Cognitive impairment, access and the built environment

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Project:

Close to the Wall

Lead Artist: Kate Adams

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Close to the Wall

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1. Introduction

1.1. Background

This report forms part of the research for ‘Close to the Wall’, a collaborative project around access to the built environment for people with severe cognitive impairment. The project is funded by Sciart as part of the Wellcome Trust’s Engaging Science grants programme and the Arts Council of England’s Grants for the Arts and is due to last 15 months. It involves lead artist, Kate Adams, a psychologist and architects, working alongside people with learning disabilities and autism. The project seeks to develop a body of creative research into the ways in which people of all ages with severe neurological impairment, navigate and experience the built environment. The project grew from a belief that many of these people are effectively excluded from certain environments because their access needs are not considered. We are aware from our own work that people with cognitive impairments find certain spaces extremely difficult. More detail about the project is given in appendix 1.

1.2. About this Report

This report brings together information from a range of sources. In the absence of a coherent set of guidelines or body of research for building for people with learning disabilities, we have taken a multidisciplinary “bricolage” approach, stealing ideas from many different fields. At an early stage in the research it became clear that there is little theory or conceptual information on these issues. Ideas inform practice on a much broader level, so the vacuum of theory suggests that the needs of learning disabled people are rarely being taken into account on a practical level.

Therefore, in order to research the field, it has been necessary to throw the net wide, scanning general architectural literature, specific disability related writings, the fields of psychology, sociology and behaviourism, fiction, our own experience and direct consultation with three individuals with different combinations of autism, dyspraxia,

asperger's syndrome and learning disabilities. Some of the most promising research is around design principles for residential care settings for elderly people with dementia and Alzheimer's. It may also be worth considering design principles for children (e.g. nurseries and schools) and design for people who are acutely ill (not to imply that people with cognitive impairment are either ill or childlike, but some of the thinking about making environments intelligible may be relevant). We have not had time to follow up these avenues.

In this report, we will be considering cognitive impairments and learning disabilities across a wide range, and autism specifically because autistic spectrum disorders create particular access requirements. At times people with different impairments will have different access needs, and there are questions about how to make a building cater to all without becoming either a boringly neutral space or an intensely 'busy' visual environment.

We hope this report will provide a foundation on which to build the next stages of the project. It is far from a traditional foundation, built from a range of incompatible structures and raising far more questions than it answers, but we hope it provides a starting point that inspires and motivates.

1.3. A word about Language

Throughout this report we refer to *disabled people*, or *people with* specific conditions (autism, learning disability, cognitive impairments or neurological impairments). This is in line with language currently considered acceptable by most organisations of disabled people in the UK. We do not use the terms *' mental disorders', 'mental retardation'*, nor refer to people as their condition e.g. *'autistics'* even though this is not uncommon in the source literature.

We use the term '*non-disabled'* to describe people who are not disabled.
We do not use the term '*able-bodied'*, as this confuses the issue since many people with cognitive impairments and autism are physically able. Similarly we do not use

the terms '*normal', 'typical'* or '*mainstream*', even though these are present in some of the source literature.

2. The Context

This project is taking place at a time when accessibility and inclusion is high on the political and social agenda across the western world. There is an enormous amount of information on making environments accessible to people who are physically disabled or who have sensory impairments. Given this context, and given the relatively high incidence of learning disabilities among impairment groups, we were surprised to find so little research about making the environment accessible to people whose primary impairment is cognition.

The project is informed by and will hopefully have repercussions for the practical implications of current UK legislation around disability and architecture.

The Disability Discrimination Act (DDA) covers issues of access and discrimination within the fields of employment, provision of goods, facilities and services, premises, education, public transport and architecture. Perhaps because it is so extensive in its reach, the recommendations set out by the DDA have been accorded an unusually long period for implementation, from 1995 through to the end of 2004. By the end of this period, both public and corporate buildings should be made fully accessible for use by all members of the public.

