**Autism and engagement with material culture**

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# Autism and engagement with material culture

# Abstract

Autism spectrum conditions are widely characterised as a cognitive difference which affects social understanding and behaviour. However, evidence increasingly suggests that the condition also affects engagement with material aspects of the environment. Here we review research into how autism affects engagement with the material world. We argue that, whilst there are important distinctions, autism affects perception of the social and material world in similar ways. Furthermore, a subtly different engagement with the material world can bring certain advantages and social contributions. We discuss implications for future research and for inclusion.

## Keywords: Autism Spectrum Conditions, Material Culture, Art, Buildings, Personal Possessions

# Introduction

It is estimated that 1.035% of the population has an Autism Spectrum Condition (ASC) [(MacKay et al. 2017)](https://paperpile.com/c/5troH5/H1d4+l0vj+R03z+LEyZ+vq60+azvq+UfHK). However, prevalence estimates for ASC vary widely (between 0.08% and 9.3%) across the world (Chairotti &Venerosi 2020) due to differences in diagnostic and reporting systems. There is growing evidence that there are fundamental differences in brain architecture and connectivity compared with neuro-typically developing people [(Hull et al. 2016; O’Reilly, Lewis and Elsabbagh 2017)](https://paperpile.com/c/5troH5/53Px+63RW). This creates differences in how people with ASC experience and engage with the world. The medical literature focuses much of its attention on the differences that people with ASC have in making accurate guesses about how other people think or feel (theory of mind – the social implications of autism) [(Baron-Cohen et al. 1997; Baron-Cohen, Leslie and Frith 1985; Leslie and Frith 1988; Ochs and Solomon, 2010; Oberman and Ramachandran, 2008)](https://paperpile.com/c/5troH5/4WlR+ZnIr+Gmh9+3Xva). It is widely recognised that autism makes social communication and interaction challenging (American Psychiatric Association (APA), 2013) for example creating difficulties in conversational interaction [(Paul et al. 2009](https://paperpile.com/c/5troH5/xZ0M); Ochs and Solomon [2010)](https://paperpile.com/c/5troH5/Gmh9/?noauthor=1) and can lead to higher rates of anxiety particularly in common social settings [(Attwood, 2000; Bellini, 2004; Boulter et al. 2014; White et al. 2009)](https://paperpile.com/c/5troH5/YhXd+7UrR+zTji+D83E). Surprisingly, little attention is paid to differences in the way people with ASC interact with the material world.

Research on the effects of ASC on engagement with the material world to date has largely been limited to childhood play. The American Psychiatric Association diagnostic criteria (2013), mentions differences in the way the use of objects. For example, the stereotyped use of toys such as lining them up and preoccupation with unusual objects or fascination with the sensory aspects of objects (e.g. their smell) (APA 2013; Kim and Lord 2010; Lord, Rutter and Le Couter 1994). The World Health Organisation (1993) system mentions that a person with autism may have preoccupations with the non-functional (usually sensory) aspects of play materials, and abnormalities in functional or symbolic play. There is however limited mention of how people with ASC engage with the material world more generally or in adulthood. The majority of the content of these diagnostic systems focuses on social ‘deficits’ and some aspects of repetitive behaviours; and not on relationships with objects, landscapes or buildings.

In fact, there is a wider literature, which when considered together, sheds a light on the interactions a person with ASC has with the material world that goes beyond the deficits and preoccupations described in the diagnostic systems (WHO, 1993; APA, 2013). An understanding of how ASC involves a focus on details in the physical environment may have come about as a side-effect of research on perceptual attention. Relatively early research revealed a preoccupation with the detail in objects or patterns in the environment (WHO 1993; APA 2013; Happé and Frith 2006). Individuals with ASC may often be interested in discerning detail in their environment (Baron-Cohen 2009; Smith and Milne 2009; Brosnan et al. 2014; Shah and Frith 1983, 1993; [Pierce et al. 2011; Sasson and Touchstone 2014; Swettenham et al. 1998; Wakabayashi et al. 2007; Vermeulen 2015)](https://paperpile.com/c/5troH5/n7hm+FTeA+GsGD). Following on from these insights, it is clear that individuals with ASC can also be very interested in or preoccupied with objects (Lord, Rutter and Le Couter [1994; Kim and Lord 2010)](https://paperpile.com/c/5troH5/YLDc). As adults they may use material culture or technology to communicate mathematical or scientific concepts (Ochs and Solomon 2010; Grinker 2010). Individuals with ASC may also derive comfort from the consistency and predictability of particular objects and object types (Forrester-Jones and Broadhurst, 2007). Some infants with autism have been reported to prefer to relate to objects rather than people (Swettenham et al. 1998) and this may be more likely if they are very interested or preoccupied with that object type (Sasson and Touchstone 2014). Nonetheless a characterisation of individuals with ASC being *more focused on things than people* is an oversimplification.

