

A REVIEW OF ACCESSIBILITY BARRIERS IN PUBLIC SETTINGS AND PROPOSED  
SUPPORT FOR INDIVIDUALS WITH AUTISM SPECTRUM DISORDERS



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A REVIEW OF ACCESSIBILITY BARRIERS IN PUBLIC SETTINGS AND PROPOSED  
SUPPORT FOR INDIVIDUALS WITH AUTISM SPECTRUM DISORDERS

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### **Abstract**

With the prevalence of Autism Spectrum Disorders on the rise, the development of more inclusive, accessible practices in public settings has become increasingly necessary (Tola, et al., 2021). This integrative review sought to (1) identify the various communication, sensory, and societal access barriers present in public spaces such as the workplace, higher educational facilities, recreational settings, and healthcare facilities, and (2) synthesize available research on feasible supports to aid in resolving these barriers. We aimed to find support to minimize communication barriers resulting from inconsideration of communication preferences of those with ASD, sensory barriers pertaining to the quality of the built environment, and negative societal attitudes toward ASD that often result from a lack of understanding of the disorder, or misinformation about ASD. From the review, three possible supports were identified: Texting with Interpret Suggest & Preview (TwIPS) (Haroon & Dogar, 2024), the Autism ASPECTSS™ Design index (Mostafa, 2015), and the SPACE framework (Doherty et al., 2023). These methods were highlighted and discussed within the review for potential implementation within public settings, with the purpose of minimizing the aforementioned barriers. Findings suggest that programs such as TwIPS, the Autism ASPECTSS™ Design Index, and the SPACE framework can improve accessibility in public settings for those with ASD.

*Keywords: Barriers, Autism, Public Spaces, Autism Spectrum Disorder, Accessibility, Inclusion, Accommodations, Supports, Workplace, Education, Recreational Settings, Leisure Settings, Healthcare*

## **A Review of Accessibility Barriers in Public Settings and Proposed Support for Individuals with Autism Spectrum Disorders**

### **Chapter 1: Introduction**

#### **Overview of Autism Spectrum Disorder**

Scientific research suggests that populations with Autism Spectrum Disorders (ASD) experience further limited access to public spaces than do their neurotypical counterparts (Tola, et al., 2021). In today's advanced society, most individuals experience unlimited access to countless resources, opportunities, and settings, so it is quite easy to become so accustomed to such a lifestyle, that we may forget to acknowledge these aspects of life in which others may not experience equal accessibility. According to the Autistic Self Advocacy Network (ASAN), an area demonstrating proper accessibility can be defined under the circumstances that "People with disabilities have the same opportunity to use it as people without disabilities" (Autistic Self Advocacy Network, 2024). Taking into account the progress we have made as a society toward improving issues of inequality, we are nonetheless still lacking in areas of both physical and social accommodation for individuals with developmental disabilities, namely ASD, within most public settings.

#### ***Symptomatic Experiences of Autism Spectrum Disorder***

Autism Spectrum Disorder is a neurodevelopmental condition signified by "(i) difficulties in social communication and social interaction across multiple contexts and (ii) restricted and repetitive patterns of behavior, interests, and activities." (Tola et al., 2021). Behaviors in social communication and interaction that are often seen in those with ASD consist of difficulties with social-emotional reciprocity, nonverbal communication, and both the development and maintenance of relationships. Restricted and repetitive behaviors that are often

observed in individuals with ASD can include resistance to change or insistence on consistency, extremely fixated/restricted interests, abnormal sensory sensitivities, and stereotypes or repetitive behaviors.

**Sensory Processing Sensitivities.** Particular symptomatic experiences of Autism Spectrum Disorder including sensory-processing sensitivities and emotional dysregulation can be heightened or triggered by the design and operation of most public settings. Sensory processing relative to ASD can come in the form of hyporeactivity or hyperreactivity to sensory stimuli surrounding the individual (Clement, et al., 2022) including auditory, tactile, and visual stimuli (Marco, et al., 2012). Though sensory processing difficulties are not unique to ASD and exist in a variety of other contexts, it is most prevalent in populations with ASD. Research has shown that 90% of individuals diagnosed with ASD experience hyperreactivity to some extent (Gentil-Gutiérrez, 2021). Intensified experiences of sensory stimuli have been shown to be one of the most significant causes of disruptive behavior, including aggression and self-injurious behaviors in those with ASD (Marco, et al., 2012).

**Emotional Dysregulation.** The difficulty or inability to communicate experiences of distress resulting from sensory stimuli may connect to the prevalence of emotional dysregulation in individuals with ASD. Emotional dysregulation is one's difficulty or inability to regulate emotions that surface in response to changing surroundings (McDonald et al., 2024). Long-term experiences of emotional dysregulation often can interfere with an individual's adaptive functioning including their expression of emotions, communication, and socialization (Restoy, et al., 2024). A variety of public settings and the sensory stimuli present in these environments can contribute to severe episodes of emotional disturbance and/or dysregulation, due to the absence of consistency or routine in these spaces. Symptomatic experiences that can be prominent in

individuals diagnosed with ASD, such as sensory-processing deficits and emotional dysregulation, highly impact an individual's ability to function adaptively within such settings, which is why the aim of this review looks to minimize opportunities for such experiences to occur within a public scope.

### ***Diagnostics & Prognosis***

It is crucial to understand that Autism Spectrum Disorder is a developmental disorder and is not classified as an intellectual disability, though it often occurs simultaneously with an intellectual disability. ASD and an intellectual disability are diagnosed comorbidly only when the social communication skills of the individual are lower than is typical to their current, general developmental level. Currently, there are three established severity levels of an ASD diagnosis according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Level one indicates that the individual “requires support”, level two individuals “require substantial support”, and level three individuals “require very substantial support” (Posar & Visconti, 2023).

ASD is a lifelong condition that is typically early-onset, with most diagnoses of ASD occurring in early childhood. It is a disorder diagnosed by means of clinical observation of certain behaviors of the aforementioned descriptions that are considered to be abnormal throughout particular corresponding developmental stages. A diagnostic suspicion for ASD can be given as early as 18 months, and a definitive diagnosis can be given as early as 3 years old (Posar & Visconti, 2023). The disorder often occurs co-morbidly with other conditions, yielding treatment needs for underlying conditions as well, in order to maximize the effectiveness of interventions that may be put in place to manage symptoms of ASD.

As prevalence of ASD has increased in recent years, the percentage of utilization of early-intervention methods has also increased. Increases in application of early-intervention methods has resulted in larger percentages of children with ASD attending public schools in standard classrooms and living relatively independently within a community in their adult-years (Autism Research Institute, 2024). In a sample of 32 children with ASD, 31 improved in at least one social ability (96.8%), and 29 improved in at least one cognitive ability (90.6%). When observed in a group setting following implementation of early intervention methods, symptoms of ASD decreased in over 85% of children and subjective developmental age had increased by 3.8 months (Blanc et al., 2021). Oftentimes, the earlier the diagnosis occurs and intervention treatments are implemented, the better the prognosis regarding social integration and communication of the individual. However, many with ASD will still be affected in some capacity when engaging in social interactions and communication (Autism Research Institute, 2024).

### ***Autism Spectrum Disorder Prevalence***

Today, it is estimated that one in 160 people (Tola et al., 2021), one in 36 children (Centers for Disease Control & Prevention, 2024) and one in 45 adults (Dietz et al., 2022) have an Autism Spectrum Disorder diagnosis in the U.S. This reportedly occurs throughout all races and ethnicities and has been found to be roughly 4 times more prevalent in males than in females (Centers for Disease Control & Prevention, 2024). As we continue to see a rise in ASD diagnoses throughout the U.S, with the prevalence increasing from 2.3 per 1000 diagnoses, to 6.3 per 1000 diagnoses between 2011-2022, (Grosvenor et al., 2024), an increasing number of questions have begun to surface regarding how we can improve daily interactions and encounters for these populations.

**Limited Public Accessibility for Populations with ASD**

When acknowledging the layout and operation of most public spaces, both are designed more-so for the efficiency of neurotypical individuals and can neglect to include the needs and accommodations necessary for individuals with ASD to feel comfortable and accepted in these settings. For this reason, a multitude of public settings including workplaces, educational facilities, leisure and recreational settings, and healthcare facilities may be largely, or entirely inaccessible to those with ASD due to present barriers to be discussed in the following sections.

***Opportunal & Social Issues***

Adults with ASD have been shown to demonstrate higher unemployment or underemployment rates, lower attendance/completion of higher education, and limited participation in public/social activities. It was found that almost 40% of adults with ASD spend little-to-no time with friends or individuals outside of their immediate family (Centers for Disease Control & Prevention department of Autism Spectrum Disorder, 2024) which may indicate that most “Autism-friendly” public and social designs within many public settings fail to comfortably and effectively facilitate participation of those with ASD within the community and public scene.

***Sensory-Related Accessibility Issues***

Oftentimes, public spaces such as grocery stores, shopping malls, airports, hospitals, etc. severely lack the necessary accommodations regarding lighting, noise control, crowding, and communication, (Autistic Self Advocacy Network, 2011), and proper methods of social inclusion that allow for a comfortable experience for individuals with ASD. By failing to provide support that accounts for struggles such as sensory issues and social difficulties, both of which can lead

to overstimulation, emotional dysregulation, etc., we as a society maintain the existence of barriers that make daily tasks and encounters unnecessarily difficult for populations with ASD.

