Muting, filtering and transforming space: Autistic children's sensory 'tactics' for navigating mainstream school space following transition to secondary school

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ABSTRACT

Mainstream school spaces provide significant sensory challenges to children with Autism Spectrum Disorder (ASD). In this paper, we provide in-depth qualitative insight of the 'sensory tactics' developed by children to navigate neurotypical spaces following transition to secondary school. Informed by work in sensory geography, and de Certeau's 'strategies' and 'tactics' concepts, we demonstrate that through muting, filtering and transforming space, children find ways to navigate the sensorially demanding environments of mainstream secondary school, e.g. finding quiet, orderly spaces - albeit in ways that do not entirely negate the sensory challenges the school environment presents. The paper concludes with several recommendations regarding ways that mainstream school spaces can be designed and/or existing spaces altered so as to be more sensitive to the sensory diversity of children with ASD.

1. Introduction

In this article we argue for the importance of addressing the sensory experiences of autistic children when navigating mainstream school space following the move to secondary school. We contribute to a wider literature which has argued for considering the whole environment - social, material, sensory - when providing inclusive educational spaces (Killoran et al., 2014; Love, 2018). We add to this literature a detailed qualitative account of autistic children's endogenous 'tactics' (de Certeau, 1984) for managing their sensory experience as they navigate the new spaces of secondary school, comprising larger buildings, more children and greater movement during the school day. School spaces are, along with nearly all mainstream public spaces, designed for the sensory profile of neurotypical people (Ashburner et al., 2008). Autistic people often process sensory information differently to neurotypical people (Donnellan et al., 2013), which can include increased sensitivity (e.g. to noise, light) and differences in patterns of sensory processing. It is well reported that autistic people can feel "'out of place' in mainstream space" (Davidson, 2010, p. 306) due to the high sensory demand of neurotypical environments. A focus on the post-transition sensory experience of school spaces that are neurotypical in design has not featured in previous research, meaning that limited attention has been paid to the sensory needs of autistic children when supporting the move to secondary school (Makin et al., 2017).

In this article we add to the limited literature which centres first-hand accounts from autistic children transitioning from primary to secondary school (Mandy et al., 2016; Makin et al., 2017). Existing research has identified challenges associated with moving to a new school, such as concerns about losing touch with current friends, not 'fitting in' to secondary school and feeling daunted by the size of the new school (Makin et al., 2017). In depth analysis of autistic children's sensory experiences of their new school has not, however, featured in existing research. We follow Pluquailec (2018) in adopting a non-pathologising approach of not rendering the 'difference' of autistic children's experiences as problematic, but rather as operating on a different part of the neurological continuum. Children's sensory experiences emerge through relations with other children and the school environment itself as a series of spaces (e.g. classroom, playground, refectory, library). This approach thus addresses the "immediate role of the different senses in generating senses of place and orienting us in space" (Rodaway, 1994: ix). To orientate our analysis, we will first introduce some context on common experiences in autism, the educational context in the UK, before locating the paper theoretically within sensory geographies.

1.1. Autism spectrum disorder (ASD)

Autism is conceptualised as a spectrum, meaning that individuals can present with a wide range of behaviours, experiences, capacities and talents, whilst also having some shared characteristics. Most early research in Autism Spectrum Disorder (ASD) focussed on social and cognitive development, finding differences in the way that autistic children respond to and process social and emotional cues (Frith, 1989; Hobson, 1995) as well as differences in hypothesising about other people's thoughts, feelings and motivations (Baron-Cohen et al., 1994). These differences often translate into difficulties in relationships and navigating social situations, particularly when they are unstructured or ambiguous. Autistic children report fewer friendships, for instance, than typically developing children (Bauminger and Kasari, 2000).

Another common feature of autism is a tendency towards routine, repetition and rigidity (Turner, 1999), as well as having intense interests (Joseph et al., 2014). Repetitive behaviour (such as arm flapping, rocking) is a common autistic response to both anxiety (Joyce et al., 2017) and sensory overload (Jones et al., 2003). ASD has historically been overwhelmingly diagnosed in boys and men, but recently there has been a growing recognition that ASD may present differently in girls and women (Lai et al., 2017; Gould, 2017; Hull et al., 2020). Girls have been found to engage in more 'camouflaging' (Hull et al., 2020) or 'compensation' (Livingston and Happé, 2017) behaviour, employing strategies to conceal their autism to fit in with the social environment (Lai et al., 2017).

