17(4), 821-834

Garg, A. X., Hackam, D., & Tonelli, M. (2008). Systematic review and meta-analysis: when one study is just not enough. Clinical journal of the American Society of Nephrology, 3(1), 253-260.

Grant, M. J., & Booth, A. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. Health information & libraries journal, 26(2), 91-108.

Gillott, A., & Standen, P. J. (2007). Levels of anxiety and sources of stress in adults with autism. Journal of Intellectual Disabilities, 11(4), 359–370.

Grzadzinski, R., Huerta, M., & Lord, C. (2013). DSM-5 and autism spectrum disorders (ASDs): an opportunity for identifying ASD subtypes. Molecular autism, 4(1), 1-6.

Guest, L., Balogh, R., Dogra, S., & Lloyd, M. (2017). Examining the impact of a multi-sport camp for girls ages 8–11 with autism spectrum disorder. Therapeutic Recreation Journal, 51(2), 109.

Guthrie, W., Swineford, L. B., Nottke, C., & Wetherby, A. M. (2013). Early diagnosis of autism spectrum disorder: stability and change in clinical diagnosis and symptom presentation. Journal of Child Psychology and Psychiatry, 54(5), 582-590.

Guttikonda, K., Ramachandran, G., & Prasad, G. V. S. N. R. V. ENHANCING THE RESTING-STATE FMRI DATA FOR DETECTION OF AUTISM SPECTRUM DISORDER USING DEEP LEARNING.

*Haegele, J. A., & Maher, A. J. (2022). Male autistic youth experiences of belonging in integrated physical education. Autism, 26(1), 51-61.

*Haegele, J. A., & Maher, A. J. (2021). A creative non-fiction account of autistic youth integrated physical education experiences. Disability & Society, 38(9), 1647–1666.

Hai, Y., Muhammad, S., ul Ain, Q., Zou, M., Liu, D., & LiJie, W. (2023). A comparison of the epidemiological factors and burden of autism spectrum disorders worldwide and in China.

Hazen, E. P., Stornelli, J. L., O'Rourke, J. A., Koesterer, K., & McDougle, C. J. (2014). Sensory symptoms in autism spectrum disorders. Harvard review of psychiatry, 22(2), 112-124.

Healy, S., & Garcia, J. M. (2019). Psychosocial correlates of physical activity participation and screen-time in typically developing children and children on the autism spectrum. Journal of Developmental and Physical Disabilities, 31, 313-328.

Healy, S., Msetfi, R., & Gallagher, S. (2013). 'Happy and a bit nervous': The experiences of children with autism in physical education. British Journal of Learning Disabilities, 41(3), 222-228.

Hedley, D., Uljarević, M., Foley, K. R., Richdale, A., & Trollor, J. (2018). Risk and protective factors underlying depression and suicidal ideation in autism spectrum disorder. Depression and anxiety, 35(7), 648-657

Herrick, S. S., & Duncan, L. R. (2023). A systematic scoping review of physical education experiences from the perspective of LGBTQ+ students. *Sport, Education and Society*, *28*(9), 1099-111

*Hickingbotham, M. R., Wong, C. J., & Bowling, A. B. (2021). Barriers and facilitators to physical education, sport, and physical activity program participation among children and adolescents with psychiatric disorders: a systematic review. Translational Behavioral Medicine, 11(9), 1739-1750.

Higgins, J. P., & Green, S. (Eds.). (2008). Cochrane handbook for systematic reviews of interventions.

Hill, A. P., Zuckerman, K. E., & Fombonne, E. (2015). Obesity and autism. Pediatrics, 136(6), 1051-1061.

Hodges, H., Fealko, C., & Soares, N. (2020). Autism spectrum disorder: definition, epidemiology, causes, and clinical evaluation. Translational pediatrics, 9(Suppl 1), S55.

Holden, R., Mueller, J., McGowan, J., Sanyal, J., Kikoler, M., Simonoff, E., ... & Downs, J. (2020). Investigating bullying as a predictor of suicidality in a clinical sample of adolescents with autism spectrum disorder. Autism research, 13(6), 988-997.

Holder, M. K., & Blaustein, J. D. (2014). Puberty and adolescence as a time of vulnerability to stressors that alter neurobehavioral processes. *Frontiers in neuroendocrinology*, *35*(1), 89–110. https://doi.org/10.1016/j.yfrne.2013.10.004

Houston-Wilson, C. (2017). Autism spectrum and social communication disorders. Adapted physical education and sport, 197-214.

İrtenk, T., & Akbulut, M. T. (2015). ARCHITECTURAL DESIGN PRINCIPLES FOR AUTISTIC CHILDREN'S EDUCATION AND REHABILITATION CENTERS. In EDULEARN15 Proceedings (pp. 5752-5761). IATED.

Jachyra, P., Renwick, R., Gladstone, B., Anagnostou, E., & Gibson, B. E. (2021). Physical activity participation among adolescents with autism spectrum disorder. Autism, 25(3), 613-626.

Johnson, C. P., & Myers, S. M. (2007). Identification and evaluation of children with autism spectrum disorders. Pediatrics, 120(5), 1183-1215.

Jordan, C. J., & Caldwell-Harris, C. L. (2012). Understanding differences in neurotypical and autism spectrum special interests through internet forums. Intellectual and developmental disabilities, 50(5), 391-402

Kahathuduwa, C. N., West, B. D., Blume, J., Dharavath, N., Moustaid-Moussa, N., & Mastergeorge, A. (2019). The risk of overweight and obesity in children with autism spectrum disorders: A systematic review and meta-analysis. Obesity Reviews, 20(12), 1667-1679.

Kasari, C., & Sterling, L. (2013). Loneliness and social isolation in children with autism spectrum disorders. The handbook of solitude: Psychological perspectives on social isolation, social withdrawal, and being alone, 409-426.

Kassee, C., Babinski, S., Tint, A., Lunsky, Y., Brown, H. K., Ameis, S. H., Szatmari, P., Lai, M. C., & Einstein, G. (2020). Physical health of autistic girls and women: a scoping review. *Molecular autism*, *11*(1), 84. https://doi.org/10.1186/s13229-020-00380-z

Kehler, M., & Atkinson, M. (2013). Examining the (em) bodied boundaries of high school locker rooms. In Contemporary Debates in the Sociology of Education (pp. 112-130). London: Palgrave Macmillan UK.