### ***Physical Limitations of Public Settings***

Most public settings, both in the sense of physical and social design, are geared toward preserving the experiences of neurotypical individuals and widely neglect the needs of those with ASD. According to architect Magda Mostafa (2008), despite the drastic increase we've seen in ASD prevalence throughout the U.S. in recent years, we have not yet created sufficient public space design regulations detailing proper accommodations for the needs of individuals with ASD. Though this information is sourced from 17 years ago, and some building design improvements may since have been made to address the needs of those with ASD, most public settings continue to pose unnecessary physical and social obstacles. In addition to the short-term difficulty public barriers pose to individuals with ASD, research has also shown that poor or obsolete environmental design can facilitate a lack of community and support, and contribute to social exclusion for adults with ASD.

### ***Social Limitations of Public Settings***

**Social Inclusion.** Social inclusion in the context of people with intellectual and developmental disabilities references the intersection of two significant domains of life, including interpersonal relationships and community participation. Although social inclusion is significant in the lives of individuals with ASD for the aforementioned reasons, current efforts to facilitate socialization and inclusion within most public vicinities often neglect to take into consideration the social preferences of the individuals themselves (McMaughan et al., 2024). According to McMaughan et al. (2004), limited research exists on the social inclusion of individuals with ASD, as well as how, and the extent to which they prefer to be included in the

community or in social situations. With social inclusion and participation being a significant aspect of life for individuals with ASD in promoting better quality of life (Tobin et al., 2014), mental health (Jones et al., 2021), and facilitating social integration (Boutot & Bryant, 2005), it is essential that we further look into, and eventually implement effective designs and supports into a multitude of public settings in order to better foster an inclusive environment for these individuals, and offer uninhibited opportunities for proper social inclusion and integration.

**Facilitating Social Inclusion & Accessibility in Public Spaces.** The effective integration of meaningful social inclusion in public spaces for people with ASD can depend on a multitude of significant factors, of which have been researched in a limited capacity. Literature regarding the interpersonal and environmental factors that play a role in the experience of proper, meaningful inclusion and social integration at the individual level (Chen, et al., 2021) is especially lacking. The sensory, communicative, and social experience of a person with ASD largely impacts the overall quality of experience they have within settings such as the workplace, school, recreational places, everyday spaces, and healthcare facilities.

With the needs of the ASD community often being overlooked within public design and function, it is essential that we increase research aimed at helping us better understand the needs of those with ASD in public settings, as well as conduct further research on how to design and implement more inclusive, supportive, and helpful accommodations within public settings for each individual with ASD and their experience. In order to have a fully equal community, we must first ensure proper accessibility for each individual with or without disability.

### **Goals of the Current Systematic Review**

Throughout this review, there will be three areas of focus: discussing specific limitations in public settings, the significance of improving accessibility in these areas, and suggestions for

implementable supports. This systematic review paper will summarize and synthesize existing literature to identify particular physical and social facets of public settings in which we can effectively improve accessibility for those with ASD. Findings regarding the experiences of individuals with ASD within work, higher education, leisure and recreational spaces, and healthcare facilities will be emphasized. Methods aimed at improving ASD accessibility that are identified from the synthesization of existing research will be reported and discussed as feasible supports to improve public access for those with ASD. This review will form the necessary foundation to address the shortcomings of existing methods, and allow for open discussion of how, and why, modern-day approaches to the design and function of public spaces have become increasingly obsolete, and will demonstrate the necessity of redesigning and implementing newer systems through an autistic lens.

## **Methods**

Previous studies have looked into existing physical and social accessibility issues for those with ASD within public settings, but little research exists connecting these difficulties to evidence-based methods of support. Though research on this topic is limited, this systematic review examined existing literature to identify specific physical and social barriers faced by individuals with Autism Spectrum Disorder (ASD) in various public environments including work/educational settings, leisure spaces, and healthcare facilities. Sources referenced consisted of articles retrieved from credible academic databases including the Psychology Database, PsycINFO, PsychARTICLES, and Google Scholar. Searches were conducted using keywords including “Barriers”, “Autism”, “Public Spaces”, “Autism Spectrum Disorder”, “Accessibility”, “Inclusion”, “Accommodations”, “Supports”, “Workplace”, “Education”, “Recreational Settings”, “Leisure Settings”, and “Healthcare”. The literature searches were filtered to include only

sources written in the English language and that had been published from 2005 onward. These sources were evaluated and selected for further analysis and inclusion in the current review based on initial information provided within the paper's abstract, and its significance to the proposed research goals. Relevant information sourced from reputable health organizations including the Autism Self Advocacy Network (ASAN) and the U.S. Centers for Disease Control and Prevention (CDC), were utilized to supplement the research findings within the current review.

## **Chapter 2: Existing Barriers Hindering Accessibility in Public Settings**

For individuals with Autism Spectrum Disorder, navigating everyday public settings can be increasingly difficult and may pose obstacles. Mainstream settings such as workplaces, universities, recreational settings, and healthcare facilities can be difficult to engage in for individuals with ASD due to insufficient communication methods, sensory difficulties, and societal attitudes that may be heightened by the non inclusive quality of the surrounding public environment (Mostafa, 2015; Harmuth et al., 2018; Kyprianos & Koniari, 2024; Shady et al., 2022).

### **Workplace & Employment**

According to Harmuth et al. (2018), social communication and interpersonal skills at the individual level are a commonly reported barrier to successfully gaining and retaining employment for adults with ASD. On a global scale, 80% of individuals with ASD are unemployed (Davies et al., 2023), due to the aforementioned barriers that are often prominent in the workplace, and make employment for these individuals either unattainable or difficult. This results in those with ASD having lower wages/earnings, lower employment rates, and minimal variation in job type compared to other populations with different disabilities (Pfeiffer et al., 2016).

#### ***Barriers in the Workplace***

A study by Pfeiffer et al. (2016) was conducted to better understand the barriers resulting from environmental factors in the workplace and how these affect work performance and satisfaction in employed, adult populations with ASD. Within the study, environmental factors as defined by the International Classification of Functioning, Disability, and Health (ICF) were the focus, which included social, attitudinal, and physical aspects of one's surrounding environment

(Centers for Disease Control & Prevention, 2024). In this study, 14 participants diagnosed with High-Functioning ASD participated in semi-structured phone interviews consisting of 8 general questions regarding their job, and 5 questions regarding the environmental factors of their workplace.

Findings from this study identified the most common ASD barriers that are present in the workplace which include social interactions, attitudes, and the physical/sensory environment of the setting. It was also found that social skills and demands, interactional difficulties, and lack of fit between social environments, were the most significant workplace barriers among the sample. Interestingly, the study showed that deficits in job skills were not a barrier for employees with ASD, and social factors of any sort (interactions, demands, attitudes, etc.) had the largest negative impact on their work performance, as well as workplace satisfaction (Pfeiffer et al., 2016).

Another study by Harmuth et al. (2018) additionally sought to identify barriers present in the workplace for those with ASD through means of a scoping review. The literature search initially yielded 2,083 studies which were then filtered to 161 total studies that had been used within the review. The study discovered workplace barriers among three categories: Person-related barriers, environment-related barriers, and work-related barriers (Harmuth et al., 2018).

Within the person-related category of barriers, many of the studies within the review focused on stereotypical traits that those with ASD often exhibit, such as social and communication deficits, and restrictive and repetitive behaviors, and how these may act as barriers within the workplace in scenarios such as interacting with colleagues, completing designated tasks, or adapting to a changing schedule (Harmuth et al., 2018).

Environmental-related barriers revealed that social attitude toward ASD was a major factor in workplace satisfaction and a significant barrier, if the surrounding attitudes were negative. Attitudes of a negative nature stemming from managers and coworkers can heighten the already-existing social anxiety that is often experienced by those with ASD, making the workplace an aversive setting. Additionally, ignorance of social and communication preferences of someone with ASD can make their job difficult and act as a significant barrier if they are tasked with a responsibility that requires an unpreferred level or form of communication or socialization (Harmuth et al., 2018).

Given the results of the Pfeiffer et al. (2016) and Harmuth et al. (2018) studies, communication and social barriers were identified to be recurring themes those with ASD face most prominently within the workplace. Another exploratory study further examined these societal barriers at an international level, through a study that collected 128 writing samples from 29 employees with ASD, and 15 supervisors who directly support an employee with ASD. These samples illustrated various work-related challenges faced by these individuals as well as their interpretation of these challenges, consequences for these challenges, and resolutions. Each participant was prompted with different but similar questions on an online questionnaire, those with ASD were asked to provide a maximum of 10 examples of times when “(a) they had misinterpreted or were not aware of the social rules, and/or (b) individuals not on the autism spectrum had misinterpreted their intentions” (p. 1617) whereas supervisors were asked to provide a maximum of 10 examples of “social challenges and/or misinterpretations experienced by employees on the autism spectrum they support or supervise” (p. 1617) (Bury et al., 2021).

From the writing samples, several types of social barriers relevant to the workplace were identified. Internal social challenges were found to be barriers faced by those with ASD as they

complete tasks for their job and participate in social events, like learning how to interpret the behavior of others, while work task barriers relate to challenges faced when completing work and social demands directly related to their job such as learning how to interpret workplace protocols. Social event barriers occurred when learning how to participate in social scenarios that are linked with the work setting or relationships established from work, this could include knowing appropriate topics of conversation, knowing what behavior is appropriate or inappropriate in this setting, etc. The final set of barriers, and the most significant to the current review, is external social challenges which are barriers that exist at the organizational, environmental level. This can include performance expectations from supervisors, the form of supervision the individual is given, and barriers within the built environment which often impose sensory difficulties for those with ASD (Bury et al., 2021).