Sensory difference has been long noted in autism, both in clinical and autobiographical reports (Iarocci and McDonald, 2006; Davidson, 2010), garnering particular attention in the academic literature in more recent years (Roberton and Baron-Cohen, 2017). From a neurotypical perspective, autistic people have been found to demonstrate both hyper and hypo sensitivities to sensory stimuli, as well as being slower to integrate sensory information (Leekam et al., 2007; Tomchek and Dunn, 2007; Roberton and Baron-Cohen, 2017). Leekam et al. (2007) for instance, found that 94% of the autistic children in their study were identified as having a sensory sensitivity, observed across multiple sensory domains - light, sound, touch, taste, smell. Differences in proprioception (Morris et al., 2015) and vestibular processing (Kern et al., 2007) have also been identified, indicating that autistic people may have a divergent sense of their body in space. A common sensitivity is noise; research on auditory processing has noted that some autistic individuals experience hyperacusis, a greater sensitivity to loud sound (Khalfa et al., 2004), whilst other experimental research has established that autistic adults have relative difficulty distinguishing speech from background noise (Teder-Salejarvi et al., 2005). Sensory differences, however, vary between autistic people; there is not one singular autistic sensory profile (Crane et al., 2009).

One underlying process proposed for these sensory patterns in autism is a general bias towards local rather than global processing (Frith, 1989) – a focus on parts rather than the whole - which could for instance explain slower integration of sensory input. Another is a general orientation away from social stimuli compared to typically developing children, which could be argued to lead neurotypical children to more easily, for instance, pick out speech from other noise (O'Connor, 2012). In this article, we do not seek to directly intervene in these debates but instead to enrich existing knowledge by focusing on the experiential impact of living with sensory difference for autistic children. Although sensory profiles vary considerably between autistic people (Crane et al., 2009), a commonality is the necessity of navigating environments designed for a neurotypical sensory profile, which diverge from the sensory needs of autistic people in varying ways. The range and complexity seen in autism is also one reason why it is important to directly address the experiences of autistic people in research (Conn, 2015), underpinning our approach in this study.

1.2. School spaces and autism

Pushing back against a history of institutionalisation and marginalisation (McHale and Gamble, 1986), the accepted norm in education policy and practice in the UK since the 1990s has been 'inclusion' of children identified as having 'Special Educational Needs' (SEN) in mainstream settings (Roberts and Simpson, 2016). (SEN is a UK educational policy term used to identify children with a range of needs that can affect the ability to learn, e.g. concentration, problems socialising, learning style, or comprehension). While standalone specialist schools exist, these are primarily for autistic children who have an intellectual disability, meaning that 70% of autistic children attend mainstream schools in the UK (UK Department of UK Department for Education, 2016). Some large secondary schools provide enhanced SEN support. This may include an area of the school where some lessons are delivered in smaller classes, meaning that some autistic children spend their time in a mixture of mainstream and smaller, more tailored spaces.

The advantages and disadvantages of these approaches are a live debate. It is argued that mixing with non-autistic children in mainstream classrooms can aid social development and better reflects the diversity that autistic children will inevitably experience outside of school (Humphrey and Lewis, 2008; Connor, 2000). Challenges in mainstream school environments include higher levels of social isolation and peer rejection than seen in ASD only classrooms (Symes and Humphrey, 2011). Autistic children who have an IQ in the typical range, who are almost always in mainstream schools, also report high levels of loneliness (Bauminger and Kasari, 2000). These complexities have led authors to call for a more nuanced understanding of inclusion as "a feeling not a place" (Goodall, 2018, p.1661), such as thinking through the different levels on which mainstream spaces can include or exclude children identified as having SEN. While much of the focus has been on the social challenges autistic children can face when navigating mainstream school, there has been less emphasis on the sensory environment, a crucial aspect of ASD experience considering the range of sensory differences found (Donnellan et al., 2013).

The move to secondary school offers additional challenges for autistic children, on top of these general issues with social integration and inclusion. Firstly, the difficulty some autistic children face in picturing themselves in new environments can make planning the move harder than for neurotypical pupils (Grandin, 2006). Struggling to imagine new environments can cause autistic students to disengage when choosing a school (Makin et al., 2017). On starting school, a change in routine can exacerbate existing sensory difficulties felt by autistic children (Makin et al., 2017). The stress of assimilating into this new social space can therefore be exacerbated by a physical space they have not yet learnt to navigate (Mandy et al., 2016). The support that autistic children are provided within the new school is often focused on their individual characteristics and needs, rather than viewing the school environment itself as a significant challenge (Mandy et al., 2016). The focus on individual learning needs thus neglects a focus on the environment as a relational and sensate space, which autistic children must learn to navigate, and which underpins their learning. In this article, we address this gap by framing autistic children's experiences within the sensory geography literature.