Ketcheson, L. R., Pitchford, E. A., & Wentz, C. F. (2020). The relationship among early functional milestones and core deficits in Autism Spectrum Disorder. Research in Autism Spectrum Disorders, 78, 101638.)

Kover, S. T., Edmunds, S. R., & Ellis Weismer, S. (2016). Brief report: Ages of language milestones as predictors of developmental trajectories in young children with autism spectrum disorder. Journal of Autism and Developmental Disorders, 46, 2501-2507.

Kraft, E. (2019). Examining the perceived impacts of recreational swimming lessons for children with autism spectrum disorder. *International journal of aquatic research and education*, *10*(4), 6.

Kunzi, K. (2015). Improving social skills of adults with autism spectrum disorder through physical activity, sports, and games: A review of the literature. Adultspan Journal, 14(2), 100-113.

Lacey, F. M., Matheson, L., & Jesson, J. (2011). Doing your literature review: Traditional and systematic techniques. Doing Your Literature Review, 1-192.

Lai, M. C., Anagnostou, E., Wiznitzer, M., Allison, C., & Baron-Cohen, S. (2020). Evidence-based support for autistic people across the lifespan: Maximising potential, minimising barriers, and optimising the person–environment fit. The Lancet Neurology, 19(5), 434-451.

Landrigan, P. J. (2010). What causes autism? Exploring the environmental contribution. Current opinion in pediatrics, 22(2), 219-225.

Lang, R., Koegel, L. K., Ashbaugh, K., Regester, A., Ence, W., & Smith, W. (2010). Physical exercise and individuals with autism spectrum disorders: A systematic review. Research in Autism Spectrum Disorders, 4(4), 565-576.

*Lamb, P., Firbank, D., & Aldous, D. (2016). Capturing the world of physical education through the eyes of children with autism spectrum disorders. Sport, Education and Society, 21(5), 698-722.

*Lawson, L. M., Bandy, M., Kadolph, A., Le, A., & Pettersson, S. (2019). The descriptive study of concerns of parents of children with ASD and factors related to obesity. Therapeutic Recreation Journal, 53(2), 117-131.

*Lee, H. J. (2011). Cultural factors related to the hidden curriculum for students with autism and related disabilities. Intervention in school and clinic, 46(3), 141-149.

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: advancing the methodology. Implementation science, 5, 1-9.

Lochbaum, M., & Crews, D. (2003). Viability of cardiorespiratory and muscular strength programs for the adolescent with autism. Complementary health practice review, 8(3), 225-233.

Lord, C., Brugha, T. S., Charman, T., Cusack, J., Dumas, G., Frazier, T., ... & Veenstra-VanderWeele, J. (2020). Autism spectrum disorder. Nature reviews Disease primers, 6(1), 1-23.

Lord, C., Cook, E. H., Leventhal, B. L., & Amaral, D. G. (2000). Autism spectrum disorders. Neuron, 28(2), 355-363.

Lord, C., Elsabbagh, M., Baird, G., & Veenstra-Vanderweele, J., 2018 Autism spectrum disorder. The lancet, 392(10146), 508-520.

Little, C. (2017). Social inclusion and autism spectrum disorder. In Supporting social inclusion for students with autism spectrum disorders (pp. 9-20).

Maddox, B. B., & White, S. W. (2015). Comorbid social anxiety disorder in adults with autism spectrum disorder. Journal of Autism and Developmental Disorders, 45(12), 3949–3960.)

*Maher, A. J. (2017). 'We've got a few who don't go to PE' Learning support assistant and special educational needs coordinator views on inclusion in physical education in England. European Physical Education Review, 23(2), 257-270

Mandy, W., Murin, M., Baykaner, O., Staunton, S., Cobb, R., Hellriegel, J., ... & Skuse, D. (2016). Easing the transition to secondary education for children with autism spectrum disorder: An evaluation of the Systemic Transition in Education Programme for Autism Spectrum Disorder (STEP-ASD). Autism, 20(5), 580-590.

Mannion, A., & Leader, G. (2013). Comorbidity in autism spectrum disorder: A literature review. Research in Autism Spectrum Disorders, 7(12), 1595-1616

Martínez-Pedraza, F. D. L., & Carter, A. S. (2009). Autism spectrum disorders in young children. Child and Adolescent Psychiatric Clinics, 18(3), 645-663.

Matson, J. L., & Kozlowski, A. M. (2011). The increasing prevalence of autism spectrum disorders. Research in autism spectrum disorders, 5(1), 418-425.

McGovern, C. W., & Sigman, M. (2005). Continuity and change from early childhood to adolescence in autism. Journal of Child Psychology and Psychiatry, 46(4), 401-408.

McMahon, J., Wiltshire, G. E., McGannon, K. R., & Rayner, C. (2020). Children with autism in a sport and physical activity context: A collaborative autoethnography by two parents outlining their experiences. Sport, Education and Society, 25(9), 1002-1014.

Menear, K. S., & Neumeier, W. H. (2015). Promoting physical activity for students with autism spectrum disorder: Barriers, benefits, and strategies for success. Journal of Physical Education, Recreation and Dance, 86(3), 43-48.

Michaud, M. (2021). Physical Activity for Children with Disabilities: Scoping Review of Mixed Methods Research(Doctoral dissertation, McGill University (Canada)).

Mische Lawson, L., D'Adamo, J., Campbell, K., Hermreck, B., Holz, S., Moxley, J., ... & Travis, A. (2019). A qualitative investigation of swimming experiences of children with autism spectrum disorders and their families. Clinical Medicine Insights: Pediatrics, 13, 1179556519872214.

*Moore, K., Bullard, A., Sweetman, G., & Ahearn, W. H. (2022). Assessing and treating anxiety in individuals with autism. Behavior Modification, 46(6), 1279-1313.

Munn, Z., Peters, M. D., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC medical research methodology, 18, 1-7.

Myles, B. S. (2000). Asperger syndrome and sensory issues: Practical solutions for making sense of the world. AApC publishing.

Napolitano, A., Schiavi, S., La Rosa, P., Rossi-Espagnet, M. C., Petrillo, S., Bottino, F., ... & Vicari, S. (2022). Sex differences in autism Spectrum disorder: diagnostic, neurobiological, and behavioral features. Frontiers in Psychiatry, 13, 889636.

*Napolitano, S. (2017). Swimming as an inclusion tool for autistic subjects. Journal of Physical Education and Sport, 17, 2339-2343.