### ***Hiring Process Barriers***

Other areas of difficulty within the workplace were shown to surface during the hiring process. In a study conducted in the U.K. by Davies et al. (2023), the experiences of employees with ASD were examined focusing on barriers that are present within the hiring process. For the study, the Diverse Minds Survey was utilized for data collection which obtained information regarding neurodiversity of an individual and employment histories, with particular modules dedicated to recruitment and hiring processes and experiences. The sample consisted of a total of 225 participants with ASD diagnoses, and 64 non-autistic but neurodivergent participants. The results of the two groups were compared to observe the variation in employment and hiring experiences between those with ASD and those with other neurodivergent conditions (Davies et al., 2023).

Those with ASD showed significantly less positive experiences with various aspects of the hiring and recruiting processes than did the neurodivergent participants. For populations with ASD, finding fitting employment opportunities that are free of bias, difficulty with interviewing due to interpersonal skill deficits, and poor interviewer understanding of ASD and associated challenges, all contribute to increased hurdles that must be accounted for and resolved for individuals with ASD seeking employment (Davies et al., 2023).

### **Higher Education**

It was found in the Longitudinal Transition Study-2 within the United States, that 38.8% of students with ASD completed a college degree, compared to that of 40.7% of students with other disabilities and 52.4% of neurotypical students, while 50% of post-graduate, highschool students with ASD in the U.S., did not pursue higher education at all (Pfeiffer et al., 2016).

#### ***Barriers Within Higher Education***

Barriers within higher education settings might make navigation of the college experience difficult for individuals with ASD. Although ASD enrollment in higher education is increasing, there nonetheless remain issues of accessibility for these students that ultimately impact their academic success and experience.

A study conducted by Lambe et al. (2019) in the U.K. was designed to evaluate specific factors college students with ASD experience that contribute to excessive difficulty in their transition to college life. The study consisted of 25 students, all of whom had a clinical ASD diagnosis, and had applied to begin their college degree within 12 months of the study (Lambe et al., 2019). Each student attended a three-day transition program at the University of Bath, and were given the option to fill out a questionnaire beforehand, which was used to gather preliminary information about their worries, as well as their expectations regarding college-life.

During the in-person transition program, facilitators prompted group-discussion using the same questions about college fears and hopes, in order to obtain firsthand information from the population themselves. From the responses of the members within the focus-groups, the main worries or difficulties faced by individuals with ASD going into higher education were consistent with themes of the social world, academic demands, college-living practicality, leaving the scaffolding of home, and the transition to adulthood (Lambe et al., 2019).

According to Lambe et al. (2019), those with ASD have reported struggles pertaining to the social world to consist of their understanding of it, strategies they can rely on to manage social situations, and their place within the social world. Worry of academic demands involved both their performance in school and the content and structure of the courses themselves. The apprehension associated with living practicality consisted of day-to-day obligations and skills, navigation, and the time gap between arriving at school and the implementation of the school-offered supports. Lack of structure provided by parents and their home also posed some worry for students with ASD regarding the absence of encouragement to socialize, time-management, and the unpredictability associated both with routines, as well as the mannerisms and behaviors of members within their living space. Regarding the transition to adulthood, many reported anxiety about actually gaining independence and the ability to make self-guided decisions, as well as the uncertainty of moving in a particular career path (Lambe et al., 2019).

To further identify specific barriers relevant to those with ASD in higher education, a qualitative research study was conducted using the firsthand input from students with ASD, through means of semi-structured interviews. The interviews were organized within a schedule and ranged anywhere from 26-147 minutes. Each topic that was introduced throughout the

interview began with an introduction, which was followed by a string of open-ended questions for the participants to answer regarding their experience within higher education. The study consisted of 23 participants with ASD who were enrolled, or had been enrolled, in higher education (Van Hees et al., 2015).

From the interviews, multiple themes of difficulty experienced by students with ASD arose, including: New situations/unexpected change, exhausting but necessary socialization, processing information and time management, doubt about disclosure of their diagnosis, and mental health issues. According to Van Hees et al. (2015), “The results [of the study] also correspond with the general research outcomes that throughout adulthood, individuals with ASD continue to struggle with issues related to communication, social skills, repetitive behaviors, resistance to change, and sensory challenges” (Van Hees et al., 2015). Findings of this study further indicate obstacles associated with social scenarios and sensory experiences, to be significant barriers in public spaces for those with ASD.

### **Leisure & Recreational Settings**

Relevant to Autism Spectrum Disorder, literature on accessibility within recreational settings is incredibly scarce and neglects to include the experiences and needs of adults who have ASD (Langa et al., 2013). The current lack of inclusive measures within leisure and recreational settings may minimize the chances of proper social inclusion of those with the disorder. According to Lussenhop et al. (2016), inclusion is understood to be the ability within a setting to “physically interact with and perceive the space, cognitively engage with the materials, and socially interact with one another” (p. 122).

### ***Barriers Within Recreation & Leisure Settings***

Sensory-processing difficulties are commonly experienced by individuals with ASD, which can result in sensory overload from particular features of the built environment. Social inclusion can become difficult for these individuals when oftentimes the presence of triggering stimuli such as auditory input, lighting, tactile surfaces, etc., are often permanent or difficult to minimize.

Kyprianos & Koniari (2024) sought to explore the levels of accessibility for those with ASD within a museum setting, through a qualitative research approach conducted in Attica, Greece. A four-section questionnaire consisting of 25 questions was established through the Google Forms platform, with 24 questions being closed-ended and the final question being open-ended. Of the 101 museums asked to participate in the study, 56 completed the questionnaire and were included in the final results, with archaeological museums making up 29% of the sample, art museums 18%, folklore 12%, and the remaining 41% being miscellaneous museums (Kyprianos & Koniari, 2024).

The study revealed that inclusive measures and initiatives for those with ASD are extremely limited. The two largest areas of concern regarding ASD accessibility were identified as lack of properly educated staff (36%), and infrastructure (18%) (building design, lighting, noise, etc.). Regarding inadequate staff training, 85.7% of the participating museums reported that there is no staff training in place to inform on interacting with and assisting those with ASD, meaning a majority of staff within museums may rely on their own understanding of ASD to address the needs and difficulties of those with the disorder. Infrastructure flaws also posed significant barriers to ASD accessibility. When asked in the questionnaire if any spaces exist within the museums to accommodate sensory-sensitivities of those with ASD, 83.9% of participants said their museums do not contain such spaces (Kyprianos & Koniari, 2024).

Minimal-to-no control over abrupt sensory stimuli within a space can make it highly aversive to individuals with ASD.

It is crucial to note the lack of existing literature surrounding ASD barriers in leisure and recreational settings. Despite this, it is still a significant topic within this field of work that requires further research. While the Kyprianos & Koniari study (2024) was conducted to review ASD accessibility exclusively within museum settings, the findings may be loosely applicable to other settings of leisure or recreation. Barriers identified within one type of public recreational setting in Kyprianos & Koniari's study (2024) including inadequately trained staff and sensory-triggering stimuli within the built environment, provides a firm foundation for further research to be conducted on this topic.

### **Healthcare Facilities**

Proper access to healthcare facilities is essential to maintaining a good lifestyle, however, populations diagnosed with an Intellectual and Developmental Disorder (IDD), including Autism Spectrum Disorder, experience unequal access to such facilities for various reasons, leaving them highly disadvantaged in receiving proper healthcare.

#### ***Barriers Within Healthcare Facilities***

Several barriers are present in hindering individuals with ASD from actively seeking, and/or receiving adequate healthcare.

An integrative review was conducted by Shady et al., (2022), with the purpose of determining specific themes that occur within the practice and deliverance of healthcare that hinder populations with IDD's. The review was conducted through the viewpoint of Levesque et al.'s framework, a patient-centered theory that represents the access to healthcare of a population. Several measures were taken to determine eligibility of found literature, including filters to

include articles with publishing dates of 2006 and onward, and study participants 18 years and older with an IDD and who also had a communication deficit or disorder. Further review of eligibility for article inclusion in the review yielded a total of 28 articles that were included (Shady et al., 2022). From this review, several themes of ASD barriers to healthcare access were identified. The results showed perception and approachability, acceptability and quality of care, special accommodations, affordability, and communication methods to be the most prominent barriers present in healthcare settings (Shady et al., 2022).

An additional study conducted by Raymaker et al. (2016) used a community-based participatory research approach (CBRP) to identify barriers for those with ASD in healthcare settings, using a long and short form instrument designed for the purpose of this study. 437 individuals participated in the study in which they were first asked to complete the “Barriers to Healthcare Checklist Long-Form” (p. 972), which was then used as a basis to establish the short-form instrument for participants to complete additional questions based on their responses to the initial form.

Several barriers in healthcare settings were identified from the results of this study, namely pertaining to areas of emotional regulation, patient-provider communication, sensory sensitivities, and navigation of healthcare. The most significant barriers hindering or completely inhibiting pursuit of healthcare consisted of fear/anxiety (35%), slower processing time and inability to participate in real-time healthcare discussions (32%), financial concerns (30%), sensory issues caused by healthcare facilities (30%) and communication incompatibility with healthcare providers (29%). This has led to higher rates of emergency department attendance and unmet healthcare needs, as well as shorter life spans in adults diagnosed with one or more IDD, compared to that of adults without an IDD. This is significantly influenced by higher

comorbidity rates which often include sleep problems, diabetes, obesity, gastrointestinal issues, nervous system issues, respiratory system issues, skin conditions, etc. (Shady et al., 2022).