2.1. Universal Design, Inclusive Design and Accessibility

Although the terms ‘universal design’ and ‘inclusive design’ are generally considered to be synonymous, the British movement for accessible architecture favours the term ‘inclusive design’ and there are differences of view around meaning.[1]

The ethos behind the DDA’s concept of accessibility draws heavily on the American concept of ‘Universal Design’, the ramifications of which we shall consider presently. The Act sets out a broad definition of disability and a relatively hazy set of specifications about how architects should implement its recommendations. Building owners are advised to take whatever steps can be ‘reasonably’ expected to ensure that their buildings are made fully accessible.

2.2. Guidance on Access for UK Architects

A look at the advice being given to architects suggests that their interpretation of the mandate set out by the DDA more or less ignores the learning disabled population. See, for example, Penton 1999, a key RIBA text on accessible design. No mention of the needs of people with learning disabilities is made throughout the chapters. This is even the case where design features known to be significant are considered: Section J, for example, deals specifically with lighting and gives the following advice re. fluorescent lighting: ‘Fluorescent lighting creates a magnetic field which can cause a hum in hearing aids and should be positioned to avoid interference.’ No mention of possible consequences for people with autism or epilepsy is made.

[1] See for example, Inclusive Design, pp.44-5 Imrie and Hall argue that universal design presents a ‘techno-paradigm’ which relies upon a medical model of disability. They cite Scherer’s study (1993:84) which suggests technical engineers “see assistive technologies and environmental modifications as...the primary solutions to the functional limitations of a physical disability.” Likewise, advocates of universal design tend to prioritize the application of technological products as core to overturning inaccessible environments.’ The authors go on to argue that devices mark disabled people out as ‘deviant’ and can serve to stigmatise and exclude.

2.3. Architectural Conceptions of Access

The literature and guidance we have seen suggests that in architectural terms, access is generally taken to mean access for physically disabled people (often specifically people in wheelchairs). It may be that the dearth of information around the needs of people with cognitive impairment can be attributed to a more general lack of disability awareness. RIBA's 1998 curriculum briefly mentions disability in Parts 1 + 2 of Design Studies exams. As noted below, there is a strong apparent bias in architectural thinking towards creating access for people with mobility impairments, and some sensory impairments.

	Always (%)	Sometimes (%)	Rarely (%)	Never (%)
Colour contrasts	32 (15)	79 (38)	45 (22)	23 (12)
Accessible toilets	174 (84)	18 (9)	0 (0)	0 (0)
Induction loops	15 (7)	67 (32)	51 (25)	37 (18)
Tactile paving	39 (19)	91 (44)	30 (14)	18 (9)
Ramps	128 (62)	59 (29)	2 (1)	0 (0)
Lifts to all levels	89 (43)	78 (38)	15 (7)	2 (1)
Lighting	88 (43)	48 (23)	30 (14)	18 (9)
One entry point	48 (23)	81 (39)	22 (11)	10 (5)
Level entry / access	128 (62)	57 (28)	2 (1)	0 (0)

Fig 1: consultation with architects about accessible design features taken into account when planning a project. Imrie and Hall, 2001.

The following two tables make this bias even more explicit, in that only 14 of the 130 architects consulted make mention of people with learning difficulties; and 60% 'rarely or never' take learning difficulties into account when designing a building.

Access groups	76
Vision impaired	23
Hard of hearing	18
Physical / mobility impaired	69
Learning difficulties	14
Other	42

Fig. 2: consultation with 130 architects (65% of architects surveyed overall) about groups of people consulted with at the inception of a project. Results are given according to number of respondents, not in percentages. Imrie and Hall 2001.

	Always (%)	Sometimes (%)	Rarely (%)	Never (%)
Vision impaired	44 (21)	86 (42)	44 (21)	14 (7)
Hard of hearing	25 (12)	71 (34)	58 (28)	29 (14)
Physical / mobility impaired	166 (80)	26 (13)	3 (1)	0 (0)
Learning difficulties	17 (8)	44 (21)	67 (32)	58 (28)

Fig. 3 different types of disability in people that architects take into account when designing a building. Imrie and Hall 2001

Author analysis of fig. 3:
‘60 % of respondents rarely or never take into account building requirements of people with learning difficulties. This is partly connected to the absence of societal understanding of what learning difficulties are. Architects and other professionals are taught nothing about, for example, dyslexia, yet contrasting mental or cognitive capabilities requires adaptive environments (and design solutions) to enable

individuals with learning difficulties to recognise places and orientate themselves from one locale to another' (Imrie and Hall 2001, pp.96-7).