Narayan, R., Rodriguez, C., Araujo, J., Shaqlaih, A., & Moss, G. (2013). Constructivism—Constructivist learning theory.

Nolan, J., & McBride, M. (2015). Embodied semiosis: Autistic 'stimming'as sensory praxis. International handbook of semiotics, 1069-1078.,

Nowell, K. P., Bernardin, C. J., Brown, C., & Kanne, S. (2021). Characterization of special interests in autism spectrum disorder: A brief review and pilot study using the special interests survey. Journal of Autism and Developmental Disorders, 51, 2711-2724.

Ozonoff, S., Iosif, A. M., Baguio, F., Cook, I. C., Hill, M. M., Hutman, T., ... & Young, G. S. (2010). A prospective study of the emergence of early behavioral signs of autism. Journal of the American Academy of Child & Adolescent Psychiatry, 49(3), 256-266.

Pan, C. Y., Chu, C. H., Tsai, C. L., Sung, M. C., Huang, C. Y., & Ma, W. Y. (2017). The impacts of physical activity intervention on physical and cognitive outcomes in children with autism spectrum disorder. Autism, 21(2), 190-202.

Papaioannou, D., Sutton, A., & Booth, A. (2016). Systematic approaches to a successful literature review. Systematic approaches to a successful literature review, 1-336.

Pawson, R. (2002). Evidence-based policy: in search of a method. Evaluation, 8(2), 157-181.

Pezzimenti, F., Han, G. T., Vasa, R. A., & Gotham, K. (2019). Depression in youth with autism spectrum disorder. Child and Adolescent Psychiatric Clinics, 28(3), 397-409)

Pfeffer, R. D. (2016). Childhood victimization in a national sample of youth with autism spectrum disorders. Journal of Policy and Practice in Intellectual Disabilities, 13(4), 311-319

Pham, M. T., Rajić, A., Greig, J. D., Sargeant, J. M., Papadopoulos, A., & McEwen, S. A. (2014). A scoping review of scoping reviews: advancing the approach and enhancing the consistency. Research synthesis methods, 5(4), 371-385.

Picci, G., & Scherf, K. S. (2015). A two-hit model of autism: Adolescence as the second hit. Clinical Psychological Science, 3(3), 349-371.

Pollock, A., & Berge, E. (2018). How to do a systematic review. International Journal of Stroke, 13(2), 138-156.

*Prupas, A., Harvey, W. J., & Benjamin, J. (2006). Early intervention aquatics a program for children with autism and their families. Journal of Physical Education, Recreation & Dance, 77(2), 46-51.

Ratajczak, H. V. (2011). Theoretical aspects of autism: Causes—A review. Journal of immunotoxicology, 8(1), 68-7

Reinders, N. J., Branco, A., Wright, K., Fletcher, P. C., & Bryden, P. J. (2019). Scoping review: Physical activity and social functioning in young people with autism spectrum disorder. Frontiers in psychology, 10, 120.

Roane, H. S., Fisher, W. W., & Carr, J. E. (2016). Applied behavior analysis as treatment for autism spectrum disorder. The Journal of pediatrics, 175, 27-32.

Rodriguez, G., Drastal, K., & Hartley, S. L. (2021). Cross-lagged model of bullying victimization and mental health problems in children with autism in middle to older childhood. Autism, 25(1), 90-101.

Rosen, N. E., Lord, C., & Volkmar, F. R. (2021). The diagnosis of autism: from Kanner to DSM-III to DSM-5 and beyond. Journal of autism and developmental disorders, 51, 4253-4270.

Rosenwasser, B., & Axelrod, S. (2001). The contributions of applied behavior analysis to the education of people with autism. Behavior modification, 25(5), 671-677.

Ruggeri, A., Dancel, A., Johnson, R., & Sargent, B. (2020). The effect of motor and physical activity intervention on motor outcomes of children with autism spectrum disorder: A systematic review. Autism, 24(3), 544-568.

Salari, N., Rasoulpoor, S., Rasoulpoor, S., Shohaimi, S., Jafarpour, S., Abdoli, N., ... & Mohammadi, M. (2022). The global prevalence of autism spectrum disorder: a comprehensive systematic review and meta-analysis. Italian Journal of Pediatrics, 48(1), 1-16.

Saxena, S., Van Ommeren, M., Tang, K. C., & Armstrong, T. P. (2005). Mental health benefits of physical activity. Journal of Mental Health, 14(5), 445-451.

Scott, S. (2010). How to look good (nearly) naked: The performative regulation of the swimmer's body. *Body & society*, *16*(2), 143-168.

Seltzer, M. M., Krauss, M. W., Shattuck, P. T., Orsmond, G., Swe, A., & Lord, C. (2003). The symptoms of autism spectrum disorders in adolescence and adulthood. Journal of autism and developmental disorders, 33, 565-581.

Seltzer, M. M., Shattuck, P., Abbeduto, L., & Greenberg, J. S. (2004). Trajectory of development in adolescents and adults with autism. Mental retardation and developmental disabilities research reviews, 10(4), 234-247

Siegel, B., & Hayer, C. (1999, April). Detection of autism in the 2nd and 3rd years: the Pervasive Developmental Disorders Screening Test (PDDST). In Presentation at the biennial meeting of the Society for Research in Child Development.

Smith, T. (1999). Outcome of early intervention for children with autism. Clinical Psychology: Science and Practice, 6(1), 33.

Solomon, M., Miller, M., Taylor, S. L., Hinshaw, S. P., & Carter, C. S. (2012). Autism symptoms and internalizing psychopathology in girls and boys with autism spectrum disorders. Journal of autism and developmental disorders, 42, 48-59.

Sowa, M., & Meulenbroek, R. (2012). Effects of physical exercise on autism spectrum disorders: A meta-analysis. Research in autism spectrum disorders, 6(1), 46-57

Spain, D., Happé, F., Johnston, P., Campbell, M., Sin, J., Daly, E., ... & MRC AIMS Consortium. (2016). Social anxiety in adult males with autism spectrum disorders. Research in Autism Spectrum Disorders, 32, 13-23.

Spratt, E., Mercer, M. A., Grimes, A., Papa, C., Norton, J., Serpe, A., ... & Newton, J. (2018). Translating benefits of exercise on depression for youth with autism spectrum disorder and neurodevelopmental disorders. Journal of psychology and psychiatry, 2.