**Current Inadequate Accommodations.** Regarding special accommodations, participants in many of the studies included in Shady et al.'s (2022) integrative literature review reported a large reliance on provided accommodations to successfully navigate the healthcare environment such as [unspecified] sensory accommodations, time and informative accommodations, communication accommodations, and/or physical accommodations. Though accommodations can be provided in some settings, they often are insufficient due to overgeneralization, and a lack of understanding surrounding the needs and preferences of those with ASD (Shady et al., 2022). In reference to healthcare, waiting room times were reported to contribute to excess anxiety, which in turn hindered the patients' ability to properly communicate with healthcare providers and receive adequate treatment. Additionally, many patients with an IDD reported the need for extra time within their appointments or consultations to dedicate to additional education regarding a diagnosis, medication, etc., as well as time to allow for the patient to process, understand, and ask questions. The fast-paced environment and timing often associated with doctor visits contributes to excess frustration and discomfort for these individuals which often leads to an aversion and avoidance of healthcare facilities (Shady et al., 2022).

**Communication & Staff Training.** Much of the barriers associated with communication in healthcare settings, has to do with inadequate training or knowledge of providers. In a separate study analyzing the success of healthcare interactions between patients with ASD and their providers, it was found that

“Many of the themes at the provider level pointed to a larger issue concerning how providers approached interactions: Did they recognize a patient's individual strengths and

challenges? Were they willing or able to alter how they communicate with patients? Were they open to changing their workflow to accommodate needs? Did they treat patients with respect?” (p. 830).

In other words, unsuccessful communication between patients with ASD and their providers was due mostly to poor or absent reciprocity of the provider (Nicolaidis et al., 2015). This idea of provider reciprocity also goes hand-in-hand with quality of care, which emphasizes the significance of proper staff/provider training and education regarding Autism Spectrum Disorder. Such knowledge gaps on the provider’s end contribute greatly to poor healthcare experiences for individuals with ASD both pertaining to the physical environment as well as the social interactions that occur (Shady, Phillips, Newman, 2022).

### **Chapter 3: Proposed Supports for Improved Access**

Environmental and societal barriers that hinder methods of communication, socialization, and environmental interaction for individuals with ASD may make enjoying recreational activities or completing day-to-day tasks difficult, and in some cases, impossible. The barriers discussed in the previous chapter are vast. For organizational purposes, the identified barriers will be grouped into more encompassing categories: Communication barriers, sensory barriers, and societal attitudinal barriers, to be addressed with proposed supports throughout the chapter. While some of these existing barriers discussed in the previous chapter may have current reforms and supports in place, we will look further into novel, evidence-based methods that could feasibly be implemented in efforts to minimize these challenges for those with ASD in public settings.

#### **Communication Barriers**

Given that ASD is a disorder that is diagnosed along a spectrum, communication preferences and abilities differ largely on a person-to-person basis. Such variation in communication methods may make it difficult for certain settings or spaces to accommodate each person's needs, which can lead to a generalized solution offering little-to-no relief from the experienced challenges. While research focusing on the communication style and skills of individuals with ASD does exist, little research takes into account the preferences of these individuals themselves (Howard & Sedgewick, 2021).

#### ***ASD Communication Preferences***

A qualitative study conducted by Howard & Sedgewick (2021) evaluated the communication preferences of 245 individuals with ASD ranging in age from 16-74 in various social scenarios. Of the 245 participants, 205 reported having a clinical diagnosis of ASD, and 40

reported self-diagnosis of ASD. During the study, participants were asked to complete an approximately 20-minute long online survey using various measures including the Autism Quotient Adult 10, Generalised Anxiety Disorder-7, Camouflaging Autistic Traits Questionnaire, and rankings of communication preferences (Howard & Sedgewick, 2021).

The final portion of the study's online survey provided seven various scenarios that require communication, including accessing services, employment, education, research, family interactions, friend interactions, and in seeking customer services. The participants then were tasked with ranking six forms of communication (Face-to-face, phone call, letter, email, text message, online instant messaging) in order of their preferred methods for the given scenario, with 1 being most preferred and 6 being least preferred. Following each scenario, each participant was given two free-response questions as an opportunity to elaborate further on their preferences (Howard & Sedgewick, 2021).

Results of the free-response questions revealed four themes relevant to communication preferences of individuals with ASD: Not the phone, written communication, masking versus autistic communication, and avoiding communication. Relevant to the current review are the findings that indicate preferred communication methods amongst populations with ASD. Results showed that the preferred method of communication depended on the relationship between whom the individual was communicating – if the individual is known, the preferred communication methods were both face-to-face and written, but when the other person is unknown, a strong preference for written forms of communication was shown. Based on the results of this study, phone calls appear to be largely aversive to individuals with ASD (Howard & Sedgewick, 2021), despite it being one of our main forms of communication between most public settings such as doctors offices, workplaces, etc.

***Identified Communication Barriers***

In another study by Shaw et al., a qualitative, mixed-methods, international survey was conducted to “explore the experiences of autistic people accessing healthcare, shining a light on the complex interplay of relevant factors” (p. 1746), with one of these factors being “communication mismatch” (p. 1746) (Shaw et al., 2024).

Online surveys were used to better understand barriers that limit accessibility to healthcare for those with ASD. The surveys consisted of various free-response questions regarding firsthand experiences of the participants in healthcare settings. 1248 adults with ASD were recruited through social media and an [undisclosed] ASD charity website to participate in the study, including those with clinical diagnoses, as well as individuals with a self-diagnosis (Shaw et al., 2024).

Results of the study identified four themes: Early barriers, communication mismatch, doubt, helplessness and fear, and healthcare avoidance and adverse health outcomes. Based on the qualitative data collected relevant to the ‘communication mismatch’ theme of the study’s results, phone usage posed a significant barrier to healthcare access for these individuals who made statements in the survey such as “Unable to visit my doctor due to the telephone appointment system.” (p. 1750) and “It is a constant battle to get them to let me use written communication only and to stop them making me use the phone.” (p. 1750) (Shaw et al., 2024). Communication difficulties were also reported in the waiting room with statements such as:

“I struggle with idioms. I was once told to sit tight for a referral letter and said where do you want me to sit, here or in the waiting room. Thing is, I had expected the letter to be written after the appointment. I was just thrown by the language. Then I felt ashamed like I had appeared demanding.” (p. 1750).

By relying solely, or mostly on communication by phone, many of those with ASD are unable to access necessary public services because they may require an alternate form of communication that either is not available as an option, or is discouraged (Shaw et al., 2024).

Findings from both Howard et al. and Shaw et al.'s studies illustrate the flaws of relying heavily on phone communication when accessing public services, and emphasize the significance of offering alternate options for communication. The following study introduces a novel texting application called Texting with Interpret, Preview, & Suggest (TwIPS) that may lessen ambiguity within conversations for those with ASD by providing an artificial-intelligence support that aids in various aspects of conversation and communication (Haroon & Dogar, 2024).

***Texting with Interpret, Preview, & Suggest (TwIPS)***

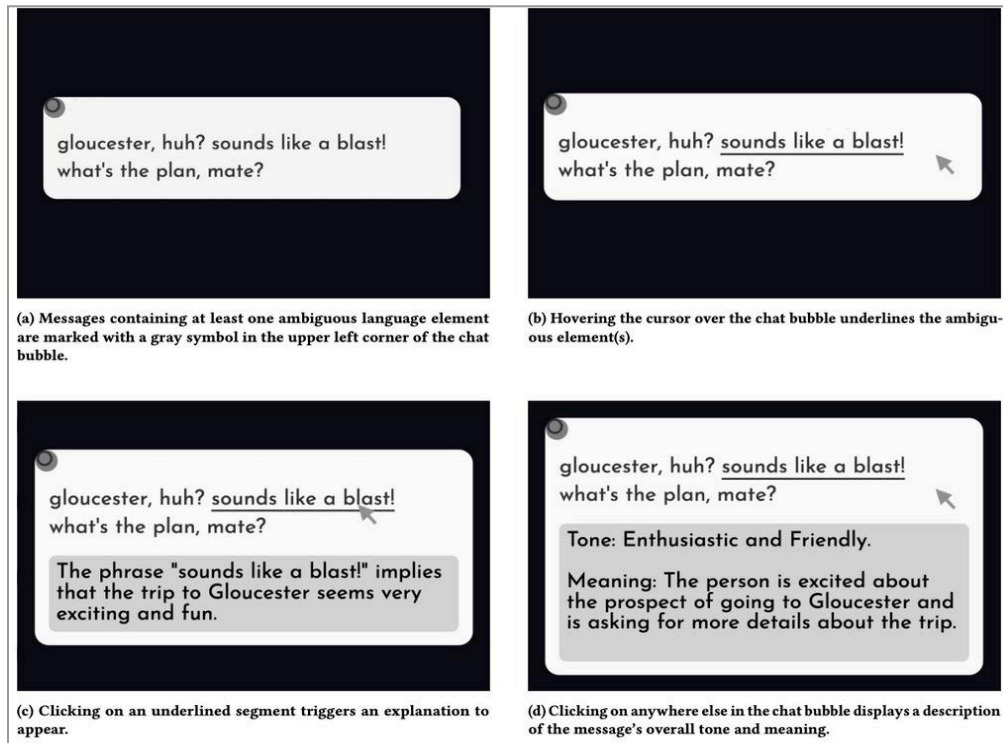
TwIPS is a prototype designed to assist users with ASD in various aspects that contribute to more successful communication experiences (Haroon & Dogar, 2024). According to the researchers, there are three features of TwIPS— Interpret, Preview, and Suggest.

“(1) INTERPRET: describes the overall tone and meaning of an incoming message, as well as individually identifies and explains ambiguous language elements in it, such as figurative language, sarcasm, and emojis;

(2) PREVIEW: allows users to preview the recipient’s likely emotional reaction to their message, helping them verify whether the emotional tone of their message comes across to the recipient as intended;

(3) SUGGEST: complements PREVIEW by suggesting a differently phrased alternate message when needed - the suggested message preserves the intent of the original message, but has a softer tone” (p. 2)

**Figure 2**  
*Demonstration of TwIPS functions*



*Note.* Diagram demonstrating and explaining how the TwIPS prototype would work from the user's perspective (Haroon & Dogar, 2024).