1.3. Sensory and neurodiverse geographies

Sensory geography has provided significant insight regarding the role of the senses in the ways we experience the environments in which we live, work and play. Sense permeates psychological experience as a whole, which demonstrates how important it is to understand the sensori-spatial experiences of autistic children following their move to secondary school. Sensory geography argues that senses are "not merely passive receptors of particular kinds of environmental stimuli but are actively involved in the structuring of that information and are significant in the overall sense of a world achieved by the sentient" (Rodaway,

1994: 4). The senses are considered active ways through which bodies encounter and interact with the world. Senses are also integrated with emotions, meaning that sensory experience is always-already emotional experience. How we sense the world plays a significant role in the emotional feelings we develop about it. Sensory atmospheres are not considered to be fixed properties of institutional spaces but are emergent or evolving properties of the relations between bodies, human and non-human, and their capacity for change. Furthermore, senses can provide multiple ways of engaging with the world; "the senses both as a relationship to a world and the senses as in themselves a kind of structuring of space and defining of place" (Rodaway, 1994: 4).

Existing sensory work in human and cultural geography has often focused on sound, which has been considered as "critical to the problem of how atmospheres are sensed" (McCormack, 2018: 121). Sound is claimed to be a significant part of formal organisation, e.g. in institutional spaces such as psychiatric hospitals (Brown et al., 2019). A focus on sound has emerged as part of the resistance to an ocularcentrism that commonly exists through the prioritising of vision in the organisation of space (Rodaway, 1994). This is taken further when considering sense as a key way in which we come to 'know the world'. Rather than claiming that knowledge develops as the result of processing sensory information about the environment, senses can be thought of as the primary modes of encountering and engaging with environments, grounded in embodied experience and movement (Serres, 2008). While the role of vision is significant, it is valuable to consider the salience of all the senses. Sensory geography has, moreover, paid limited attention to divergent sensory experience, taking a broadly universalist approach to understanding the senses. We add here to the emerging literature exploring neurodiverse sensory geographies (Davidson, 2010; Ryan and Räisänen, 2008), as a route to promoting better sensory inclusion in mainstream spaces.

Sensory differences seen in autism can be compounded by neurotypical design, or "the construction and positioning of […] 'sensory furniture' […] by non-disabled others" (Davidson, 2010, p. 306). A common design assumption, for instance, is that the 'signal' of speech can be easily distinguished from the 'noise' of other sounds in a busy environment. Spaces set up to afford neurotypical sensory systems thus can be felt by an autistic person as though the world has been put through a mixing desk, with everything turned up at once. There is, indeed, a small literature looking at autism friendly design (Kinnaer et al., 2016; Mostafa, 2008; Nguyen, 2006), some of which focuses specifically on school and classroom design (Vogel, 2008), and threaded through which is an attention to sensory difference. Recommendations often focus on creating a clearly structured environment, with clear navigation and well-ordered spaces (Nguyen, 2006), as well as lowered lighting and dampened sound (Humphrey, 2008).

Turning to education environments, Howe and Stagg (2016) argue that heightened sensory capacities have a "significant impact on daily functioning" for autistic pupils, disrupting both social and pedagogical performance. Goodall (2018) additionally found that children with autism in mainstream school discussed feeling "closed in" and identified the "constant changing of classrooms" (p. 7) and crowds as stressful. Smaller, more intimate educational environments have been noted as preferable (Sproston et al., 2017). In line with this preference, Connor (2000) noted that autistic children sought out 'bolt holes' (p. 295) in the school environment, which met these criteria of being smaller, more ordered and quieter places. Similarly, Ryan & Räisänen (2008) argue that autistic children create "micro spaces within existing places" (p.141), that can be relied on as peaceful or secluded. The school library is noted as one such place of "refuge" (Humphrey and Lewis, 2008, p. 38). In seeking out these places of 'refuge' and 'bolt holes', we can see that autistic children are not simply the passive recipients of the sensory environment, but active agents seeking to modulate their spatial environment to moderate its impacts and find a sensory equilibrium. In the analysis below we extend these insights to explore in more depth the active ways which children with autism navigate the school environment.

2. Research context and methodology

This project took place in a large urban UK secondary school, which included an on-site wing for children designated as having SEN. None of the children participating in this study were taught in the wing, which catered for those whose needs were deemed to be too complex for mixed classes. However, all of the children in the current study had core subject lessons in wooden pods that were situated in the school playground. These lessons would range from six to eight children with neurodevelopmental problems, and one teacher from the main school. Outside of these core subject lessons, they attended mainstream classes where they would receive additional support from the SEN staff in their more challenging lessons. In this study, we aimed to explore children's experience of school spaces, in this environment which contains both mainstream and SEN-specific provision. As this is an understudied area, we utilised an ideographic qualitative approach to develop in-depth analytic insight regarding children's' post-transition sensory experiences of mainstream school spaces.