Srinivasan, S. M., Pescatello, L. S., & Bhat, A. N. (2014). Current perspectives on physical activity and exercise recommendations for children and adolescents with autism spectrum disorders. Physical therapy, 94(6), 875-889.

Staples, K., Tood, T., & Reid, G. (2006). Physical activity instruction and autism spectrum disorders. ACHPER Healthy Lifestyles Journal, 53(3), 17-23.

Streatch, E., Bruno, N., & Latimer-Cheung, A. E. (2022). Investigating Strategies Used to Foster Quality Participation in Recreational Sport Programs for Children With Autism Spectrum Disorder and Their Perceived Importance. Adapted Physical Activity Quarterly, 40(1), 86-104.

Sung, M. C., Tsai, C. L., Chen, F. C., Chen, C. C., Chu, C. H., & Pan, C. Y. (2022). Physical activity, sedentary pursuits, and their determinants in children with autism spectrum disorders. Journal of Developmental and Physical Disabilities, 1-14.

Tamminen, K. A., & Poucher, Z. A. (2020). Research philosophies. In The Routledge international encyclopedia of sport and exercise psychology (pp. 535-549). Routledge.

Tanguay, P. E. (2011). Autism in DSM-5. American Journal of Psychiatry, 168(11), 1142-1144.

Tarnai, B., & Wolfe, P. S. (2008). Social stories for sexuality education for persons with autism/pervasive developmental disorder. Sexuality and Disability, 26, 29-36

*Thoren, A., Quennerstedt, M., & Maivorsdotter, N. (2021). What physical education becomes when pupils with neurodevelopmental disorders are integrated: a transactional understanding. Physical education and sport pedagogy, 26(6), 578-592.

Todd, T., & Reid, G. (2006). Increasing physical activity in individuals with autism. Focus on autism and other developmental disabilities, 21(3), 167-176.

Triandis, Harry. "Collectivism v. individualism: A reconceptualisation of a basic concept in cross-cultural social psychology." Cross-cultural studies of personality, attitudes and cognition. Palgrave Macmillan, London, 1988. 60-95.

Tricco, A. C., Lillie, E., Zarin, W., O'brien, K., Colquhoun, H., Kastner, M., ... & Straus, S. E. (2016). A scoping review on the conduct and reporting of scoping reviews. BMC medical research methodology, 16, 1-10.

Tricco, AC, Lillie, E, Zarin, W, O'Brien, KK, Colquhoun, H, Levac, D, Moher, D, Peters, MD, Horsley, T, Weeks, L, Hempel, S et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018,169(7):467-473. doi:10.7326/M18-0850.

Tse, A. C. (2020). Brief report: Impact of a physical exercise intervention on emotion regulation and behavioral functioning in children with autism spectrum disorder. Journal of autism and developmental disorders, 50(11), 4191-4198.

TSE, A. C., Anderson, D. I., Liu, V. H., & Tsui, S. S. (2021). Improving executive function of children with autism spectrum disorder through cycling skill acquisition. Medicine & Science in Sports & Exercise, 53(7), 1417-1424.

Waizbard-Bartov, E., Ferrer, E., Heath, B., Rogers, S. J., Nordahl, C. W., Solomon, M., & Amaral, D. G. (2022). Identifying autism symptom severity trajectories across childhood. Autism Research, 15(4), 687-701.

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. Cmaj, 174(6), 801-809.

Wells, G. A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. (2000). The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses.

White, S. W., & Roberson-Nay, R. (2009). Anxiety, social deficits, and loneliness in youth with autism spectrum disorders. Journal of autism and developmental disorders, 39, 1006-1013.

Wing, L. (1997). The autistic spectrum. The lancet, 350(9093), 1761-1766.

Wolff, S. (2004). The history of autism. European child & adolescent psychiatry, 13, 201-208

Volkmar, F., Chawarska, K., & Klin, A. (2005). Autism in infancy and early childhood. Annu. Rev. Psychol., 56, 315-336.

Yu, S., Wang, T., Zhong, T., Qian, Y., & Qi, J. (2022, January). Barriers and facilitators of physical activity participation among children and adolescents with intellectual disabilities: A scoping review. In *Healthcare* (Vol. 10, No. 2, p. 233). MDPI.

Zhao, M., & Chen, S. (2018). The effects of structured physical activity program on social interaction and communication for children with autism. BioMed research international, 2018.

Zwilling, M., & Levy, B. R. (2022). How well environmental design is and can be suited to people with autism spectrum disorder (ASD): A natural language processing analysis. International Journal of Environmental Research and Public Health, 19(9), 5037.

Appendix A

Table 1

Search Strategy used During Database Searches

Terms	Associated Search Terms
Autism Spectrum Disorder	"Autism Spectrum Disorder" OR "ASD" OR "Autis*" OR "Asperger"
Locker Room	"Locker Room" OR "Locker*" OR "Changing Room" OR "Vestiaires" OR "Sport Facility" OR "Athletic Facility" OR "Gym" OR "Shower" OR "School" OR "Aquatic Facility" OR "Swimming Pool" OR "Pool" OR "Sensory Spaces"
Adapted Physical Activity	"Adapted Physical Activity" OR "APA" OR "Inclusive Physical Activity" OR "Adapted PE" OR "Physical Education" OR "Physical Activity Participation" OR "Therapeutic Recreation" OR "Adapted Physical Education" OR "Sensory Inclusion" OR "Hidden Curriculum"