14 participants were recruited from a campus setting in the U.S. to participate in two phases of the study. During phase one, the users engaged in a simulated, scripted conversation using TwIPS, depicting a conversation between the user and a hypothetical friend 'Ben,' for reference script (see Haroon & Dogar, 2024). All participants received the same script consisting of both blunt and non-blunt messages (unknownst to the participant), which acted as "model responses" (p. 6) , for the participant to send to Ben throughout the conversation. Participants were given the opportunity to use the scripted response as it was given, modify the scripted response, write a new response entirely, or choose the alternate (non-blunt) response if they considered the modeled response to be too harsh. Following the simulated conversation,

participants were given time to elaborate on their decisions and provide their first-impression of the TwIPS prototype itself, as well as on the suggestions given by the SUGGEST and PREVIEW features of the prototype (Haroon & Dogar, 2024).

In phase two, the participant initiated a new conversation with Ben. They were encouraged to write their messages in their own speaking/writing style to make the conversation more realistic and natural. In this phase, ‘Ben’ was an AI-persona designed through use of the AI program GPT4. Prior to phase 2, GPT4 received pre-exposure to ambiguous elements of language including “positive sarcasm, figurative language, emojis, and jokes in its responses” (p. 6). Priming the AI-software (Ben) with such language prior to phase two ensured that Ben would properly prompt participants in a manner that would require them to use the INTERPRET feature in order to comprehend the conversation. Participants’ use of the INTERPRET feature allowed the researchers to evaluate TwIPS’ ability to recognize and explain potentially confusing concepts regarding language and communication that can surface in conversation. In phase two, participants were also given the opportunity to utilize the PREVIEW feature to help gauge the actual tone of their message compared to their intended tone and decide if the message needed to be adjusted (Haroon & Dogar, 2024).

Once both phases of the study were completed, participants engaged in an interview and survey, regarding their perceptions of the usefulness of TwIPS, and offered feedback on ways it could be improved. The survey consisted of 19 Likert-scale questions, to be rated on a scale of 1-7, with 1 being *completely disagree* and 7 being *completely agree* (Haroon & Dogar, 2024).

### ***Disadvantages & Suggestions for Effective Improvement***

Three main points of feedback were identified based on the collected data including personalization of the application, establishing trust in using the application, and establishing a

form of the application that works for neurotypical individuals. One of the most prominent suggestions received was the need for personalization of the software that would allow it to adapt to the user's speaking/writing style. Participants suggested that this would improve the application's usefulness and efficiency by maintaining the communication style and patterns of the user. By incorporating adaptive learning AI software, the application could collect and record user data to use as a reference in learning the writing style and speaking patterns of the user, to better personalize the features offered by TwIPS to each individual (Haroon & Dogar, 2024).

Participants also reported concerns with putting trust in the application, disclosing that they "were hesitant to trust the system too much, knowing it may not always be correct." (p. 12). This concern highlighted the importance of the researchers ensuring proper, clear disclosure of the possible inaccuracy or insufficiency of generated responses, message interpretations, and feedback on written messages in future models of TwIPS. Incorporation of adaptive learning AI software would help to resolve this concern also, by altering its guidance to the needs of each individual user over time, rather than function in a generalized capacity. By having the ability to adapt to the user's needs as the user becomes more experienced with using TwIPS, the application would reduce its input and guidance in accordance with the user's abilities, minimizing the chance of over-dependence on the application as time goes on (Haroon & Dogar, 2024).

Another significant point offered by the participants is the potential for role-reversal with use of the software. While this is a hypothetical factor that would require a redesign of the existing application or development of a new, alternate version of the application, it could have widely beneficial implications. While TwIPS is designed for a user with ASD and implies the understanding that the other person with whom they are conversing is neurotypical, participants

with ASD suggested the possibility of designing a similar application intended for neurotypical users. This would provide a second novel application, with the INTERPRET, SUGGEST, and PREVIEW features being oriented toward guiding neurotypical individuals in better understanding the communication patterns of their peers with ASD (Haroon & Dogar, 2024). This could be largely impactful, considering that a deeper comprehension of communication differences is facilitated on both ends, rather than being the responsibility of solely the individual with ASD.

Although TwIPS shows immense potential in offering an advanced AI communication method for those with ASD, it is important to note that with merely eight participants, the discussed study may only be interpreted as a pilot study. TwIPS still requires extensive research to objectively evaluate the efficacy of the system and observe its applications within various public settings and scenarios.

### ***Implications for Public Settings***

Haroon & Dogar (2024) demonstrated promising potential for TwIPS in facilitating successful communication for individuals with ASD, pending resolution of the previously discussed suggestions for improvement. Despite being a technologically-based method of communication, TwIPS may eliminate the overwhelm and anxiety individuals with ASD feel when engaging in phone calls (Howard & Sedgewick, 2021), by mimicking the decision-making and structure that goes into written communication. TwIPS may resemble written communication and even have some advantages over written communication that individuals with ASD could benefit from, such as personalized assistance in comprehending emotional tone and intent that one may not receive with simply written communication.

Incorporation of TwIPS into the healthcare system could yield prominent improvements in accessibility of healthcare and healthcare facilities. Although variations of texting/messaging portals do currently exist within healthcare settings (MyChart, UPMC, Cleveland Clinic etc.), TwIPS is designed specifically to aid those with ASD in communication by offering features such as INTERPRET and SUGGEST that help to eliminate ambiguity and nuances for those with ASD, which may allow for increased independence and autonomy within patient-provider interactions. By providing a system that effectively allows an individual with ASD to review, analyze, think through, and receive guidance on conversational input, several anxiety-inducing factors associated with healthcare may be reduced. This could facilitate increasingly successful communication with doctors and nurses, more thorough understanding of diagnoses and treatments, and may alleviate the stress associated with scheduling an appointment or contacting a healthcare provider.

Regarding possible development of an inverted design of the TwIPS model to be geared toward neurotypical individuals, healthcare professionals could benefit largely from implementation of such a system. This concept shows potential to improve the experience of individuals with ASD in healthcare settings by expanding healthcare providers' understanding of the needs and experiences of those with ASD, thus improving the often negative patient-provider interactions (Shaw et al., 2024).

Another suggested support that could further improve the TwIPS design for communication in public settings could be the ability to segregate information/data for each person on the receiving end of the conversation. Allowing the TwIPS software to personalize the user's settings to the needs of each individual person with whom the user converses could improve the quality of patient-care delivery in healthcare settings. Having the ability to segregate

individualized data for each patient could ease the overwhelm of healthcare facilities by speaking to them in ways they're comfortable and familiar with.

This suggested feature would also have significance in workplaces in communicating with various colleagues who have ASD, as well as in higher education, allowing professors to communicate with students who have ASD in a more personalized, helpful manner, which could in turn improve understanding of course material, and could also alleviate social anxiety and build confidence in facilitating socialization with peers.

### **Sensory Barriers**

Sensory processing sensitivities are experienced by a majority of individuals diagnosed with ASD and often affect emotional well-being, making socialization and developing interpersonal relationships increasingly difficult for these individuals. In addition to emotional health, sensory sensitivities can significantly alter other aspects of an individual's bodily well-being, which can result in unpleasant experiences of discomfort, distress, anxiety, and/or physical pain. Though not every individual that experiences sensitivities to sensory stimuli experience reactions to each form of sensory stimuli, sensitivities to any of the five sensory domains (Auditory, olfactory, tactile, gustatory, and visual) are possible alone or in any combination (Brake, 2024). In relation to these five domains, sensitivities can consist of loud noises, strong smells, unsettling food or object textures, harsh fluorescent lighting and a multitude of other stimuli a neurotypical individual may not notice. For those with ASD, these sensory processing differences make it difficult to thoroughly experience most public spaces, leading to lower social participation and isolation due to the often aversive, unwelcoming sensory environment in most public settings (MacLennan et al., 2023).

### ***Criterion for Minimized Sensory Input in Public Settings***

For people with ASD, the built environment can have substantial effects on their emotional health and well-being, considering the incompatibility between autistic sensory and spatial needs and the design of built environments, which are designed with neurotypical individuals in mind and often neglect to include the needs of neurodivergent individuals (Black et al., 2022). A literature review was conducted by Tola et al. (2021) to address existing design flaws relevant to sensory stimuli within a built environment that may heighten the experience of sensory overload and overstimulation, experiences that are common for those with ASD. The review sought to identify features that must be incorporated in the design of buildings and public spaces in order to achieve proper accessibility and inclusion of those with ASD (Tola et al., 2021).

The scoping literature review was conducted along the guidelines of the *Joanna Briggs Institute Methodology for Scoping Review* in which three stages were conducted as part of the methodological process which looked at the interplay between the built environment and ASD. These three stages were “(i) the literature searching, (ii) the selection of studies according to defined eligibility criteria... and (iii) the extraction and synthesis of data” (p. 2) (Tola et al., 2021). Studies that reported or described spatial needs, guidelines, or criteria relevant to the design of a built environment that properly accommodates people with ASD were included in the review. At the end of the three stages, 21 studies had been identified for inclusion in the study (Tola et al., 2021).