Far from being a deficit, a perceptual focus on detail can sometimes be an advantage. Previous research has shown that students with higher ASC scores are able to identify detail more quickly than neuro-typically developing individuals in embedded figures and have some strong three-dimensional technological design skills (block design) (Shah and Frith 1983). Baron-Cohen and colleagues (2009) examining cognition suggest that many people with ASC are good at paying attention to detail and have an ability to understand complex patterns. Some studies suggest that many individuals with ASC have special skills (Howlin et al. 2009; Meilleur, Jelenic and Mottron 2015) that may include ability to pick out detail in the environment (Happé and Vital 2009; Smith and Milne 2009) and other visuospatial skills such as painting (Howlin et al. 2009; Treffert 2009).

What has been lacking to date is a focus on how individuals with ASC relate to the physical world around them. Differences in material engagement may be as significant as are differences in social engagement. Furthermore, the similarities and differences between these two spheres of engagement, and the implications for our understanding of ASC and for inclusion more widely, remain to be understood.

We have sought to explore material culture in ASC by conducting three experiments and present these alongside other studies drawn from different domains of life. The first relates to people’s engagement with and interest in art, the second to their engagement with buildings in their community or environment, the third to their engagement with personal possessions.

## Art

Art is a complex area to define. At a simple level it can be described as ‘the expression or application of human creative skill and imagination, typically in a visual form such as painting or sculpture, producing works to be appreciated primarily for their beauty or emotional power’ (Oxford University Press 2020).

Many studies attempt to evaluate the efficacy of using art as a therapy or intervention with people on the ASC spectrum (Schweizer, Knorth and Spreen 2014), focusing on improving social ‘deficits’ associated with people who have ASCs. However, few studies have examined how people with ASCs perceive and experience art in terms of enjoyment and culture in the same way as art is experienced among neuro-typical populations. One exception, research by Jordan and Caldwell-Harris (2012), found no significant differences in the proportion of people with ASCs, compared with neuro-typical people, who have an interest in art, when examining responses on an online discussion forum.

Differences in theory of mind capacities may influence how people with ASC interact with or experience and understand art. Theory of mind involves understanding and reflecting on the content of both our own and others’ minds (Baron-Cohen 2000b). This incorporates understanding of how actions may be influenced by imagination, beliefs, desires and emotions and appreciating that other people’s perspectives and mental processes can differ from our own, (Baron-Cohen 2000b; Baron-Cohen 1990). Keskin (2009) suggests that theory of mind plays an important role in the understanding of art, particularly where symbolism is used. There is a suggestion that symbolism and theory of mind are strongly related and can impact on one another (Lillard and Kavanaugh 2014; McAlister and Cornwell 2010) because there may be a requirement to understand other people’s perspectives as well as an understanding of the differences between mental representations and the reality that they represent (Lillard and Kavanaugh 2014). Differences have been found in the symbolic understanding of people with ASC in areas such as play (Baron-Cohen 1987) and communication (Allen and Lewis 2015). However, further research is needed to improve our understanding of how theory of mind and symbolic understanding affects people with ASC relationships with art, especially since art is a personal experience that at its most basic level is immediate and has no requirement to understand the mind of another. Despite differences in creative expression between ASC and neuro-typical populations, many people with ASC show significant creative skills (Roth 2020). More research is needed to further understand the relationship between ASC and creativity.

### ASCs and artistic talent.

Some older research describes individuals with ASC as having ‘impoverished creativity’ and ‘imagination deficits’ (Craig and Baron-Cohen 1999). However, more recent studies suggest that people with ASC are ‘differently’ creative relying on different skills and attributes from which their creativity emerges (Roth 2020). There are many talented professional and amateur artists with ASC who show exceptional technical and creative skills (Buck, Kardeman and Goldstein 1985). Case studies of people with ASC who have exceptional artistic talent have found that their art can be very detailed and that these artists are often skilled in perspective, proportion and foreshortening (Pring 2005). Many individuals with ASC have special isolated skills (SIS) (Meilleur, Jelenic and Mottron 2015), often in the modalities of music, art and mathematics (Miller 1999). Meilleur, Jelenic and Mottron (2015) found the prevalence of SIS to be 62.5% among a large group of individuals with ASC in Canada. These skills were more commonly found in individuals with greater intelligence. Bennett and Heaton (2012) found a slightly smaller but still significant proportion of people with ASC to have SIS (42%) in a UK study; of those with a special skill 23% were specifically skilled in art.