Appendix B

Table 2

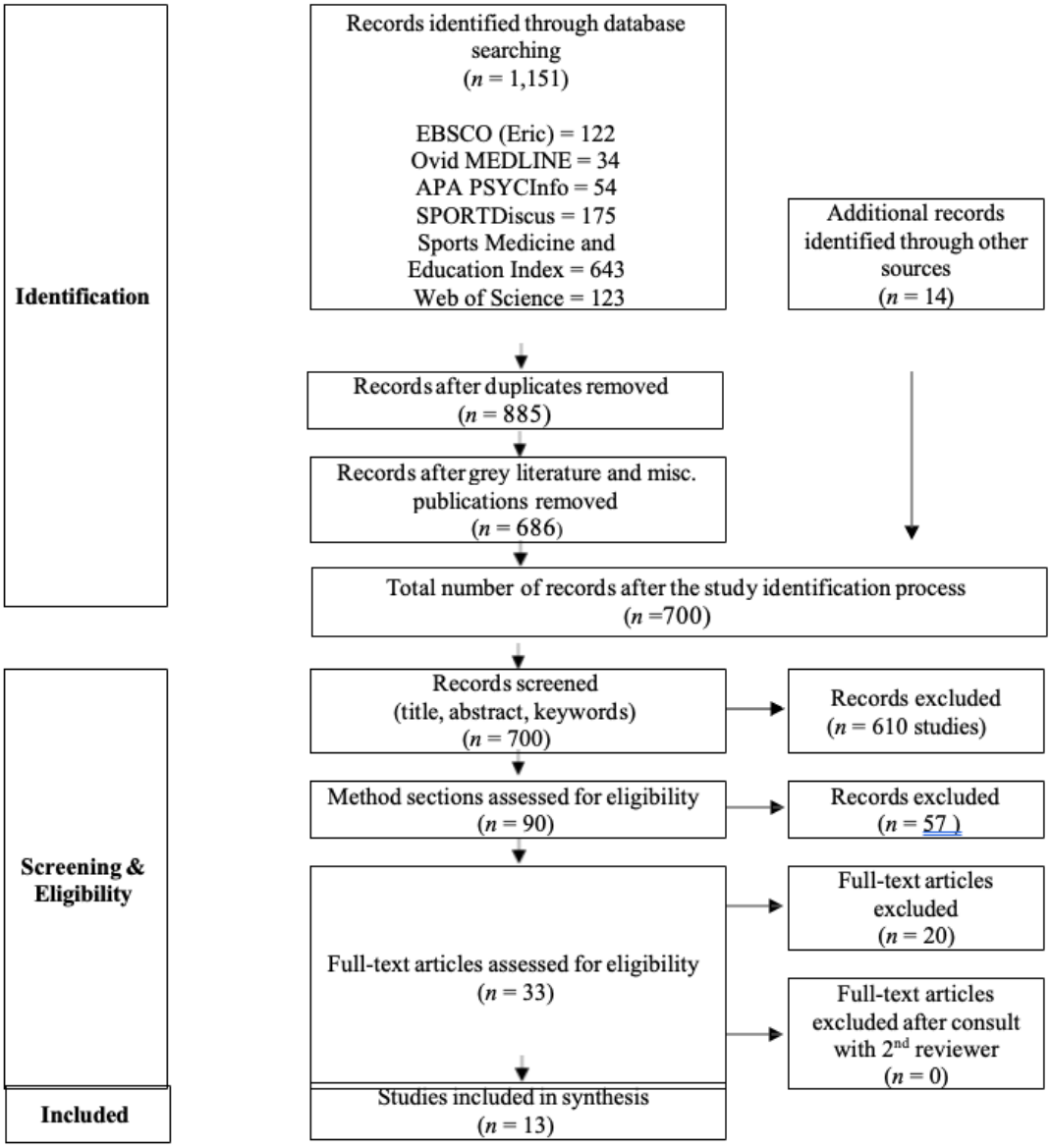
Data Charting Categories

Categories	Subcategories
Publication Information	Author(s) Language Year Country
Participant Information	Age Gender ASD Diagnosis Severity of Diagnosis, if available Symptomatology, if available Comorbidities, if available
Locker Room Information	Type of Locker Room Setting (i.e. school, community center, gym)
Findings	Feelings surrounding the Locker Room Barriers to Access in the Locker Room Adaptations to the Locker Room Space

Appendix C

Figure 1

Flow Diagram of the Study Selection Process



Appendix D

Table 3

Summary of the Studies Included in Scoping Review

Authors	Country, Language	Participants	Diagnosis of Participants	Context of Locker Room Use	Findings
Arnell, S., Jerlinder, K. & Lundqvist, LO. (2017)	Sweden, English	24 adolescents (17 males, 7 females) Ages: 12 -16	High-Functioning ASD, No co-occurring intellectual disability	Locker room and showers in Physical Education class	Adolescents with ASD experience heightened vulnerability and insecurity in changing rooms and showers, leading to avoidance and anxiety due to the physical changes associated with puberty.
Dowdy, A. & Tincani, M. (2019)	United States, English	1 child, 1 adolescent (2 males) Ages: 10 & 17	Participant 1: ASD, ADHD, Marfan's syndrome, DiGeorge Syndrome, intellectuel disability & non-verbal. Participant 2 : ASD, ADHD, intermittent explosive disorder, & pica.	Swim lesson	Locker rooms are challenging transitional spaces for individuals with ASD to navigate, especially when they enjoy the activity they are doing (e.g. swimming). However, they have the potential to become positive spaces when paired with reinforcement strategies, such as providing preferred treats upon successful completion of tasks like putting on the first item of clothing.
Haegele, J. & Maher, A. (2022)	United States, English	8 adolescents (8 males) Ages: 13-18	ASD diagnosis, able to communicate verbally	Regular PE class	The locker room was seen as a space where bullying frequently occurred in school due to the lack of adult supervision. However, students also found that locker rooms could serve as a place for social interactions and relationship building among peers.
Haegele, J., & Maher, A. (2021)	United States, English	8 adolescents (8 males) Ages: 13-18	ASD diagnosis, verbal	Inclusive PE class	The locker room is seen as a non-safe space due to students feeling exposed and uncomfortable. Students will often change quickly in a stall to avoid being seen by their peers, especially

					students who feel like their bodies do not align with the athletic norms of the locker room environment they find themselves in.
Hickingbotham, M., et al. (2021)	United States, English	(systematic review) children and adolescents	Diagnosis of "invisible" psychiatric or neurodevelopmental disability (including ASD & Aspergers)	Locker rooms as a gateway to physical activity and/or physical education	Locker room environment is mentioned as an important concern for the neurodivergent children, especially as it pertains to navigating social interactions within it.
Lamb,P., Firbank, D., & Aldous, D. (2014)	United Kingdom, English	5 adolescents (4 males, 1 female) Ages: 11-16	ASD diagnosis, 1 ADHD co-diagnosis	Regular PE class	The locker rooms are identified by the students with ASD as problematic spaces which cause negative emotions due to the lack of personal space and chaotic nature of the environment. The students highlight coping mechanisms that they developed for navigating the locker rooms such as using the shower stalls or outdoor areas (like corridors) to create smaller, isolated safe spaces.
Lawson, L., et al. (2019)	United States, English	12 families, 28 participants	1 or more children with an ASD diagnosis	Swim lessons	The locker room was identified as a significant barrier to accessing swimming opportunities. One participant cites difficulties navigating the locker room environment as the reason he stopped attending his swimming lessons.
Lee, H. (2011)	South Korea, English		ASD diagnosis or Asperger syndrome	Locker rooms as a space for the hidden curriculum	The locker room as sites of misunderstanding and discomfort for students with Asperger syndrome who may not fully comprehend the complex unspoken social rules.
Maher, A. (2017)	England, English	12 Learning Support Assistants (6	Work closely with special needs students, including many with ASD and Aspergers	Regular PE	Various educational specialists highlight changing and the changing room as a challenge for individuals with ASD and a barrier to inclusion and participation in physical