Several spatial criteria for proper ASD accessibility regarding built settings were established following the results of the study, which were then divided into groups of sensory quality, intelligibility, and orientation. According to the study, improvement of sensory quality in built environments requires the establishment of a low arousal environment by minimizing

sensory stimuli, provision of adequate transition spaces between areas with differing sensorial output, and provision of quiet spaces with minimal or no sensory output to promote independent (or assisted/accompanied) de-escalation from sensory overwhelm. Environments facilitating intelligibility were also identified as an important criterion for proper ASD accessibility, which included design factors such as having a simple and unambiguous layout, the ability to facilitate orientation, and the ability to promote familiarity and predictability. Visual supports were also identified as significant criterion in facilitating ASD accessibility in public, built environments. This includes using visual supports such as photos, pictograms, and/or color both to communicate urgent information regarding the environment to individuals with ASD, as well as to indicate the function of each space in a manner that may be better-received by those with ASD (Tola et al., 2021).

### ***The Autism ASPECTSS™ Design Index***

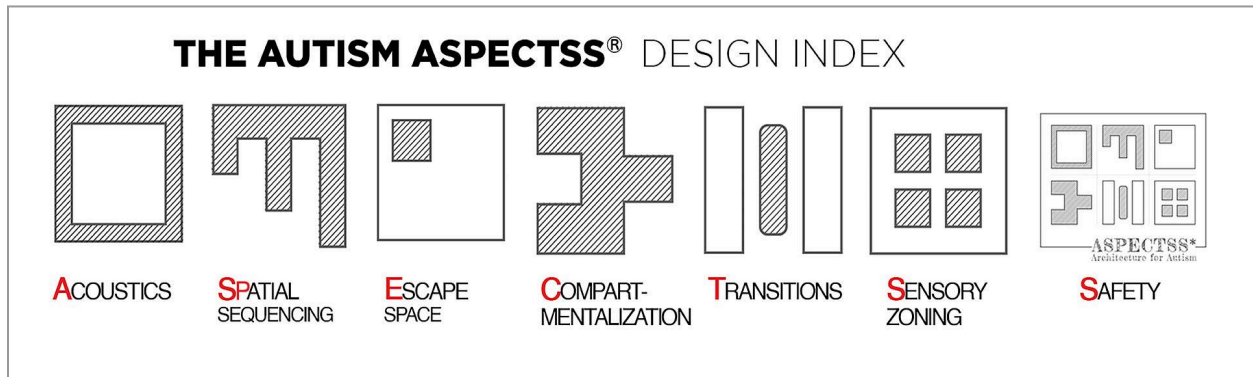
The Autism ASPECTSS™ Design Index is a research-based framework for properly inclusive design of built environments for ASD populations. If implemented into the designs of public spaces, ASPECTSS™ has the potential to reduce the design flaws identified in the previous study (Tola et al., 2021) and could facilitate a positive sensory experience for populations with ASD in public settings, thus increasing accessibility. ASPECTSS™ is a research-based framework designed by architects in cooperation with individuals who have ASD, as well as with experts within the field, that identifies barriers to public accessibility brought forth by the design of the built environment.

ASPECTSS™ is a framework comprised of seven concepts of design that have been researched for over a decade (Mostafa, 2015), for the purpose of their potential to facilitate proper inclusion of individuals with ASD in public spaces internationally. The seven design

concepts of ASPECTSS™ consist of acoustics, spatial sequencing, escape space, compartmentalization, transitions, sensory zoning, and safety.

**Figure 1**

*The Seven Elements of the Autism ASPECTSS™ Design Index*



*Note.* Seven features of the Autism ASPECTSS™ design index illustrated in striped portions of diagrams (Mostafa, 2015).

**Acoustics.** According to the guidelines set by ASPECTSS™, acoustics are one of the most highly prioritized aspects of accessibility in public settings (Mostafa, 2015). Auditory input such as background noise, echo, and reverberation must be controlled for in built environments in a manner that is user-dependent and allows each individual to have acoustical control for the necessary level of user-focus they require within the occupied setting. This means that in a setting that requires higher amounts of focus, (Art galleries, museums, libraries, etc.) the user should have the ability to minimize the amount of auditory input occurring around them in some capacity, to allow for the opportunity for them to regulate their sensory experiences (Mostafa, 2015).

**Spatial Sequencing.** Spatial sequencing attends to the organizational affinities often experienced by populations with ASD. This criterion emphasizes the impact that predictability can have on the well-being of individuals with ASD, and requires that for a space to be considered truly accessible for those with ASD, the areas within the environment must be

organized logically and based according to the usual routine associated with the spaces. Logical organization facilitates seamless transition from one space or activity to the next, by minimizing distractions or disruptions which could increase anxiety (Mostafa, 2015).

**Escape Space.** According to the guidelines set forth by ASPECTSS™, the dedication of spaces to act as means of escape from the main public setting an individual is occupying, may help to minimize emotional dysregulation and sensory overload often experienced by individuals with ASD in public settings. Escape spaces provide a low-stimulation environment that is available as needed, that allows individuals to step away from a potentially over stimulating environment, and helps them to feel calm and more comfortable (Mostafa, 2015).

**Compartmentalization.** This criterion suggests that autism-friendly environments require separation of activities that occur in various areas, which can be implemented on either a small or large scale. According to Mostafa, “Each compartment should include a single and clearly defined function and consequent sensory quality.” (p. 28). Clear distinction of each space and its function using some form of sensory stimuli unique to each compartment (Labels, colors, etc.) provides access to visual cues that assist greatly in simplifying knowledge of expectations for individuals with ASD in a way that reduces ambiguity and provides a sense of familiarity (Mostafa, 2015).

**Transitions.** Effective transitions within a public space work in coordination with other ASPECTSS™ design concepts including spatial sequencing and sensory zoning. Transitions essentially serve the same purpose as escape spaces in the provision of an area for an individual to regulate their emotions or pause before entering the next space or activity. Transitions offer a more short-term space to recalibrate and reset before moving on to the subsequent space (Mostafa, 2015).

**Sensory Zoning.** The criterion for sensory zoning proposes that public spaces should be arranged dependent on the sensory quality rather than for typical function or order which would entail “high-stimulus” and “low-stimulus” zones. By grouping spaces according to their sensory aspects rather than by means of function, individuals with more severe sensory sensitivities could still have the opportunity to experience the spaces with lower sensory qualities to the extent that they are able to, rather than having to avoid the public setting entirely (Mostafa, 2015).

**Safety.** This design concept simply emphasizes the importance of organizing and designing public settings with an understanding that ASD can alter an individual’s environmental perception. Safety precautions should be incorporated into the design of built environments to preserve the well-being of users and ensure a pleasant experience. Safety precautionary measures can be strengthened or made more effective by incorporating principles relevant to the compartmentalization and spatial sequencing design concepts (Mostafa, 2015).

### ***Effectivity of the Autism ASPECTSS™ Design Index***

Mostafa introduced the concept that “by constructively altering the built environment with autistic sensory needs in mind, one can alter autistic children’s behavior positively” (p. 57). While her ideas and research were formulated within the scope of children with ASD (Mostafa, 2015), this may be loosely applied to the behavior of adults as well, in relation to their responses to various experiences of public settings.

A study conducted by Mostafa utilized a 12-question survey consisting of one question for each of the seven criterion of the Autism ASPECTSS™ Design Index in a whole-school context, and one for each criterion that was deemed necessary in a classroom context. The survey was completed by four special education schools and one inclusive public school, as well as four architectural organizations that had designed the schools recruited to participate in the study. In

summary, Mostafa directly assessed the quality with which the ASPECTSS™ design index aligned with the quality of the design practice. The study showed high alignment between the two, with the range of scores being 46.4-57 points out of a possible 60 (Mostafa, 2015).

### ***Implications for Public Settings***

This study, though conducted in strictly a school setting, suggests the high potential of the guidelines laid out in the Autism ASPECTSS™ design index to facilitate promising resolutions to many of the sensory barriers experienced by individuals with ASD in public settings (Mostafa, 2015). Being only an index and not a physical implementation of the discussed concepts, steps toward implementation of the criteria outlined by the ASPECTSS™ design index, though more taxing, could in theory be possible with proper funding and timelines.

The possibility of implementing the design concepts laid out by ASPECTSS™ shows promise for substantial improvement in accessibility for individuals with ASD in public settings. The ASPECTSS™ framework could, in theory, be implementable in each type of public setting that was discussed in chapter two, as each setting had been identified to have some form of sensory barrier present (Pfeiffer et al., 2016; ; Kyprianos & Koniari, 2024; Shady et al., 2022), this would include workplaces, higher educational facilities, recreational settings, and healthcare facilities. Reevaluation of sensory stimuli that are present in built environments, organizational decisions, and environmental layout plans, in comparison with the ASPECTSS™ design index, could point to current flaws that create an unpleasant, uncomfortable environment for those with ASD. From this point, alterations could be made to the built environment to reflect each design concept outlined by the Autism ASPECTSS™ design index in as little or as large-scale of a capacity as is feasible.

## **Societal & Attitudinal Barriers**

As addressed in chapter two, interpersonal connections contribute significantly to the comfortability and accessibility of individuals with ASD in public settings. The stigmatization of ASD we see within society negatively impacts both the social status and the social experience of individuals with ASD in shared settings, often making participation and presence in these environments extremely aversive (Kim et al., 2023). While methods of reform do exist in some settings, they often are focused on reducing negative societal attitudes surrounding ASD by changing certain traits or behaviors of the individual who has ASD, rather than addressing the problematic attitudes held within society (Jones et al., 2021). A significant portion of the societal stigmatization that surrounds ASD often contributes to increased barriers to socialization faced by populations with ASD in public settings, which may be a direct result of society's lack of acceptance of ASD, and limited understanding of the disorder (Kuzminski et al., 2019).

Stigmatization of ASD present within society may be a result of media portrayal and lack of knowledge about the disorder itself, which reflects onto how these individuals are interacted with and treated within society. Despite increased awareness of ASD, this is still a prominent issue, one that significantly impacts the wellbeing of these individuals. Recognizing the negative attitudes society maintains surrounding ASD, Australian researchers conducted a study to analyze the knowledge of ASD possessed by neurotypical populations and their attitudes toward ASD (Kuzminski et al., 2019).