Many theories have been put forward for why these differences in creative expression come about have been put forward. For example, some researchers have suggested weak central coherence as an explanation for the fine attention to detail seen in some individuals with ASC (Pring, Hermelin and Heavey 1995; Ryder, Pring and Hermelin 2002). Although this may create a ‘deficit’ as perceived by some observers or in some situations, this difference in processing may in fact be advantageous in others, for example skills such as in block design and embedded figure tasks (Ryder, Pring and Hermelin 2002; Shah and Frith 1993) that may be more relevant for artistic detailing and engineering creativity.

Temple Grandin (2006), an academic who is on the autism spectrum herself, highlights the different ways that people with ASC may think. She describes her own thinking style as that of a ‘visual thinker’ and demonstrates how this allows her to visualise concepts and excel in subjects such as art. Other types of cognition styles of people with ASC are described as ‘pattern thinkers’ and ‘word specialists’. All of these categories are examples of systemic thinking; this kind of very logical cognitive processing is commonly found among those with ASC (Baron-Cohen et al., 2009) and may explain the increased attention to detail and talent displayed by some individuals with ASC.

### ASCs and prehistoric art.

Many commonalities exist between features seen in art produced by people with ASC and that of European Upper Palaeolithic art (Humphrey 1998; Kellman 1998; Spikins, Scott and Wright 2018). These include a focus on components rather than the full image, superimposition, high attention to detail, perspective and foreshortening (Humphrey 1998; Kellman 1998). This suggests that people with ASC, or with autistic traits, may have been present in Upper Palaeolithic society (Spikins, Scott and Wright 2018). It is possible that talented individuals with SISs in art may have influenced other artists during this period (Spikins and Wright 2016).

Some researchers, such as Pickard, Pickard and Bonsall (2011) and Bednarik (2016), argue that people with ASCs would not have been tolerated in prehistoric societies and even if they were present would not have been able to express such talent without modern medical and educational support. However, this argument focuses on the deficits associated with ASC and fails to acknowledge some of the important benefits that individuals with ASC may have brought to prehistoric societies. For example, improved concentration, superior pattern recognition, and enhanced memory skills could all be extremely beneficial to hunter-gatherers (Spikins and Wright 2016). Some authors have noted that some genes associated with ASC predate the human species and can be found in closely related primates (Marques-Bonet and Eichler 2009; Mozzi et al. 2017). There is also proposed evidence of positive natural selection towards the genetics associated with ASC without intellectual disability (Polimanti and Gelernter 2017; Warrier et al. 2016).

### Decoding images on prehistoric artefacts (Spikins and Wright 2016).

We carried out an online survey of 1062 participants, of which 339 fit within the Autism-Spectrum (AQ) quotient typical of ASC (Baron-Cohen et al. 2001). The AQ is a self-assessment screening tool which measures the extent to which an individual shows autistic traits. Scores in the range of 0-50 can be achieved, with a score of over 32 being suggestive of autistic traits; 80% of adults with ASC score over 32 on this measure compared with 2% of neurotypical individuals (Baron-Cohen et al., 2001). Since the AQ test is non-diagnostic these participants were classified as having an above average amount of traits on the autism spectrum (AU) with the remainder considered neuro-typical (NT). Participants were students at the University of York, the general population (responding to a press release) and from approaches to ASC support groups and the Autism Research Centre. Results were published via an open access e-book ‘The Prehistory of Autism’ (Rounded Globe) (see Spikins, Wright and Hodgson 2016) and media engagement. Participants were firstly asked several questions regarding their hobbies and previous experience of art and Palaeolithic art. They were then presented with several pictures of embedded (hidden) images in Palaeolithic artwork and asked to identify what they saw in the image. Two blank control images were also shown in the study.

There was an association between autistic traits and an independent interest in art. AU participants were found to be more likely to have experience of art outside of the classroom (HR=31.79% N=302, LR=20.26% N=617, chi squared P < 0.01). Using analysis of variance (ANOVA) those with high experience of art were found to have a higher average AQ (f=13.5, p=<0.001). Visual attention to detail was found to be an important element of this relationship. Experience of art (i.e. engagement with art objects or artistic depictions) was associated with a high visual attention to detail score (a visual attention to detail score greater than 8), with a third of those with a high experience of art (N=221) also showing high visual attention to detail, whereas only 21.32% of those with a limited experience of art (N=699) showed high visual attention to detail (chi squared p<0.001). In addition to this, using ANOVA, it was found that those with high experience of art had a higher mean attention to detail score (f=7.36, p<0.01). Individuals with autistic traits and a high attention to detail seem both more inspired to independently create their own art and showed a greater interest and involvement in art in general.