		male, 6 female) & 12 Special Education Needs Coordinators (1 male, 11 female)			education. Changing seems to be the main issue around PE, especially for girls with ASD. Separate or "special" changing facilities to accommodate for sensory needs seems to be effective in overcoming the barrier to participation.
Moore, K., Bullard, A., Sweetman, G., & Ahearn, W. (2021)	United States, English	5 adolescents Ages: 10-19	ASD Diagnosis, Anxiety	Locker room named as anxiety provoking environment	Locker room as a site for anxiety. The loud noises of the hair dryer in the locker room bathrooms are named as especially triggering and may lead to physical reactions such as aggression, freezing, screaming, etc.
Napolitano, S. (2017)	Italy, English	10 subjects Ages: 12-17	Diagnosed with ASD and belonging to ACFFADIR association	Recreational swimming	Locker room mentioned as element to consider when introducing individuals with ASD to swimming. Found that it is important to take the time for the participants to familiarize themselves with the environment.
Prupas, A., et al. (2006)	Canada, English	24 children & their parents Age: Nursery level	Newly-diagnosed toddlers and children with ASD	Locker room as a communal changing space before accessing the swimming facility	Locker room is viewed as a positive/neutral space, where learning of essential skills (i.e. cleaning & changing) can be done. Seen as a transitory space important for the children to say "hello" and "goodbye" to the pool. Important to note that in this locker room setting each child has a parent present in the locker room environment with them helping them navigate the space.
Thoren, A., Quennerstedt, M., & Maivorsdotter, N. (2020)	Sweden, English	76 children Ages: 10-11	Neurodevelopmental Disorder (either ADHD or ASD or both)	Inclusive PE class	Locker rooms can be inclusive (and even viewed as a safe space) when they are well-structured and predictable, with clear visual aids like pictograms to help guide students with ASD navigate them. Locker rooms can also become exclusive when they feel overcrowded,

					chaotic, and lack clear communication about expectations and rules.

Appendix E

Figure 2

Geo Chart Depicting Geographical Distribution of Author Affiliation

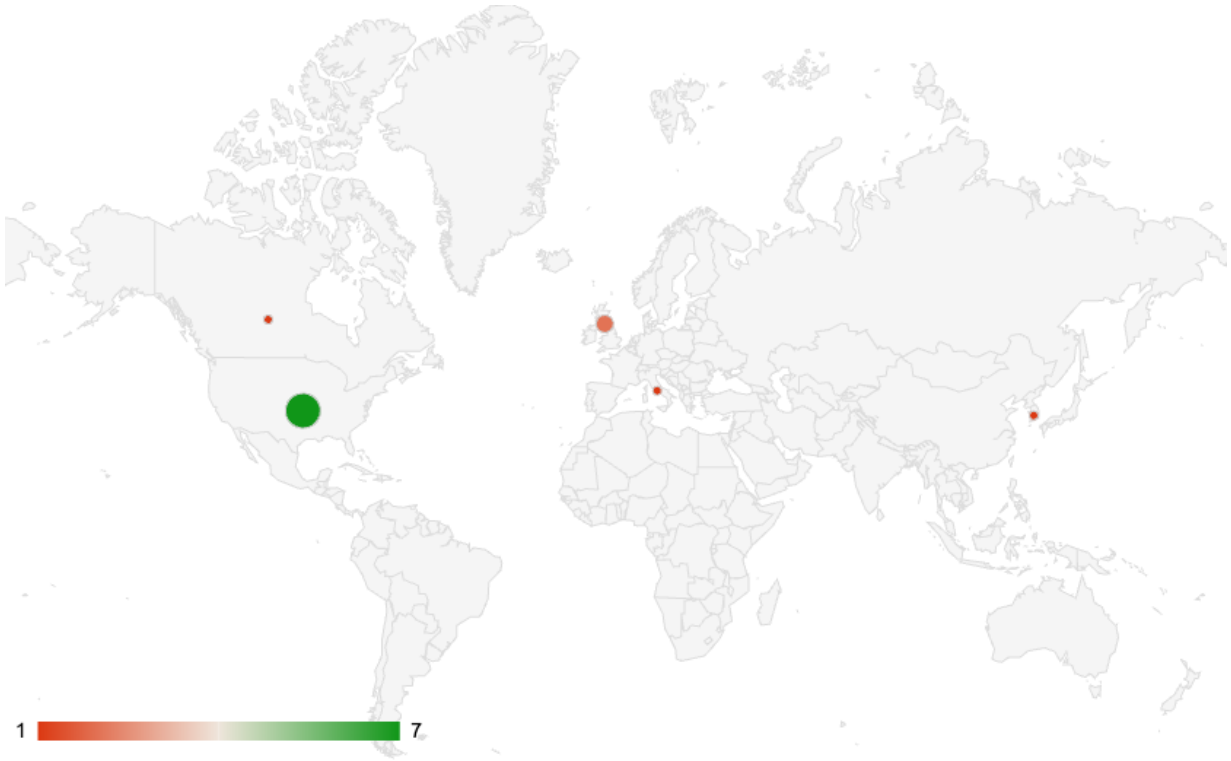


Figure 3

Biological Sex Distribution Across Selected Studies (Where Indicated)