This cross-sectional study evaluated a sample of neurotypical adults in Australia, through a 10-minute online survey which was developed with the direct assistance of individuals who have ASD, and a co-researcher who also had an ASD diagnosis, all of whom were consistently

consulted upon for their knowledge and experience, and provided input throughout the duration of the study (Kuzminski et al., 2019).

The survey consisted of three portions– demographics, attitudes, and knowledge, and the questions used in each section of the survey were non-identifying of the participant, for survey questions, (see Kuzminski et al., 2019). The standardised SATA is a 16-item scale that was used to measure the attitudes the participants held toward ASD. For the purpose of this study, it was altered to accommodate culturally appropriate terminology relevant to the Australian population and was also reduced to 15 questions for its purpose in this study. Questions on this scale were answered by participants along a 4-point Likert scale ranging from (1) strongly disagree, to (2) strongly agree. Another portion of the survey gave participants the opportunity to share any questions they had that they would like to ask someone who has ASD, either for clarification or curiosity which would also indicate to the researchers a lack of knowledge regarding the question topic (Kuzminski et al., 2019). Overall, 1,050 surveys were submitted, of which only 1,078 completed the portion regarding Societal Attitudes Toward Autism (SATA) and had also met the inclusion criteria, qualifying these 1,078 entries for inclusion in the study (Kuzminski et al., 2019).

In calculating the SATA scores, the score of each participant was grouped into one of four categories. A score of 0-15 demonstrated strong, negative attitudes toward ASD, 16-30 demonstrated negative attitudes, 31-45 indicated positive attitudes, and 46-60 showed a strong, positive attitude toward ASD. After analyzing the SATA scores, it was found that 81.3% of the population revealed a strong positive attitude toward ASD. 29 participants reached the maximum score of 60, and the lowest score recorded was 24 (Kuzminski et al., 2019).

The knowledge section of the survey was co-produced, and had received only 1,054 entries to be included in the analysis. The scores from this portion revealed that 81.5% of the participants in this section possessed a high level of knowledge about ASD. A majority produced high scores in categories of *Societal Views and Ideas*, *Characteristics of Autism*, and *Strengths and Challenges*. However, they had scored lowest in the section of *What it Could be Like to Have Autism*. This study demonstrated that most neurotypical individuals within the Australian sample have a rather extensive knowledge about ASD and 99.9% demonstrated positive or strong positive attitudes toward ASD. In an analysis of demographic variables and SATA scores, it was also found that a substantial factor that influenced attitudes regarding ASD was knowing and being around someone with ASD (Kuzminski et al., 2019). This may indicate that societal knowledge of, and attitude toward ASD can be improved by consistent, personal experience interacting with someone with ASD (Kuzminski et al., 2019).

Questions regarding knowledge of ASD in the *Societal Views and Ideas* category, received the highest proportions of “i don’t know” as the chosen response. The questions in this section were based heavily on various media portrayals and depictions of ASD which reflected a gap in some participants’ knowledge of the disorder. This could highlight the misconceptions surrounding ASD that are fostered by some individuals. For those without firsthand experience interacting with and knowing someone with ASD, media portrayals may be the only reference for knowledge or an understanding of ASD, which can produce wildly inaccurate misconceptions and stereotypes surrounding ASD, which in turn, may contribute to the maintenance of negative attitudes and stigmatizations within society (Kuzminski et al., 2019).

***SPACE Framework***

The SPACE framework refers to a proposed collection of concepts used to gauge autistic needs within healthcare settings, in efforts to facilitate improved accessibility of healthcare services and quality of care for individuals with ASD. SPACE is an acronym referencing sensory needs, predictability, acceptance, communication, and empathy (Doherty et al., 2023).

This framework was developed for the purpose of providing a method to minimize the knowledge gap concerning ASD that exists between neurotypical individuals and individuals with ASD. This knowledge gap could be a result of insufficient training and education, or absence thereof entirely, and may contribute to often unwelcoming, uncomfortable experiences in public settings for populations with ASD. The five concepts outlined by the SPACE framework are further broken down into additional categories of physical, processing, and emotional, which assist in further facilitating a more thorough, accurate understanding of ASD and the needs of those with ASD (Doherty et al., 2023).

While sensory needs were discussed in the previous section, the context of sensory needs in the following section is presented in a different light. The SPACE framework doesn't provide guidelines for physical environments, but rather, it provides an outline of accurate information specifically designed to offer knowledge about ASD to neurotypical parts of society (healthcare workers, retail workers, etc.) to improve their comprehension of the disorder, and the needs of those with ASD, with the intent of improving societal attitudes toward ASD. The SPACE framework merely targets each individual's knowledge of the disorder within society, and provides a supportive framework to improve the knowledge neurotypical individuals have about ASD.

**Sensory Needs.** Sensory sensitivities are, as discussed previously, experienced by most individuals with ASD (Brake, 2024), and may make most public places inaccessible for these populations. The experience of sensory overload can often lead to emotional disturbances and difficult behaviors (Marco, et al., 2012), which, if lacking knowledge surrounding sensory sensitivities and sensory overload as it pertains to ASD, one may escalate the situation and make the particular environment that is contributing to the sensory overload, increasingly more aversive to these individuals. The SPACE framework illustrates the importance of neurotypical individuals possessing immediate knowledge of sensory triggers and understanding different control factors within their ability, so they have the ability to assist in mediating these stressors (Doherty et al., 2023).

**Predictability.** As discussed previously, the need for routine and predictability is often needed, and lack thereof, can contribute to extreme experiences of anxiety and discomfort for those with ASD (Lambe et al., 2019; Mostafa, 2015; Lambe et al., 2021). With most public settings being such fast-paced, ever-changing environments, neurotypical understanding of the distress this can cause for these individuals is essential. According to Doherty et al. (2023), finding ways to provide information regarding a public setting in advance to the individual actually attending, can drastically reduce anxiety and unpredictability surrounding the visit. Such actions taken to minimize unpredictability and uncertainty can provide the opportunity for these individuals to still attend, and feel more comfortable while doing so (Doherty et al., 2023).

**Acceptance.** Despite an increase in awareness and knowledge surrounding ASD in recent years, society still must adopt a wider-spread acceptance of ASD in order to see beneficial change in accessibility. As addressed in the Kuzminski et al. study previously, many misconceptions of ASD can be attributed to a lack of general knowledge regarding the disorder,

due to skewed media portrayals of the disorder itself, and of people with ASD (Kuzminski et al., 2019). This knowledge gap could be a contributor to societal factors that inhibit acceptance of ASD such as stigma and stereotypes (Kuzminski et al., 2019). Rather than simply making people ‘aware’ of ASD, the quality and accuracy of the knowledge offered through the SPACE framework has the potential to foster more thorough understandings and perceptions of ASD. By providing accurate information and knowledge about ASD through the SPACE framework, societal acceptance of ASD has the potential to become more expansive, which could lead to more adequate accommodations and better understanding of the needs of those with ASD (Doherty et al., 2023).

**Communication.** Methods of communication utilized by people with ASD vary widely based on the level of ASD that is experienced and the preferences of each individual (Howard & Sedgewick, 2021). Even those who have the ability to communicate fluently through verbal means, may experience communication difficulties during times of extreme stress or sensory overload. At minimum, even a general understanding of current communication methods that are used to assist individuals with ASD, such as nonverbal communication, use of interpreters, or use of augmentative and alternative communication (AAC) devices, could facilitate an improvement in how neurotypical individuals in public settings communicate with those with ASD (Doherty et al., 2023).

In addition to communication methods, understanding of the variability in language and comprehension of conversational elements for those with ASD could further promote communicational inclusion of those with ASD in public settings (Doherty et al., 2023). Based on the Kuzminski et al. study discussed previously, which found that increased interaction with individuals who have ASD contributes to positive and strong positive attitudes toward ASD,

could in turn, reduce stereotypes and stigmatizations that are present in society regarding ASD (Kuzminski et al., 2019).

**Empathy.** A common misconception about ASD that is fueled by society, is the idea that people with ASD lack, or are unable to experience empathy. A significant discrepancy within this misunderstanding is a concept called the “Double Empathy Problem” which is understood to be a mutual misunderstanding between those with ASD and neurotypical people, in the understanding of experiences and displays of empathy (Milton et al., 2022). This theory suggests that those with ASD express empathy in a manner that is unfamiliar to neurotypical individuals, and because neurotypical individuals mistake this to be an inability to empathize, issues with reciprocity surface, often leading them to experience difficulty in empathizing with those with ASD (Doherty et al., 2023).

In efforts to resolve the issues surrounding empathy as it is both given and received by individuals with ASD, SPACE seeks to facilitate methods of ensuring accurate views from both perspectives. This is mainly suggested on the neurotypical end, suggesting neurotypical individuals should directly ask to ensure they have a correct understanding and perspective of how they interpreted an event compared to how a person with ASD may have interpreted the same event, rather than making assumptions based on the behavior and non-verbal communication of someone with ASD (Doherty et al., 2023).

By conducting a verbal-check of each person’s comprehension of any particular interaction or event, successful interaction and facilitation of empathy can be improved (Doherty et al., 2023), which could potentially minimize the inaccurate misconception held by society that people with ASD are unable to empathize.

**Additional Features.** Though not directly a part of the SPACE framework, Doherty et al., point to the significance of general space in the experiences and comfort of those with ASD in public settings.