2.1. Procedures and participants

Four participants were recruited, all of whom were diagnosed with ASD, and had been assessed to be capable - both academically and socially - of attending the mainstream part of the school. All children were in Years 7 and 8 (aged 11–13), so were in the earliest years of their secondary school experience. The first author had previously worked in the school in a support role and had experience of working with autistic children in that setting. As such, the first author had expertise of working sensitively with autistic children, with an awareness of the challenges faced and how to communicate in a way to ensure children felt comfortable. Prospective participants were familiar with the first author, which helped to make participants feel at ease in advance of, and during, interviews. Interviews varied in length but averaged 20–30 minutes - with participants invited to take a break at any stage.

Ethical approval was secured from the host university, and the school consented to take part in the study. Parents were contacted by the school's Special Educational Needs Coordinator (SENCo) and gave their consent on behalf of their child. The children were informed about the study in appropriate terms and asked to sign a consent form of their own. Five children were selected by the school to take part in this study, and four parents consented on behalf of their child. The children were interviewed using a loose semi-structured interview schedule, which asked them to reflect on their experiences of different spaces within the school, such as the lunch hall, library and classrooms.

2.2. Analytical approach

For the initial stages of the analysis, the processes of qualitative analysis were followed, broadly reflecting the procedures of Thematic Analysis (Braun and Clarke, 2006, 2020). The analysis was founded in a commitment to a close reading of individual experience, as well taking an ideographic and hermeneutic focus. The first author conducted the interviews, which were transcribed verbatim before being coded at both the semantic and latent level. The first author then organised these codes into initial themes and clusters, and through engaging in the process of the 'hermeneutic circle', considering how the codes and themes interact to make sense of the data set as a whole, constructed higher level themes. All authors then interrogated the resulting themes, at which point we focused on participants' sensory experiences and the ways that they navigate the mainstream school environment. Through further interrogation of the data, empirical and theoretical literature, we decided key concepts to help explore these facets of the data. It was at this point that we identified the value of de Certeau's (1984) distinction between spatial 'strategies' and 'tactics' to provide theoretical direction

to our analysis.

de Certeau (1984) explored the interplay between how space is 'produced' - the operations of power which delineate the shape, boundaries and official routes through space - and the practices of the 'consumer', individuals who use and navigate spaces in official and unofficial ways. One of his powerful examples evoked an image of Manhattan, New York City. Viewing the city from above, we can see a grid structure of streets, laid out as an official spatial strategy. Zooming down to street level, we can also view the city from the point of view of those walking around it, and a more chaotic image emerges as people use the city in multiple ways: cutting through streets, walking back and forth, creating shortcuts and finding their own routes. Within the 'strategies' (the grid structure) imposed from above, therefore, people find 'tactics' to modify and use space for their own ends, achieving an "appropriation of the topographical system on the part of the pedestrian" (p. 97). A tactic, therefore: "insinuates itself into the other's place, fragmentarily, without taking it over in its entirety, without being able to keep it at a distance (p. xix)." Tactics are always limited, however, as whilst: "strategies are able to produce, tabulate, and impose these spaces […] whereas tactics can only use, manipulate, and divert these spaces. (p. 30). de Certeau argued that 'tactics' were the spatial practice used by those in marginalised positions, not necessarily holding the power to influence the overall shape of the space. He argued for more focus on these "practices, mixtures of rituals and makeshifts (bricolages), manipulations of spaces" (xvi) to understand the spatial practices of everyday life, which he argued often operated under the skin of power and discipline.

As a form of practice that happens within the bounds of a spatial organisation imposed from above, de Certeau therefore argued that: "The space of a tactic is the space of the other. Thus, it must play on and with a terrain imposed on it and organized by the law of a foreign power" (p. 37). The children who took part in this study can be understood as positioned as 'other' by the spatial strategies of school firstly by being children in an adult defined space, and secondly by being neurodivergent in a space designed for neurotypical adults and children.

In the analysis below we use this framework to explore the 'tactics' that children undertook to counter their spatial exclusion, the ways in which they found "cross-cuts, fragments, cracks and lucky hits in the […] system" (p. 38) which they could use to modify and transform the sensory geographies of school. In focusing on autistic children's tactics, we are not suggesting they have a distinct level of agency over their lives and experiences in a simplistic sense (i.e. they are neither entirely active nor passive). Instead, a more nuanced sense of context-dependent agency is developed - focused on the 'active' phase of learning to navigate new school environments following the move to secondary school, where these 'tactics' have had to be created and employed.

3. Sensory tactics: Navigating neurotypical school spaces

Participants primarily described the sensory experience of school as overwhelming and chaotic. Whilst identifying some spaces which could be seen as more reliable 'micro-spaces' (Ryan and Räisänen, 2008) or 'bolt holes' (Connor, 2000), primarily the library (see also Humphrey and Lewis, 2008), children described the mainstream spaces of the school as providing little sensory respite. Children described different navigational tactics to make sense of the chaotic school space, finding ways to mute, filter and transform the sensory geographies of the school.