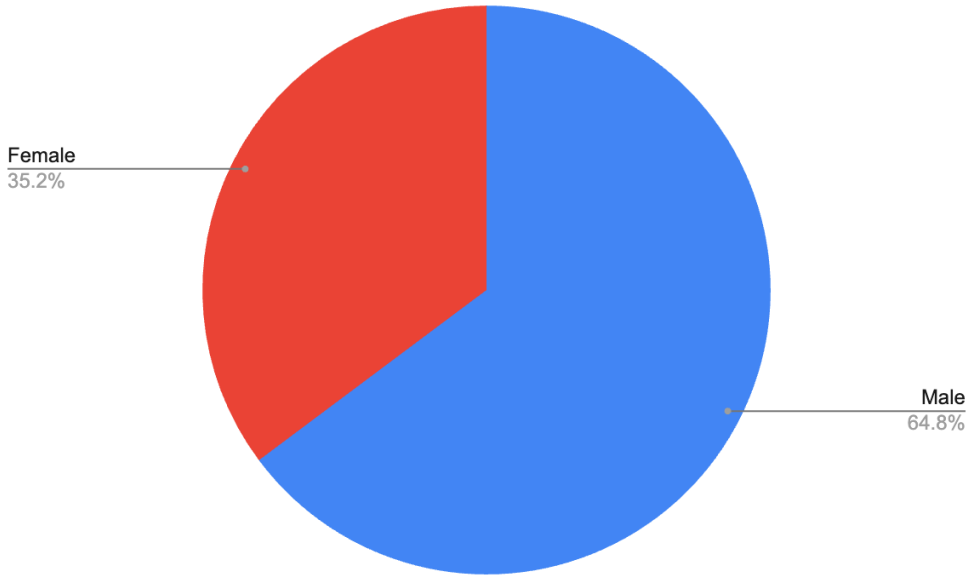


Figure 4

Prevalence of Comorbidities (Where Indicated)

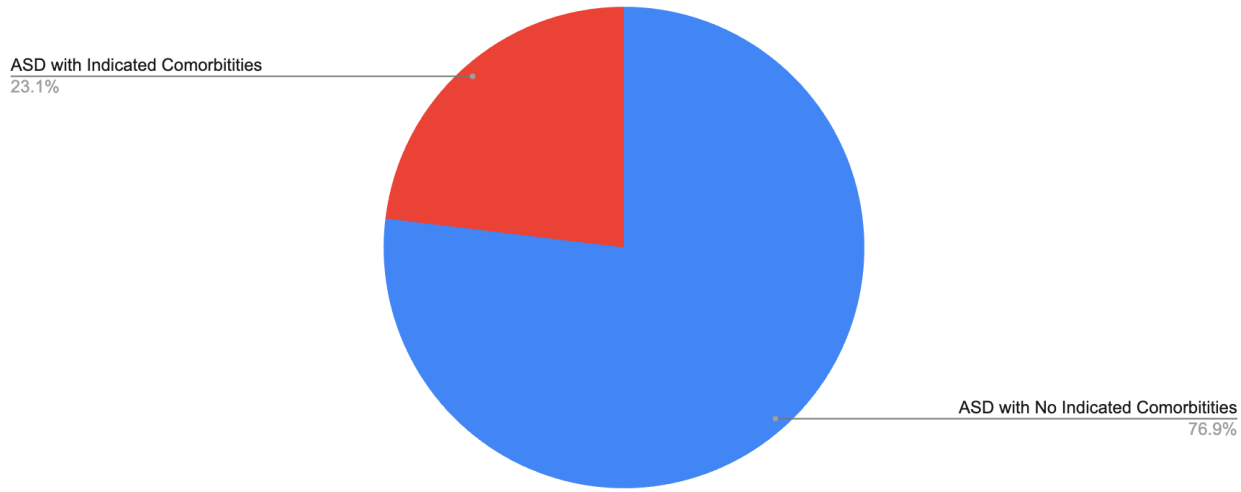


Figure 5

Distribution of Comorbidities Across Participants (Where Indicated)

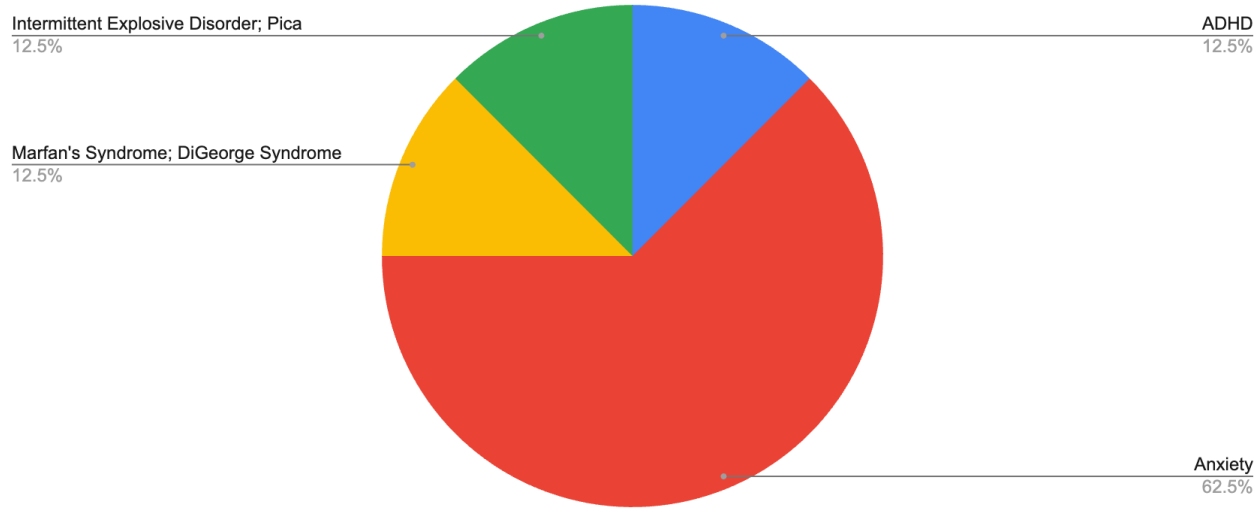


Figure 6

Context Specific Use of Locker Room Use (where indicated)