We located one book specifically about design for people with learning disability (Harker and King, 2002). We have purchased this book but unfortunately it contains little of relevance for this project.

Practising architects are not currently accountable to the RIBA once they have qualified, and do not have to justify their practice where disability is concerned to any extraneous body. It remains to be seen whether current legislation is set to change all that, and whether the concept of accessibility will come to mean a broader spectrum of needs than it currently describes, from an architect's perspective.

Thankfully, the focus of 'universal design' on physical disability does not render it entirely useless from the perspective of finding good design principles for people with learning disabilities. Quite apart from the fact that some people with cognitive or sensory impairments also have physical impairments, there are often similarities between the design requirements of people with different impairments. For example, the design of signage, using large clear lettering, for visually impaired people specifically, may inadvertently cater to the needs of someone with a learning disability.

3. Feelings about Buildings and Places

One of the interesting questions that the project could explore is whether people with certain cognitive impairments actually feel more strongly about architecture than non-disabled people. From literature, and from our initial consultations it seems that this is very likely to be the case.

In Thinking in Pictures, Temple Grandin (who also has autism) describes her attachment to physical spaces:

People with autism are capable of forming very strong emotional bonds...my strong emotional bonds are tied up with places more than people... People with autism also

have place – or object – specific memories. Going back to a place where something good happened...helps us re-experience the pleasure. Just thinking about it is not good enough [pp.92-3][2]

Interestingly, the people with autism whom we consulted all expressed a strong interest in architecture. People with autism often choose to design and draw buildings or cities, possibly because of the opportunity to order and control the imaginary environment being created… And of course, we are dealing with individual people with individual preferences, not with human 'examples' of the autistic mindset. Indeed, all of the people with autism consulted with were at pains to point out that their comments should not be considered representative of a generic autistic point of view. Nevertheless what they had to say about both buildings and autism was highly relevant to our project:

About buildings and architecture

On the whole I like buildings. My favourite is Broadgate Estates.[3] I feel a part of it, having been with it from the start, a sense of belonging

I love grids and geometrical design. There are some buildings I really want to see in Ottawa, Canada.

My favourite thing was room plans. Don't ask me why because I don't know. I was always picking up leaflets and brochures in DIY stores. By my early teens I had fallen in love with kitchens and even now I always have a few kitchen furniture brochures around for light reading. At the peak of my fascination I had over 100 kitchen brochures from all over Europe that I ordered from interior design magazines. I would design the layouts of kitchens on graph paper using nothing

[2] See Appendix 4 for a discussion of the visual nature of autistic thinking.

[3] One of the reasons given for loving this piece of architecture is that the person concerned had seen its development right the way through from its inception, when posters/leaflets announced it was about to be built. This might be a really significant piece of information. A lot of people with autism like leaflets, as well as liking to know what is about to happen, so perhaps architecture should incorporate an explanation – visual and written – of how its design and realisation came about.

except a pencil and a ruler. From there I went on to other rooms, then whole houses, estates, and eventually cities. Once we had to stand up in class when we were about 14 and say what our hobbies were... I said my hobby was architecture and designing cities. The whole class laughed at me. I don't know what they thought. These days of course I can just play The Sims or Sims City if I want to do that kind of thing, but it's not the same. You can't be as creative as you can when your work is all your own imagination and not just playing around inside someone else's imagination.

3.1. Buildings as aesthetic spaces

One person described the beauty of *"the containment created by the overhang of the bargeboards of the gable ends of buildings"*. Another said that the ugliness of some buildings could hurt her.

Two of the people with autism that we consulted cited churches as favourite spaces. One of them, Ros, loves cathedrals. As for temples, synagogues and mosques – she appreciates the beauty of the buildings, but not what they signify, which is unfamiliar to her. As a Christian, she makes a connection between faith and space. She appreciates the *attention to detail, the enormity and compassion of cathedrals*, which she describes as being *very attractive*. On visiting Coventry Cathedral, she was saddened by its history – the old cathedral was destroyed in the WW2 aerial bombardments. She loved the stained glass windows, but disliked the tapestry of the new Cathedral.