3.1. Cacophonous space: Living with neurotypical design

Participants described the spaces of school as often being experienced as cacophonous, chaotic and invasive. Whilst 'cacophony' is a term usually used to describe sound, here we extend this meaning to include the full range of sensory experience, to describe incidents and spaces described by participants as overwhelming and confusing. Classrooms and the communal indoor areas, such as corridors and lunch

hall, were most often picked out as spaces which were experienced in this way. Firstly, the corridors were described as a seething horde of people:

Tobi: The hallways are the busiest, when everyone moves from one class to another. It feels a bit closed in because there's a lot of people in one area and all over the stairs. […] My own space is being invaded and I have like, this much left (Tobi makes a gesture where he pinches his thumb and forefinger together).

Rory: The worst is getting in at the beginning of the day from outside. I don't really mind it cos it's not loud, but you do get squashed by people. You kind of have to, erm, push your way through. And people behind you push and barge you when you don't want them to. Yeh. It don't really hurt but it's annoying when you get pushed in the back.

These two accounts describe moving through the school as an invasive, jostling experience. 'People' make up an overwhelming undifferentiated mass in both accounts; 'all over the stairs', and another obstacle to 'push through'. Perhaps unable to filter their experience (Davidson, 2010), both children use the language of violence to communicate a sense of vulnerability in the crowds.

Tobi's account conveys a heightened awareness of finite space, and his description alludes to an idea of space as being 'used up' by the other children: 'I have like, this much left'. Space is the resource required for movement, to deploy the 'tactics' that Tobi and Rory have developed as ways to manage the sensory demands of the school. Rory also experiences the busy spaces of the corridors as a battle to 'push through'.

In addition to being closed in or invasive, Molly describes the corridor as being a site of confusion:

Molly: Sometimes there are incidents, like one time there was this traffic jam like all these people packed together and I was just trying to get through. And someone was just screaming and I was like why are you screaming?

The impression from this account is of a feeling of being lost and stuck in a dehumanised mass ('traffic jam') whilst also being subject to concerning and unexplained noise ('screaming'). Molly does not seem to identify herself as belonging to the 'jam', instead referring to them as 'these people' she must move through. Her account conveys a feeling of helplessness, stuck in a clogged game of human Tetris, and subjected to disembodied, unexplained screams.

Classrooms were also mentioned by all participants as places which could be experienced as chaotic or overwhelming. Noise was the biggest factor here:

Tobi: people talking loudly and shouting in class. I just find it really uncomfortable.

Molly: maybe the people in my class … they start talking to me and I'm trying to work or if someone like, starts tryna … or sometimes if people, like, talk really loudly I'm just like okay … please can you just try and like, keep it down a bit. I'm tryna work here. It's just a bit … okay … yes … we get it it … please can you just shush please. It sometimes happens every now and again.

Molly's exasperation reveals how difficult it is to balance the demands of class work with the distraction of cacophonous space. Much like her reaction to the 'incident' in the corridors, she is at the mercy of events that 'happen' around her in a random and unsolicited way.

Rory compared the quality of noise in the classroom with that of outside:

Rory: Oh yeh, when there is a lot of shouting in my class … It's cos it's all in one space. I don't mind that kind of noise in the playground cos it's outside, it's diluted, there's a lot of space to take it away. But inside, all that shouting … The playground is the loudest but it don't feel that loud. It doesn't really matter. The loudest when I don't feel right is certain classrooms.

Interviewer: Why would you say it's easier when it's outside than in a classroom?

Rory: The sound can travel anywhere whereas inside the door is closed, the windows are closed, the sound is trapped, just travelling around the room. I don't know if it's me or not but it sounds a lot louder

inside then outside.

Interviewer: What is that experience like for you?

Rory: It causes pain. It really hurts my ears and then I just shout and get angry. I really don't like it. I get angry at the teacher just watching.

Rory alludes to the different spaces in the school and how they interact with the sounds from his classmates. He is aware that the distressing nature of the sound is partly down to his environment. Whether it can 'travel' or is trapped has an impact on its intensity. Sound is personified, characterised as a force that cannot escape when the room is noisy. It travels 'around the room', the circular motion reminiscent of a predator circling their prey. The 'trapped' sound heightens the awareness of the closed space, turning the classroom into a trap of its own. Unlike the 'diluted' effect of outside, noise is concentrated in an airtight room. The space becomes claustrophobic and uncomfortable, dominated by the sound.