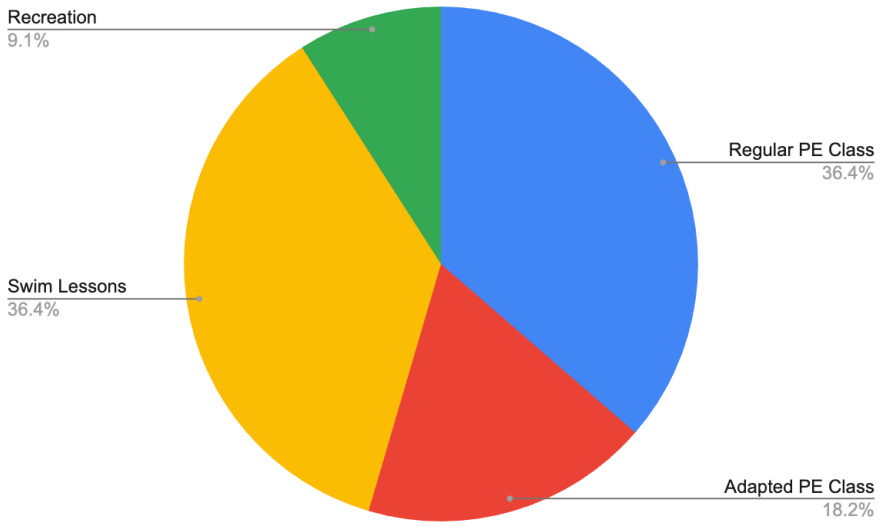


Figure 7

Distribution of Locker Room Perception

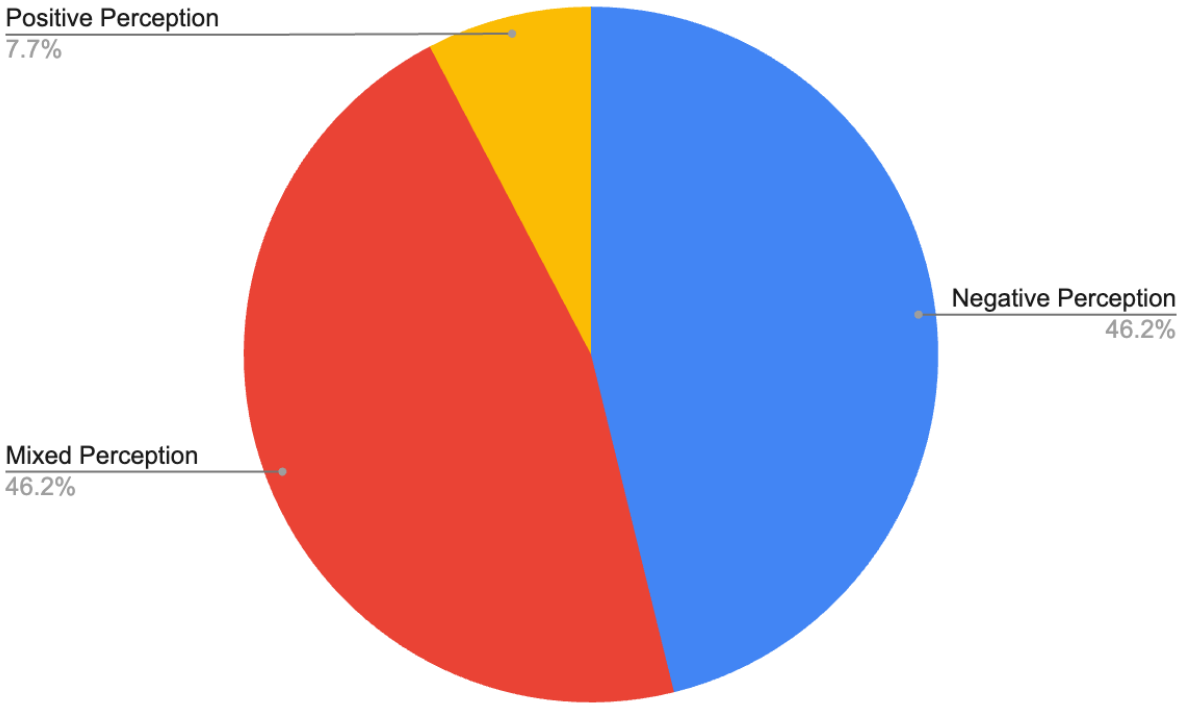
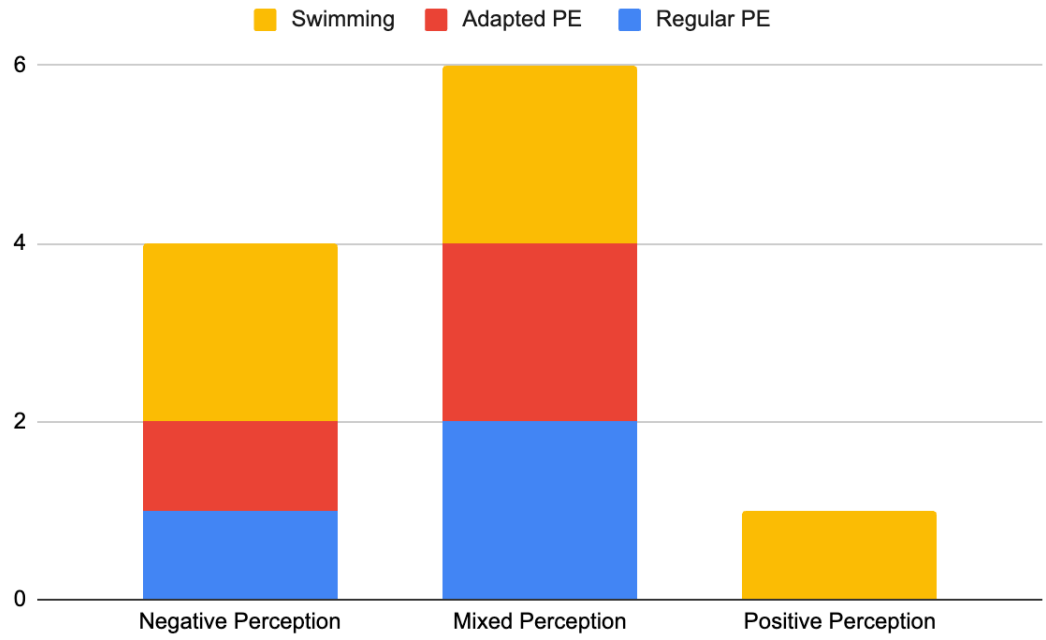


Figure 8

Perception of Locker Room Environment Across Contexts (Where Indicated)



Appendix F

Table 4

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page 4 (ENG) Page 5 (FR)
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page 9-11
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page 11-13
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Page 31-32
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Page 31-36
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Page 32-34
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Page 32-34 Page 88
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Page 33-36
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Page 35-37

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 35-37
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Page 36-38
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Page 41-43 Page 90
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Page 91-94
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A (per item 12)
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Page 43-46
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Page 46-52
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Page 54-60
Limitations	20	Discuss the limitations of the scoping review process.	Page 59-63
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Page 61-63
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A

Appendix G

Figure 9

Panasonic Low-Noise IONITY Hair Dryer; Model: EH5305P