## The Built Environment

### Interaction with the built environment.

People with ASC may interact with their built environment differently from neuro-typical people. Differences in spatial navigation of urban environments (both real and using virtual reality software) have been found between children with and without ASC (Fornasari et al. 2013; Kawa and Pisula 2010; Pierce and Courchesne 2001). Specifically, children with ASC explore their environment less in free exploration tasks. This difference appears to be greater in environments with high levels of visual stimuli (Fornasari et al. 2013; Kawa and Pisula 2010). Interestingly, Fornasari and colleagues (2013) found that differences in spatial navigation between children with and without ASC disappeared when the children were given a goal-based task, such as a treasure hunt, suggesting that motivational factors may also have an impact on attention control and spatial navigation in this group.

Some research has found that people with ASC see buildings and physical space as reliable and certain, and feel more comfortable in them than with other people who can be unpredictable (Baumers and Heylighen 2010). Despite seeking comfort in such reliable spaces, the purpose of some features of buildings may be less obvious to people with ASC than to neuro-typical people. Some people with ASC may not understand or feel comfortable in using a room for multiple uses, so that unfamiliar buildings or buildings used in unfamiliar ways can be a source of discomfort (Baumers and Heylighen 2010).

Research also shows that some people are more likely than others to read and objectively analyze visual characteristics in the older built environment (e.g. Wells and Baldwin 2017), while the complexity of the older built environment appears to correlate with emotional attachment to places (Wells 2017). This relationship bears interesting comparison with our observations on the emotional attachment to objects amongst ASC individuals. Perceptions of complexity may in turn bear some relationship to the positive values attributed to objects displaying decay and patina by people who work within conservation (after Wells 2020).

The research/evidence-based design movements in architecture have long advocated a more person- and human-centric perspective on architectural design (e.g. Demsky and Mack 2008; Rapoport 2008; Gifford 2014) and, within this context, many adaptations for making buildings ‘autism-friendly’ have been proposed (Chan 2018; Davidson 2010; Kinnaer, Baumers and Heylighen 2014, 2016; Mostafa 2008, 2020; Sanchez et al., 2011). These largely focus on sensory adaptations for people with ASC (Davidson, 2010; Mostafa, 2008, 2020; Sanchez, Vázquez and Serrano 2011). Reduced sensory stimulation is advised in visual (e.g. subdued colours, indirect lighting, minimal objects), auditory (e.g. soundproofing), olfactory (e.g. minimal use of air fresheners and scented cleaning products) and tactile areas. Mostafa (2008) found that reduced auditory stimulation, through soundproofing; and spatial sequencing and compartmentalisation of building space, both improved attention span, response time and behavioural temperament in a group of children with ASC.

Researchers have also attempted to capture the experiences of adults with ASC through qualitative interviews and studying their autobiographies (Chan 2018; Kinnaer, Baumers and Heylighen 2014, 2016). They have found that many people with ASC prefer to live in quiet neighbourhoods with reduced human and vehicle traffic, that they tend to prefer buildings with fewer objects/clutter and that open storage furniture with clear labels are easier to navigate and organise their belongings in. However, it is also clear from this research that there is no ‘one size fits all’ design approach for people with ASC, and as in the neuro-typical population, variation in design preferences exist. For example, some individuals prefer large, open plan spaces which allow for predictability by seeing everything that is going on, whereas others find this overwhelming and prefer small, structured areas (Kinnaer, Baumers and Heylighen 2016). Similarly, some individuals with ASC may manage tactile overstimulation by having a bath which fully immerses them in still water, whereas others may prefer a light shower (Kinnaer, Baumers and Heylighen 2014).

Chan (2018) suggests that ‘neuro-divergent’ neighbourhoods, designed to meet the needs of both neuro-typical people and those with ASC, could allow both groups to benefit from each other’s strengths and skills. Naturally, some design features are universally appreciated; people with ASC as well as those who were neuro-typical also valued green open spaces for example (Chan 2018; Wang et al. 2019).

### Values placed on buildings (Schofield et al. 2019).

In one of our studies (Schofield et al. 2019) we found that perception of the built environments and values that people who are above the AQ threshold (described above) have for their built environment are different from neuro-typical people. A survey of 760 people (of whom 634 completed the AQ), was carried out after recruiting through University networks, the Autism Research Centre (Cambridge) and a range of Autism and Asperger groups.

Information about individual characteristics and relationships and experiences with buildings in their local environment were gathered from survey participants. They were asked questions about buildings of importance to them, their favourite buildings as children and the particular features of buildings which were significant to them. Participants were also asked to look at different types of building and types of city (from aerial photographs) and choose where they think they might be the most comfortable living.