By contrast, the playground is equally loud, but claustrophobia is not felt. The expanse of space serves to dilute the 'pain' caused to his ears. His discomfort in classrooms is expressed in the somatised terms of 'it causes pain' and 'all that shouting' - which is felt as an assault that 'really hurts my ears'. Sound, even when not negatively valanced, permeates Rory's experience of space, causing the school building to be coloured according to its auditory possibilities. Painful sounds have permeated the way Rory organises the school building, and it is structured in a way that is hyper-sensitive to the many components that influence noise.

This experience seems to cause some confusion as to what he is experiencing and why he is feeling this distress. He is aware that he 'don't feel right' in 'certain classrooms'. There is perhaps an awareness that he may be experiencing something differently to his classmates: 'I don't know if it's me', and this could also be reinforced by the difference in outward behaviour between himself and his classmates; Rory can be seen here to identify himself as the faulty link in the sensory chain. The cacophonous space of certain areas can be isolating; it opens up painful realisations of separateness from the neurotypical pupils in the school.

3.2. Sensory tactics: Filtering, muting and ordering spaces

Whilst the mainstream spaces of the school were often talked about as cacophonous, overwhelming and confusing, participants also described having 'bolt holes' or 'micro-spaces' (Ryan and Räisänen, 2008; Connor, 2000) in the school which provided a more comfortable or easily navigable environment. Davidson (2010) discusses how autistic people engage in strategies of 'muting' and 'filtering' spaces to better adhere to their sensory profile. In this section, we take forward these concepts to help describe the sensory 'tactics' (de Certeau, 1984) engaged in by children to manage their experience of school. In the analysis that follows, we see that participants are active agents in managing their experience of the neurotypical spaces of the school, through various imaginative, physical and social tactics. Agency is not considered here to be absolute - but rather to be one layer of activity undertaken by autistic children in a school environment with multiple restrictions on experience and activity (for autistic and non-autistic children).

3.3. Finding muted space: the library

Firstly, it was notable that all participants discussed spaces in the school which they tended to migrate towards when they had some choice over their location - namely at lunchtime. As also noted by Symes and Humphrey (2011), the library was cited as a space where participants felt more comfortable:

Omar: I like the library cos I get to chat with friends and play on the chrome book. I feel most at peace here, even though you can't eat food here, but there's bean bags on the floor and it is like a big sitting room totally separate from the rest of the school.

Interviewer: Ah okay. Why would you head to the library?

Tobi: In the library it is not too noisy. You can sit down and relax.

Here both Omar and Tobi talk about the library as a relaxing and peaceful space, in contrast to the chaotic and noisy descriptions of the corridors and classrooms. The separate, more contained and manageable nature of the space is highlighted, as well as the more relaxed furnishings and homelike decor. The 'quietness' of the space is related to libraries typically being quiet places, but also for Omar and Tobi due to the presence of soft furnishings, carpets and books acting to dampen the sound. Omar here discusses the library as a social space, where he can 'chat with friends', in a more conducive environment than an invasive corridor or clattering classroom. Molly also highlighted a social function of the library for her:

Molly: there's a year 8 kid I sometimes like to talk to. But he's … he's a bit sarcastic. But he just likes the library so much you just know where he is gonna be. You don't have to go all over the school to find him, and risk getting hit by a ball in the playground. But sometimes the library is locked, I mean full, and so there's nobody to play with.

There is ambiguity in this account of Molly's relationship with a "sarcastic" "Year 8 kid" (12-13 year old), whose main attraction appears to be his reliable location in the library, a safe zone in the school. The alternative is presented as having to search through the other, less reliable spaces of the school, including the possible threat of being hit by a ball in the playground. Although at first the library represents reliability and solace, the last line of the extract tells us that even this safe space cannot be relied upon. It is revealing that Molly associates the library being full of other children as tantamount to her being 'locked' out. If it is 'full' of other children, you might expect this would increase the options of classmates to play with. Instead, this safe space is cast as limited in its capacity to foster friendships, as you are either in the crowd experiencing the 'fullness' of the space, or staying outside, which means facing the potential violence of the playground. Reminiscent of Conor's 'bolt hole', there is a womb-like intimacy to the library that offers protection from the emotional wear and trials of the busy school day.

3.4. Filtering space: The playground

The playground emerged as an ambivalent space in the participants' accounts. Whilst being less intensely noisy, more 'diluted' than in the inside spaces, it was nevertheless sometimes described as holding the possibility for chaotic interactions:

Tobi: Although the playground is a good place it is also a place you cannot relax because there's a lot of people running around. Often they are chasing other people and shouting a lot.

Molly: once in the morning there was a basketball and it hit someone's bag. In their bag they had a glass bottle in there and it smashed. It made me really paranoid and so now when I see a basketball I just have to duck just in case. In the playground and sometimes in the corridors too I keep ducking if I hear a ball bounce.