3.2. Buildings as social spaces

In designing public buildings, architects tend to organise space bearing both social purposes and functionality in mind. The crossover between sociology/behaviourism and architecture, at least where the British tradition is concerned, is of long standing.[4] Buildings, especially public ones, are fundamentally social in conception.

[4] Americans by contrast, followed the sociological approach to design only when it had been proven effective. See People and Buildings, pp.135-151

Contrast this with the following statement by Ros, one of the people with autism whom we consulted: '*people ruin buildings'.* Space is organised predictively and prescriptively; social behaviour is both guided and anticipated in the very structure of a building. People with autism are not social people: they find crowds of other people overwhelming and unpredictable. When asked how an architect could improve a lobby area to be more acceptable or manageable, Ros replied that they could erect a huge sign saying 'evacuate the building'!

The following is taken from 'Silent assumptions in social communication', a chapter in People and Buildings, and although dated (especially in the admission of the quest for 'objective' meaning), is noteworthy from the perspective of gaining insight into the sorts of normative sociological assumptions often made by architects. We are given a definition of the term 'proxenics':

'The study of ways in which man gains knowledge of the content of other men's minds through judgements of behaviour patterns associated with varying degrees of proximity to him. Spatial distance is a "silent language" through which men unwittingly convey attitudes, feelings and judgements about their fellows. This emphasis fits naturally with the wish of architects to find in the behavioural sciences, evidence that design variables are objectively meaningful.'

Churches are large-scale buildings, that make use of space and light to create a tranquil environment. However the use of small spaces within a larger space might be desirable in view of the following comments:

'I used to love Sundays when I was a kid because you could walk around places with your senses open without fear of assault. Nowhere is ever peaceful these days. If I was designing my ideal public place it would have to include little havens of peace and tranquilly where you could escape to. Mind you, I think a lot of people would be able to appreciate and benefit from that, not just people like me.'

4. Design Issues

4.1. General Principles

We had hoped to begin to compile possible principles for accessible design for people with cognitive impairments, and although this has not been possible we do feel able to suggest a number of *design issues or features* that we think are worth attending to.

Designing for Dementia suggests several general design principles, which might also apply to people with other cognitive impairments:

- The environment should promote self-esteem, autonomy and individuality
- The environment must be safe (although see notes about the dignity of risk below)

Where the crossover fails is in the following recommendations:

- The environment should be small
- The environment should be familiar

The latter consideration is difficult to implement in a public space rather than a residential setting. The former consideration is not necessarily applicable to someone with autism. A small sized public space would risk bringing large crowds of people together within a confined space.

4.2. Intelligibility and predictability of the environment

Making an environment make sense to people seems a recurring theme, and this makes intuitive sense to us in putting this report together. If one's impairment is of cognition and understanding, then an environment that is easier to understand is likely to be more accessible. Ros said "despite being bright I still don't understand" – pointing out that whilst her impairment is neither of comprehension, nor is it strictly cognitive, the end result for her is the same as it would be for someone with learning disability. A confusing environment has the same negative impact on her, though for different reasons.

Structure, clarity and predictability can be inherent in the design of the environment (Harker and King 2002).

In *Designing for Dementia*, the author insists that 'the environment must be legible.' There are several ways of ensuring legibility, the first and most critical of which is:
'visual access – the capacity of residents to see or sense where they are or want to go.' In order to ensure 'total visual access' in residential settings, all bedrooms might open onto the lounge and dining area and there might be no corridors. But corridors can provide visual access too. L-shape and Y-shape buildings allow for total visual access from all parts of the building. This would be something to bear in mind when designing for learning disabled people with a cognitive or memory impairment. But some of the same principles also apply to people with autism or brain injury, who may become confused or disoriented for reasons not associated with memory loss.
Specific mention is made around autism and predictability of the physical environment, for example:
'Autism is thought to put people in a difficult and confusing world. Structures – for communication, the daily and weekly timetable, the environment and use of buildings – are very important. They provide fixed points and certainties in an uncertain and threatening world where unpredictability and sudden change can be unnerving. Harker and King 2002