Of the 634 participants who completed the AQ test, 42.9% (272) scored above the validated cut off of 32 indicative of probable ASC and 57.1% (362) were in the neuro-typical range.

The results showed some subtle but important statistical differences. Individuals with ASC were more likely to be interested in the structure and construction of buildings. They also tended to rank communal aspects of buildings as being of lesser importance than did those who were neuro-typical, and the social function of buildings was seen as less important to the overall value by this group. The motivations for paying attention to buildings were also distinctive. Individuals with ASC placed a higher value on the evidential features of the building, that is, the information that can be gleaned from their study, suggesting that buildings were valued as a source of knowledge or historical interest, rather than social connection (p < 0.01). Furthermore, subtle differences appeared from childhood - individuals whose childhood favourite building was valued for aesthetic or functional reasons were much more likely to have a higher average ASC quotient than those who selected historical or personal social significance (p< 0.01).

Clear differences were recorded between those scoring above the ASC threshold, and those in the neurotypical (NT) range, in the way they engage with the built environment with less personal or social reasons and more reasons related to the construction of the buildings themselves and architectural and historical elements within the ASC group.

## Objects/ Personal possessions

### Object Preferences

Interaction with objects has been investigated widely among children with ASC; although research including adults is less common. There is evidence that children with ASC are more likely to pay attention to concrete features of objects, as opposed to abstract features than neuro-typical children. Ropar and Peebles (2007) asked children with and without an ASC to sort a set of 24 books into 2 categories. The two groups of children were matched by verbal mental age (VMA) rather than chronological age, as children with a lower VMA have been shown to be more likely to use visual features when sorting objects (Ropar & Mitchell, 2001). Children with a VMA of less than 5 years were also excluded for this reason. Children with ASC were significantly more likely than neuro-typical children to sort the books by concrete features such as size or colour, rather than abstract features such as category membership. People with ASC engage with and process their sensory environment differently from neuro-typically developing people across the age range (Crane, Goddard and Pring 2009; DeBoth and Reynolds 2017; O’Neill and Jones 1997) and this example shows that these concrete features were more salient than they were to the neuro-typical children. The researchers asked the children with ASC who had sorted the books according to concrete features to repeat the task with books that were all the same size and colour; this time half sorted the books by abstract features. All children with ASC were able to sort the books by category membership when specifically asked to do so, demonstrating that people with ASC are able to sort in this way but may generally prefer to sort using concrete features.

These differences between the sorting preferences of people with and without ASC, raise questions as to how this may impact the day to day life of people with ASC living in majority neuro-typical societies. Many objects are organised according to category membership, rather than size, shape or colour; for example, books in a library and film titles on a streaming service. This may create a barrier for people with ASC if objects and multimedia are not organised in a way that is logical to them. Further research is needed to see if this difference is also present in adults with ASC and those with and without intellectual disability.

Differences in play object preferences have been found between children with and without ASC (Dominguez, Ziviani and Rodger 2006). In one study, children with an ASC were significantly less likely to play with construction, doll and house toys and significantly more likely to play with plastic animal toys, gross motor, infant, dress up, action figure, dressing up or specific theme toys (e.g. Thomas the Tank Engine) than neuro-typical children (Dominguez, Ziviani and Rodger 2006). The children with ASC may have been drawn to the infant toys as these tend to have sensory features, however the children with ASC in the study had a significantly lower mean developmental age compared to the children without which could also explain this difference. The authors suggest that the increased interest in Thomas the Tank Engine toys could be the result of children with ASC being more influenced by popular media than neuro-typical children due to spending more time watching TV and videos rather than playing with others (Dominguez, Ziviani and Rodger 2006). However, this contradicts evidence that children with ASC are less influenced by trends and social pressure (Yafai, Verrier and Reidy 2014). The National Autistic Society (2002) have found that Thomas the Tank Engine is one of the most appealing characters to children with ASC, with 57% of children with ASC associating with Thomas before any other character. There are a number of reasons that Thomas may be particularly attractive to children with ASC (National Autistic Society 2002). Firstly, storylines in Thomas the Tank Engine episodes are usually predictable and clearly explained. Characters also have clear facial expressions that change infrequently and are also often accompanied with an explanation of the corresponding emotion e.g. ‘Thomas is sad.’ In addition, the background scenery in episodes is kept stable which allows children with ASC to focus on the actions of characters and not be distracted by secondary details. A liking for engineering topics and trains has also been noted in people with ASC. Another factor relates to less interest of young people with ASC compared to neuro-typically developing counterparts for socially related topics such as ‘celebrities’ (Cho et al. 2017).