Tobi and Molly describe different tactics for dealing with potential for cacophony or chaos in the playground space. Molly describes avoiding the playground if possible, spending her time in clubs away from the playground:

Molly: I go to Fun Club and Chapel Club … I like them because they are all indoors so we don't have to go out in the freezing cold … Usually they're in the lecture theatre which is just a big expanse of air.., but today we were in pod 2 which was amazing because it's all quiet and cosy in there. But you have to cross the playground to get there, and um, risk getting hit by a ball. So I run …

Molly here describes how her search for a quieter indoor space has driven her choice of activities at lunchtime. Similarly, to descriptions of the library above, she values the 'quiet and cosy' Pod 2 far more than the 'big expanse of air' of the lecture theatre. The more contained, dampened, muted space is again preferred. As a tactic to limit her exposure to the playground space and its potential danger she describes running through this space, making her engagement as light and quick as possible, to filter and minimise its effects.

Tobi, despite his reservations about the movement and shouting in the playground, named it as a favourite place:

Tobi: Um, my personal favourite place in the school … probably the playground, because it is where I play a lot of Champ and Champ is a fun game to me.

Champ, also known as Four Square, is a ball game played on four coloured squares, painted on the playground floor. Rather than avoiding the playground, as Molly has done, Tobi here describes finding a 'micro-space' (Ryan and Räisänen, 2008) - the four coloured squares of the Champ playing area, where he is safe and has a set purpose (playing the game). This game appears to ground him in the space meaning that he is able to tune out the other sounds and risks of the playground and feel happy here. He again filters the space as a tactic for managing it, but this time through grounding his focus in one area and activity, rather than speeding through.

3.5. Transforming space: Using metaphor and imagination

Finally, as well as physical strategies of finding muted, filtered or ordered space within the cacophonous school, Molly also described a way of thinking about the corridors which transformed her experience of them:

Molly: Umm, yeah it's kind of cool. If you are what I call the current, like, if you, like, it's a sea of people. And if you are part of it then that's really cool. But if you are like pushing in the other direction or opposite direction that could be a bit unnerving. Like you just have to dodge them and if you crash into them then it's like, well, game over.

Interviewer: What do you mean game over?

Molly: Like, have you played Mario?

Interviewer: Yes.

Molly: Have you played that mushroom guy? Like if it hits you then you just fall and die. It feels a bit like that. If you crash into someone like a prefect then it's like, double death.

Interviewer: Why prefect?

Molly: I don't know. Maybe because they have more power over the little peasant year 7s like me.

Molly here transforms the chaotic, undifferentiated experience of invasion in the corridors, described in the first theme, into an experience of connection with others. By thinking of herself as part of a 'current' she can experience the busy movement of the school as 'cool' rather than invasive. The anonymity of being part of a collective 'sea of people' offers protection and unites her to her classmates as they push forward together. She may also enjoy being 'in the current' in a more literal sense; she enjoys the uninhibited transition that is possible whilst moving with the crowd. On this reading, moving 'in the current' is a tactic, a reassuring way of dealing with problematic space.

The disaster of physical injury, however, increases in likelihood if you are not 'part of' the 'current'. The 'current' within this 'sea of people' seems to be positioned here as a destructive force, a faceless mass that 'crashes' like waves. This binary way of thinking is reminiscent of Molly's experience in the library - you are either 'part of it' or not.

Transforming the potential negative of 'crashing' into an older student into a game, with simple rules (and endless regenerations) can also be seen as a way of making sense of her navigation of the social hierarchy of the school. Her navigation of the school environment requires so much mental energy that she acutely understands the rules of the game. Knowing that bumping into another student will cause a severe emotional reaction, she tries to mitigate her own emotional responses. Unable to control the overwhelming experience moving around the corridors is simplified into the essential elements of a game. In the chaos, her autism has led her to impose rules that 'transform' the space, to help her manage her anxiety.

4. Conclusions

In this article we have explored how autistic children navigate neurotypical sensory geographies following a move to mainstream secondary school. The core spaces of the school – classrooms, corridors, lunch hall, and to a lesser extent, the playground – were often experienced as cacophonous and chaotic, and potentially overwhelming spaces for our participants. Understanding the sensory tactics that autistic children develop is key to gaining insight regarding how well autistic children adapt to mainstream secondary school - and therefore the likelihood of their successful education. The move from primary to secondary school requires children to develop different tactics for the new environment, understanding of which can assist the development of strategies used by local education authorities in the design and operation of mainstream secondary school spaces. Children in this study described various spatial 'tactics' (de Certeau, 1984) to mitigate and manage the cacophony of these core spaces, which we have characterised as sensory tactics of 'muting', 'filtering' and 'transforming' space. These included seeking smaller spaces with softer lighting, fewer people, and limited noise; creating 'micro spaces' (Ryan and Räisänen, 2008) through focussed activity; and using imagination to transform confusing crowds into something more ordered and understandable. de Certeau (1984) described tactics as "the space of the other" (p. 37), and we can see here that autistic children are spatially marginalised within the school, seeking more easily modifiable spaces on the edges of the mainstream environment. The neurotypical assumptions which underlie school design – manifested in fluorescent lighting, multiple hard surfaces, constant movement – place autistic children in a "terrain … organised by the law of a foreign power" (p. 37), in which they must find "cross-cuts, fragments, cracks and lucky hits" (p. 38) of sensory equilibrium.