Physical space, processing space, and emotional space are highlighted. In reference to physical space, maintaining a distance that is outside of touching-distance can, for those with ASD, facilitate a less anxious, and less tense environment, which could allow them to have a more pleasant experience within the occupied setting. For neurotypical individuals, this points to the significance of mindfulness regarding personal space and proximity when interacting with someone who has ASD (Doherty et al., 2023).

It is also essential for neurotypical individuals to exhibit patience when interacting with a person with ASD, due to their need for “processing space” (p. 5). This concept refers to the additional time those with ASD may require when taking in new information or an unexpected occurrence. Patience is crucial in these contexts, as repeating oneself can restart their processing time and cause frustration. It’s suggested that prompting can be helpful, by saying something such as “Are you still thinking?” (p. 5) you signal to them that you are still present in the conversation and awaiting an answer, while avoiding causing any frustration or overwhelm for them (Doherty et al., 2023).

Emotional space is also essential in providing individuals with ASD the opportunity and space to de-escalate from high-stress or high-sensory environments in a more calm environment. By providing such an environment for them, their safety is maximized and they have the opportunity to decompress and recover in any way they may need to, which would otherwise be impossible in a high-stimulation, overwhelming environment (Doherty et al., 2023).

### ***Implications for Public Settings***

As mentioned previously, SPACE is a framework initially designed for use in healthcare settings, in efforts to both facilitate healthcare visits that are more helpful and more comfortable for those with ASD, as well as provide a resource for healthcare workers in which they can deepen their understanding of ASD, allowing them to provide higher quality care to patients with an ASD diagnosis (Doherty et al., 2023). The simplicity and conciseness of the SPACE framework would make it a helpful tool for healthcare providers and even those who simply work in healthcare settings (volunteers, receptionists, etc.) in its ability to provide accurate, yet simple information regarding the needs and experiences of those with ASD.

The goals and method of use for the SPACE framework, are unlike the goals of many reforms or methods currently in place, which often make it the responsibility of those with ASD to use methods that merely make public settings more tolerable. Provision of the information offered through the SPACE framework makes the accommodations necessary for a pleasant experience for those with ASD, the responsibility of healthcare providers, yet doesn't contribute to any additional stress for the providers (Doherty et al., 2023). With the necessary accommodations being made on behalf of the healthcare providers in accordance with the SPACE framework, individuals with ASD may no longer be expected to accommodate or adapt to the surrounding environment on their own.

Despite its initial purpose being specific to the healthcare field, the SPACE framework may show large potential for implementation and use in other public settings. Implementation of the concepts outlined by the SPACE framework would be rather simple to implement into work environments. Training using SPACE could be required as a mandatory part of onboarding in places of employment.. This could ensure all employees have a collective, thorough

understanding of ASD and the needs of those with ASD, and are better prepared to interact with colleagues, customers, clients etc.who may have ASD, in a way that would foster comfort, accessibility, and inclusion. Provision of more knowledge regarding ASD to all employees could make workplaces more inclusive, reduce stigma that may be present surrounding the disorder within the workplace, and foster more positive attitudes about ASD within the workplace (Kuzminski et al., 2019).

The SPACE framework also shows promise for implementation in recreational settings, which could go hand-in-hand with implementation in workplaces. By implementing SPACE into workplaces, whether generally or as a mandatory training, baristas, flight attendants, retail workers, and other employees from various recreational, or everyday settings would be exposed to accurate, valuable knowledge about ASD, what it entails, and how they as employees can facilitate a fostering environment for these individuals (Doherty et al., 2023). For those with ASD, this could make the difference between a pleasant or unpleasant experience in such settings.

Similarly, the SPACE framework could be used by colleges in the form of workshops, DEI training, or other methods, to ensure a socially educated, inclusive student body and staff. A school that discloses its incorporation of SPACE framework into its education and infrastructure could potentially appear more appealing to those with ASD planning on going to a post-secondary institution, as they would have some predisposition to the likeliness of inclusivity and knowledge of ASD on campus.

## **Chapter 4: Conclusion**

### **Discussion**

In response to barriers that hinder accessibility for those with ASD in workplaces, higher educational facilities, recreational settings, and healthcare facilities, TwIPS, the Autism ASPECTSS™ design index, and the SPACE framework provide feasible, evidence-based propositions to resolve the barriers that make these public settings inaccessible. Research regarding communication challenges and strengths of those with ASD was prominent, demonstrating a large focus on the communicatory needs of those with ASD. Literature relevant to general communication patterns of those with ASD was applied to findings from chapter 3 to evaluate in which public settings communication difficulties were most prevalent. Communication barriers appeared to be identified most in the workplace and in healthcare, however, communication barriers in higher education settings yielded minimal research. Given the nature of higher education settings, communication barriers may actually be present, but too little research is available in which we can gauge the occurrence of such barriers in higher education. Sensory barriers within public settings may have been the most researched barrier identified within this review, and had literature across multiple disciplines including architecture, of which contributed largely to the discussion of sensory barriers and in proposing potential supports to relieve the impact of these barriers on those with ASD. The topic of societal and attitudinal barriers that hinder social inclusion in a general sense yielded a respectable amount of literature that was synthesized in accordance with results of the studies discussed in chapter two, to pinpoint the more prominent settings where attitudinal barriers hindered accessibility. This appeared to be the workplace and factors relevant to employment, and healthcare facilities.

Overall, a rather large gap in research was discovered pertaining to both barriers for ASD that are present in leisure and recreational settings, as well as possible supports to minimize barriers within such settings, which could potentially indicate reduced ASD attendance of such settings due to the inaccessibility and difficulty they pose for these populations. Additionally, communication barriers as they are present in higher education settings also demonstrate some gaps in the amount of available research.

### **Strengths**

A majority of the studies present in this review originated in the U.S., however, a range of national and international studies regarding the challenges of those with ASD within a variety of public settings were additionally incorporated throughout the review. An international scope was beneficial in loosely analyzing variances in the levels of progression of ASD accessibility across various countries including the United Kingdom, Australia, Greece, Spain, as well as others. Additionally, synthesis of ideas from studies with different origins created a potentially strengthening quality within the overlap of ideas between the proposed supports discussed in Chapter 3. Theoretically, each proposed support has potential for international implementation. Further synthesis of international studies within this field of work could continue to intertwine strengths of various additional frameworks, concepts, and proposals to further strengthen the potential effectivity of the proposed supports.

This review systematically organized barriers to ASD inclusion as identified among the literature into separate categories, and identified novel supports to aid in minimizing each of these, pending implementation of these systems and programs into common public settings. Categorization of existing barriers found in various public spaces and summarization of proposed

novel supports to improve ASD accessibility in public spaces allowed for a thorough comprehensive look into a topic that has only been researched in a limited capacity thus far.

### **Limitations**

Limitations in the field of research in turn impacted the scope of discussion and applications of the current review. For example, literature within this field of work is scarce, and demonstrates several gaps in information regarding specific barriers in public settings for those with ASD and effective resolutions for these issues. An additional point is the prevalence of studies focusing on children with ASD as compared to studies focusing on adults with ASD. Though the conclusions may have some applications toward adults with ASD, due to the developmental and societal differences between children and adults, these findings cannot be truly generalized and must take into consideration potential inconsistencies between data collected from children and data collected between adults.

Though the primary goals of this review were to pinpoint specific barriers existing for those with ASD in public spaces and identify supports to minimize the barriers addressed throughout, generalization of the identified barriers and supports discussed within the review still occurs to an extent. Because ASD varies so widely in how it presents itself, no intended solution or aid to alleviate challenges for these individuals can apply to all individuals with ASD. Implementation of these supports is not a solution and would still neglect to improve accessibility for all members of the ASD community, but the goal is merely to alleviate these challenges to as great an extent, for as many of these individuals as is possible.

### **Future Directions**

The topic of accessibility barriers present in public settings for those with ASD would benefit from more empirical research both at a national and international level, namely in areas

of higher education, leisure & recreational settings, and the hiring process relevant to work settings. This field of work could also seek to incorporate more case-studies to gain a firsthand perspective of these issues from individuals with ASD themselves, and conduct more research with a focus on adults with ASD rather than children with ASD.

In reference to the ideas proposed in Chapter 2 to potentially resolve barriers in public settings for those with ASD, the Autism ASPECTSS™ design index could be utilized in a study with participants who have ASD, to evaluate from their perspective, the effectivity of a built environment following the guidelines laid out by ASPECTSS™ in reducing sensory barriers. The TwIPS prototype could be adjusted according to the feedback received from the study, and retested in a sequential study with a larger sample size to further observe its usefulness and the outcome of alterations made to the prototype. The SPACE framework should be run in a pilot study to observe its effectiveness in increasing general knowledge of ASD and reducing negative attitudes toward ASD within neurotypical populations.

While each of the proposed supports presented in chapter two were intended to target specific forms of barriers (Communication, sensory, attitudinal), some of the findings may indicate that there is potential for simultaneous implementation of these supports and overlap of their features. The Autism ASPECTSS™ design index outlined the significance of escape spaces and transition spaces in providing designated, low-stimulation areas where those with ASD can either step away entirely and regulate themselves in a less overwhelming environment, or have a low-stimulation space between two high-stimulation environments in which they can recalibrate and decompress briefly before entering the next space (Mostafa, 2015).

The SPACE framework also incorporates a similar idea of “escape spaces” which is called “emotional spaces” (p. 5) (Doherty et al., 2023). This miniscule overlap in design features

for each the ASPECTSS™ and SPACES frameworks, points to the possibility of further overlap and integration of these two systems. With the TwIPS, ASPECTSS™, and SPACE systems each targeting a different form of accessibility barriers, implementation of all three into the same environment would theoretically be possible. This collaboration could show potential for significant minimization of barriers concerning communication, sensory factors, and societal attitudes, which could contribute to a novel, highly Autism-friendly environment.

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