### Attachment to Objects

Many children and infants have an attachment to a comfort toy or blanket (Mahalaski 1983; Passman 1987). It is thought that these objects provide a proxy for their attachment figure, improve feelings of security and help children with their emotional regulation (Passman 1987; Passman and Weisber 1975). Object use appears to increase when infants spend more time away from their primary caregiver in care settings (Fortuna et al. 2014). Given that many species have no such mechanism, it is a question of interest as to how and when objects became important in this way. Kalpidou (2012) found that attachment to a comfort toy or object is related to tactile processing, with those who have a higher tactile threshold and who seek out more tactile stimulation being more likely to have such an object. This could suggest a biological mechanism that contributed to evolution selecting for this mechanism.

Many individuals with ASC report differences in sensitivity to touch (in both directions) (Güçlü et al. 2007). Researchers have found both under and over responsiveness to tactile stimulation (Mikkelsen et al. 2018). Some research has found increased sensitivity to only certain types of tactile stimulation (Cascio et al. 2008). The mechanisms underlying these differences are not fully clear (Mikkelsen et al. 2018) and there have been some suggestions that differences in tactile sensitivity may be emotional rather than perceptual in origin (Güçlü et al. 2007). Further research is needed to establish how tactile hypo and hyper-sensitivity impact on people with ASCs’ relationships with and attachments to objects. Despite anecdotal reports of attachment to comfort objects continuing throughout adulthood for some individuals with ASC (BBC, 2016), little empirical research has been conducted in this area. A further survey, explored in more detail below, supported this anecdotal evidence showing that participants with an AQ indicative of ASC were more likely to still use their favourite childhood object if it was still within their possession (Spikins, Wright and Scott 2018).

### Special Interests

Diagnostic criteria for ASC describe ‘highly fixated, restricted interests’, for example a ‘strong attachment to or preoccupation with unusual objects’ (APA, 2013). Jordan and Caldwell-Harris (2012) investigated differences in special interests, more commonly referred to as hobbies in neuro-typical people, between adults with and without ASCs. They found that people with ASC did have more specific interests than neuro-typical people but, contrary to some author’s assertions, they found that they also had a wider range of interests.

Research specifically into special interests relating to the material world is more limited; however, Jordan and Caldwell-Harris (2012) found that people with ASC were more likely to have an interest in mechanical systems and vehicles than neuro-typical people. Other research has also found people with ASC to have greater interests in item attachment as well as collecting, sorting, categorising and organising objects (Caldwell-Harris and Jordan 2014). However, there is no one specific type of object or personal possession that is exclusively favoured by people with ASC and not those without. Behaviours suggesting a strong interest in a specific object or object type, such as collecting, showing and researching, can be seen amongst individuals in both groups. It may therefore be more useful to investigate why individuals value specific items and differences between groups related to this. For example, Hartley, Fisher and Fletcher (2020) found that typically developing children placed greater value on objects previously owned by celebrities, whereas children with ASC were more likely to value objects based on their materials and rarity. Self-ownership also has less of an impact on the value placed on an object by children with ASC than for children without (Hartley and Fisher 2018).

### Preferences in valued personal possessions (Spikins, Wright and Scott 2018)

In another study from the group, 500 participants completed the material objects beliefs and engagement (MOBE) questionnaire (published in Spikins, Wright and Scott 2018) considering 13 questions about how people engage with objects and the significance they place on particular possessions.

The study demonstrates statistically significant differences in the values and significance attached to personal possessions between people who scored above 32 on the AQ indicative of probable ASC (AU) (as described above) and those who were in the neuro-typical range (NT). Individuals with AU were found to be more likely to be interested in the practical or functional aspects of objects than neuro-typical people who were more likely to be interested in the sentimental or interpersonal values of a personal object. Furthermore, these differences also translated into the personal significance attached to their possessions. When asked what object they would choose to take out if they were limited to removing one object in a house fire when they needed to evacuate a property quickly, 60% of people in the AU group chose a practical or functional reason for taking an object compared to 40% of neuro-typical people, whereas this proportion was reversed for the sentimental value of an object or an object that reminded them of a close personal relationship (p= 0.008). Likewise, when asked about choosing an object to take to a desert island, the proportion choosing a practical object compared to a sentimental object in neuro-typical people was 25:75%, whereas for people in the AU group this was approximately 50:50% (P = 0.041). Typical contrasts between the items chosen to take with them were between more functional objects, such as files of information or computers (AU group), and more sentimental objects, such as photograph albums, teddy bears or irreplaceable mementoes such as family heirlooms or jewellery (neuro-typical group). One AU participant would rescue from a fire a file labelled ‘Take this in case of fire’ containing important documents, whilst NT participants would save their ‘family archive of photographs and letters - this includes my Grandad’s autobiography and letters he wrote to my Grandma during the war.'