Our findings focus on the strategies and tactics developed in navigating the school environment. These are potentially distinct from strategies employed in relation to identity - and the social and emotional impacts of having an autistic identity in school settings, e.g. bullying, negative peer relations (Sedgewick et al., 2019). The strategies and tactics in the current paper relate to sensorially navigating the school environment, not social relations - although we are not suggesting the two are fundamentally distinct. Indeed, our findings can broaden existing knowledge of social relations by providing significant insight regarding autistic children's sensorial navigation of school environments. Furthermore, we can draw some comparisons between social strategies identified such as 'camouflaging' and 'masking' in school settings, as an attempt to avoid stigmatisation or bullying (Kreiser and White, 2014; Cook et al., 2018). Whilst successful in the short term, such 'concealment' tactics have in turn been found to be an extra source of stress, being linked to higher levels of mental health problems (Lai et al., 2017; Hull et al., 2017). This further indicates that whilst autistic children may be able to find ways to cope in neurotypical environments - whether through sensory or social tactics - if the environment remains solidly neurotypical these can only be partial or temporary solutions. It is notable, for instance, that all of the tactics employed by our participants took them away from the main spaces of the school, and in most cases away from interaction with other pupils. Sensory exclusion thus potentially exacerbates existing social exclusion.

Our findings add to previous literature which has highlighted the sensory challenges of mainstream school spaces for autistic children (Ashburner et al., 2008). The spatial 'strategies' of schools - in terms of built environment and lines of movement around the school – need to include an understanding of the sensory experiences of ASD children. Indeed the 'tactics' used by children in this study to mitigate their experiences of sensory exclusion can provide a starting point for developing an inclusive spatial strategy for schools. All the tactics described above can be seen as ways to simplify and modify the experience of space. Proposals which echo these endogenous tactics include school designs which incorporate dimmer switches, to subdivide classrooms, and limit the range of materials used in the built environment (Humphrey, 2008). Managing sound was a consistent concern for the children, especially in mainstream school spaces, and somewhat countered in

smaller spaces or those with soft furnishings. Understanding of hyper-acuity (Khalfa et al., 2004) and auditory filtering (Teder-Salejarvi et al., 2005) can also help to orientate teachers to monitoring acoustic properties of classroom spaces. Our findings make clear that the priority for such adaptations needs to be the core spaces of the school – classrooms, corridors, and lunch areas. The 'tactics' employed by our participants could have only limited impact in such places, highlighting the marginalisation of autistic children from the mainstream spaces of the school. This observation is in line with wider moves to shift focus from a deficit model of autistic people to a broader understanding of how neurotypical environments can impede and limit neurodivergent children and adults (Legault et al., 2019), and relates to long-standing issues and questions relating to inclusive education more broadly. While considerable progress has been made in terms of understanding a range of different needs, our findings demonstrate that in relation to autism, and neurodiversity more broadly, understanding remains lacking, which it is vital to address if more neurodiverse-friendly school environments are to be designed and developed in the future. This is particularly important, given a context in which the whole notion of inclusion in education remains subject to considerable debate as to whether current (and recent) policies are delivering more inclusive school environments (Williams-Brown and Hodkinson, 2020).

Returning to Rodaway's (1994) statement that sees: "the senses both as a relationship to a world and the senses as in themselves a kind of structuring of space and defining of place" (p.4), we can see here that school space is structured fundamentally differently for autistic children to their peers. As senses are subjective and internal, this is additionally an invisible difference, only made visible through behaviour which attempts to mitigate or limit sensory experience, which can include repetitive behaviours or aggression (Hilton et al., 2010). We would therefore argue that mainstream school environments often consist of sensory exclusion, further disadvantaging autistic children. Whilst most of the literature on school inclusion for autistic children has focussed on social relationships (e.g. Symes & Humphrey, 2011) sensory exclusion is another important dimension to consider. Without a baseline level of sensory ease, children will find it difficult to engage in either social or learning activities. Our analysis also adds to sensory geography literature by providing specific empirical insight of the experience of autistic children in a mainstream secondary school setting. In doing so, it emphasises how important sensory tactics are to autistic children's experience of school environments, expanding existing research on geographies of neurodiversity. This is valuable for other areas of difference and diversity in which mainstream spaces can be challenging, such as mental health.

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