# Discussion

The research brought together and explored in this paper, suggests that far from having large ‘deficits’ in engagement with the material world, people on the autism spectrum engage differently and often with perspectives that bring value compared to those perspectives of neuro-typical people.

Across these very different domains of engagement with the material world several patterns emerge, leaving others yet to be researched (see table 1). A similar focus on fine details and functionality unites the value and significance which individuals with ASC (in contrast to those who are neuro-typical) tend to attach to both personal possessions and their built environment for example. Similarly, we see a preference for a predictable engagement with the material world – through artistic depiction, returning to familiar clearly structured buildings, or using and ordering information in files or computers, and less attention to reminders of relationships, mementos or nostalgia for past social events. These different preferences also emerge in infancy and seem fundamental to the condition rather than the result of any cultural conditioning.

Table 1. Summary

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Domain | Interest in this element of the material world or specific elements affected by ASC | Attention to this element of the material world or specific elements affected by ASC | Value attached to this domain in general or specific elements affected by ASC | Documented differences in infancy or childhood | Value attached to fine details | Specific skills related to this element of the material world seen in some individuals with ASC. |
| Art | x | x | x | x | x | x |
| Built environment | x | x | x | x | x | ? |
| Personal possessions | x | x | x | x | ? | x |

These similarities show interesting parallels with patterns documented in how individuals with ASC show different engagement with the social world. For example, much as personal possessions and favourite buildings are selected and valued for their functional use and information potential, conversations tend to be preferred which are focused on knowledge and facts rather than on social relationships. Likewise, a similar drive for predictability and regularity is also seen in engagements with buildings as with social interactions. There are also interesting differences. The details of objects, building and art are seen as important, and yet the details of people are rarely highlighted as of significance in who becomes a particular friend (rather more similar interests etc.)

What explains these patterns? Whilst our research reveals some insights, the answer is far from clear-cut. Preferences for certain characteristics of the material world may reflect the ‘deficit’ model so prevalent in the diagnostic literature of ASC (Wright, Spikins and Pearson 2020). However, we believe alternative hypotheses deserve consideration and research. The material world preferences seen in ASC may arise through differences in aspects of brain functioning such as differences in sensory processing between people with ASC and those who are neuro-typically developing (Marco et al. 2011; Kern et al. 2006). Or more interestingly could represent fundamental differences in brain architecture and connectivity (Di Martino et al. 2014) driven by evolution (Wright, Spikins and Pearson 2020).

Further research might also further define an ASC worldview that might encompass not only the physical world but also the natural world as well as the often-quoted difference in social relationships with people. In their relationships with animals for example, individuals with ASC appear to prefer predictable and structured understandable patterns and focus on details (for example birds and their birdsong (Murray, Lesser and Lawson 2005)), and may feel more comfortable in engaging with the animals around them than with people (Prince 2010). As we expand our understanding of ASC as a way of living in the world, rather than simply a social deficit, we would expect to learn more about ASC as a worldview, with consistencies across these different realms of experiences as well as unique elements.

## Implications

We know that loss of meaningful objects (Phenice and Griffore 2013) or loss of important habitats (Angus et al. 2005; Sury, Burns and Brodaty 2013) can have negative consequences for individuals. Coward and Gamble (2008) made a challenge for researchers ‘to investigate the cognitive mechanisms behind human engagement with material culture’. Research suggests a range of benefits to mental health service users or those undergoing neurological rehabilitation when handling for example and discussing museum artefacts (Ander et al. 2013). They include emotional benefits, such as developing a sense of belonging, sensory/aesthetic benefits, and benefits to identity formation.

However, the paucity of research into the material engagement with the world with people who have neurodevelopmental differences is stark. This needs to be addressed by researchers, academic institutions and research funders. There are differences in the language used by different disciplines to discuss material culture, which can create problems in gathering and discussing research in related fields (Buse, Martin and Nettleton 2018). We need to better understand the experiences and values that people derive from familiar places (Jones 2017) and objects (Hartley, Fisher and Fletcher 2020; Wallendorf and Arnould 1988). We know it is important for numerous sections of society including homeless people (Kiddey 2017), young musicians in socially deprived areas (Lashua et al, 2009) and refugee communities [(Hamilakis 2018; Holtorf, Pantazatos and Scarre 2018)](https://paperpile.com/c/5troH5/vdgQ+K3dj). This paper proposes that it is also of importance for those with ASC.

There is now a large literature on community-led design and the benefits of art for the public. There may be some careful thought and planning required to balance the needs different sections of the community, for example potential tensions between those who value of prioritise social aspects of engagement with those who are more interested in patterns, detail or visual aspects of the environment. In some countries there is an increased focus on involving the public in museum programming and built heritage conservation. Careful consideration should be given to how we support those who are drawn to these careers because of their skills in visual/pattern analysis but who may be less interested in the social aspects of this work. Further research could usefully explore how to integrate these different perspectives and needs to enable an inclusive and integrated approach.

## Inclusivity

There has been some promising research on inclusivity in public buildings [(Kennedy 2006](https://paperpile.com/c/5troH5/iZfN); [Varner 2015)](https://paperpile.com/c/5troH5/J0w9) by for example, considering the sensory environment (Vogul 2008; Sánchez, Vázquez and Serrano 2011) or the predictability or aesthetics of the layout (Beaver 2011; Kanakri 2017; Scott 2009). Design decisions can be based on the sensory and other needs or insights including users with ASC [(Mostafa 2008)](https://paperpile.com/c/5troH5/SdW7). Social and communication needs also need to be considered [(Sánchez, Vázquez and Serrano 2011)](https://paperpile.com/c/5troH5/Wvqk). The classroom environment is important for the learning of children with ASC [(Scott 2009)](https://paperpile.com/c/5troH5/7xRr), although there is limited high quality research in this field [(Martin 2016)](https://paperpile.com/c/5troH5/veFw). More research is needed, to further our understanding of how buildings can be made inclusive; most research focuses on public buildings rather than homes and predominantly focuses on sensory adaptations. Greater inclusion of people with ASC’s own opinions and experiences in future research may help to broaden our understanding of building inclusivity.

As community art projects, museum exhibitions and heritage conservation become more accessible to the wider population, consideration needs to be made as to how people with ASCs fit into this. As previously described, many individuals with ASC are gifted in areas such as art and building design; how might their participation in these areas be affected by increasing levels of social interaction being developed into these roles? Similarly, it is important to consider how individuals with ASC who enjoy the work of others in these fields can access this in a way that is comfortable for them.

## Strengths of People with ASC

There is a prevailing view of ASC as representing a number of ‘deficits’, despite the fact that there is considerable research evidence that ASC comes with a number of strengths (Wright, Spikins and Pearson 2020). Intellectual disability is more prevalent alongside ASC but is distinct from it and is often unhelpfully conflated with it. Areas of strength include ‘enhanced understanding in areas such as mathematics, chemistry, engineering and computing, and enhanced perception of visual details, touch, smell and musical pitch. Special isolated skills or talents are often present and are more common than previously thought’ (Spikins and Wright 2016). Many people with Asperger syndrome (a previously described subgroup of ASC (WHO, 1993)), regard themselves as different but productive, frequently happy and not necessarily disabled (Baron-Cohen 2000a). As mentioned, many people with ASC do not have an intellectual disability (Iossifov et al. 2014; Ronemus et al. 2014) and can have a quality of life equivalent to other people without requirement for additional support (Howlin 2000; Baron-Cohen 2000a; Rodman 2003; Fitzgerald 2004; Fitzgerald and O’Brien 2007; Baron-Cohen et al. 1997; Lau and Peterson 2011). Much of the research into ASC focuses on children and those with a comorbid intellectual disability (Howlin et al. 2015); more research is needed to help fill the gap in knowledge around adults with ASC and their contributions and relationships with modern society.

There is a growing view that Autism Spectrum Conditions are part of natural human variation (Baker 2006; Fenton and Krahn 2007; Jaarsma and Welin 2012; Kapp et al. 2013; Runswick-Cole 2014; Spikins and Wright, 2016; Wright, Spikins and Pearson 2020). Our work suggests that people with ASC bring a range of different skills and interests that ought to be considered in ways that move away from a deficits model and consider difference and diversity. This could open up a range of support with new ways of interacting that goes beyond medical or care models and into more social, cultural or cognitive difference paradigms.

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# Tables

Table 1. Summary

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| --- | --- | --- | --- | --- | --- | --- |
| Domain | Interest in this element of the material world or specific elements affected by ASC | Attention to this element of the material world or specific elements affected by ASC | Value attached to this domain in general or specific elements affected by ASC | Documented differences in infancy or childhood | Value attached to fine details | Specific skills related to this element of the material world seen in some individuals with ASC. |
| Art | x | x | x | x | x | x |
| Built environment | x | x | x | x | x | ? |
| Personal possessions | x | x | x | x | ? | x |