Entrances, foyers – what makes these spaces difficult to navigate? *People are the problem***.** Tell us about your worst sort of entrance. *A door with stairs right behind it.*

4.2.1. Wayfinding

There is a passage in The Curious Incident of the Dog in the Night-Time, included in Appendix 3, where the narrator describes finding Swindon train station, having been incapable of following a by-passer's directions. He ends up taking a massive detour to get there, following logical but impractical processes. Yet when he is shown a very complicated section of the A-Z, he finds his way to the address in a much shorter time than it would take anyone else. Ros described the paradox that whilst her thinking and learning are verbal, she can only make sense of visual maps:

‘I’m very good at maps but I’m no good at verbal directions. It’s nothing to do with memory, I can’t picture the map in my head when it’s given to me verbally …it totally contradicts all my other learning. To learn anything at school I had to be told it… I couldn’t learn from reading’
Access to maps may be worth considering, and perhaps the possibility of ‘easy maps’ for places.

The suggestion that dead ends should be avoided wherever possible turned up repeatedly in books relating to design for people with dementia and Alzheimer’s. The principle is probably transferable to design for people with other cognitive impairments. In *Thinking in Pictures*, Temple Grandin describes her dread of dead ends [pp.94-5].

4.2.2. Clarity of function

The idea of ‘single function’ rather than multifunction rooms recurs in the literature, along with consistency across rooms, as in this RNIB recommended design process checklist, reproduced in Designing for Special Needs, p.85

Stage	Look at:
Review each room	Colour contrast, lighting and non-visual clues to find your way around
Function of room	A room used often in a similar way might have a ‘route’ defined by colour, sound texture, e.g. path from bedroom to bathroom.
Overall themes of building	Consistent use of colour and materials. Do all toilets have the same colour door? Do kitchens have tiled floors?
Consistency	Light switches similar and at same height, handrails consistent in style and shape
What needs to be variable	Lighting controllable – dimmer switches

Safety outside	Lighting at night, steps and paths illuminated and contrast with surrounding area

'How does someone know what a door is for? When I was severely catatonic in a psychiatric ward, I had no idea. I couldn't get about. Walls just came up from nowhere beside me.'

4.2.3. Accessible signage and information

Covington and Hannah (1997), a universal design manual which, typically, seeks to cater for a user group consisting of both non-disabled and physically disabled people, gives the following pointers on school design, which might also apply outside the school setting to spaces used by people with learning difficulties. Brackets are not the author's:

- Simple, intuitive information. Intuitive use is paramount to understanding.
- Signage is for everyone (in the school)
- Can (the students) *hear* the information?
- Can (the students) *see* the information?
- Can (the students) *touch* the information? [p.128]

The same book gives general pointers on signage, which are not always 'universally' applicable: *Use every sense (i.e. sight, sound, touch, even smell) to direct and guide.*

An over-determined design interpretation of the above advice might risk bombarding the senses of a student with autism.

4.3. Sensory Issues

The importance of noise and quiet is recognised by some in the field of design for people with dementia and people with autism. Many of the same principles may apply for people with other cognitive impairments.

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‘The design must enhance orientation by highlighting important stimuli and reducing the impact of extraneous stimuli… The dizzying array of stimuli will promote confusion and disorientation. The design challenge is to ensure that the environment is engaging without being confusing; directive without being manipulative; supportive while still promoting autonomy. It has been said that “noise is to people with dementia what stairs are to people in wheelchairs”. The design and location should promote the possibility of a calm, quiet environment in which the number of unfamiliar faces and noises are minimised.’ [*Designing for Dementia*, p.17]

Compare this with the comments of one of the people with autism we consulted with:

‘The worst part of being like this is that smells and noises in most public places are so awful that I have to try and ignore them and shut them out. Imagine you went somewhere that looked so ugly or was so bright it was painful to look at it and you had to walk along squinting your eyes closed. That is what it feels like for me walking through the centre of town, (which I have to do twice a day going to and from work) except I am squinting my ears and my nose, but in a mental sense rather than a physical one, of course… Shopping malls are my worst nightmare. They have confusing layouts and very few interesting physical features, and I have been known to get lost in them for extended periods of time. The toilets and the places that sell overpriced stale croissants are always well within sniffing distance of each other, and believe me, bleach and coffee are not complementary odours. There are so many visual distractions screaming for your attention... Not to mention the awful muzak and the nauseating lighting. I have been known to become ill in shopping malls... Everything from panic attacks to sensory overload. So, apart from what I have already said about design and layout, lighting and acoustics are also very important.’

One person with autism said that **she needs time when moving around in buildings in order to process the sensory information that she receives**. See also the extracts from ‘the curious incident of the dog in the night-time’ in Appendix 3.

What is being described is a sensory overload, the combination of several, conflicting sensory stimuli, which creates an unpleasant and overwhelming environment. There is an extensive recent literature on 'sensory integration' which should be explored as part of the project. Although not specific to people with learning disability, many of the issues would seem relevant.

4.3.1. Coping with sensory overload

The following reflections are lifted directly from the information pages of:
www.aspergerinformation.net
They can be considered bearing in mind our earlier question – how to make a space calm and reassuring to a person with autism, without sacrificing its interest.

'Self stimulation, Stims and Stimming

Self stimulation is a response to times of high or low arousal as well as being related to various emotional states such as feeling frustrated, nervous, anxious, bored, etc. and it can be either calming or arousing.

A stim is an activity that serves this purpose, usually a repetitive mannerism. Examples would be rocking, spinning, arm/hand movements, head movements, head hitting, pacing, humming, making noises, banging things, thumb sucking, hair chewing, hair or finger sniffing, staring etc.

While stimming can be self-injurious or appear that way, not all self-injurious behaviour is stimming. Hurting yourself can be a form of displaced aggression towards oneself and could be a sign of depression.'

'Sensory Overload

When the brain becomes over stimulated it can go into overload. The type of sensations that could cause this would be things like bright lights or flashing lights, loud or conflicting noises, strong smells, pressing up against other people in a crowd, being surrounded by moving faces or objects, or any confusing or overwhelming sensory environments where any number of these things could be occurring at the same time.

I find that it can be made much worse when the environment is unfamiliar and also that **my emotional state makes a big difference.** If I am feeling tired, sad or under stress to begin with then sensory overload is almost certain to occur and much worse than when I am feeling better.

The overload can manifest itself as anything from something as mild as a heavy feeling that you can't go on and need to get away to being as severe as becoming almost catatonic. It could be accompanied by headaches or feelings of panic and disorientation. You may be unresponsive or confused. There is a distinct sensation of slipping away from the world and the brain feels like it is shutting down.'

Practical implications for architecture, to follow on from the above points, might be that public buildings, however busy, need to have quiet (in terms of crowds, colour schemes, lighting, textures) spots/corners where people can regain their equilibrium. Many people who would not describe themselves as disabled also find busy public buildings a nightmare and would make use of quiet areas, so the benefits would be widespread.

4.3.2. Space

Space recurs in the literature and in the consultations. See also the section on 'buildings as social spaces. It would be interesting to explore empty public spaces with people as part of the project. Space standards need to be generous and allow for residents' potential sensitivity to the need for personal space. Residents need

room in communal areas to be able to withdraw to their own space. [Harker & King 2002, p159]

4.3.3. Light

Natural light and ‘good’ or adequate light was mentioned in the literature and by individuals as important. Researchers on Alzheimer’s disease suggest that where natural light could not be provided, artificial light should attempt to reproduce its effects. A similar point is made in a wider text on design for people with learning disability:
‘Natural light is good and this gives an added sense of space.’ [ibid]

The following is an explanation of the negative effects of ill thought-out lighting from one of the people with Asperger syndrome that we consulted with:

‘*Another example of what is bad for me though is the open plan office in which I work. It is in a basement, so the ceiling is low and there are no windows. The only lighting is that awful fluorescent strip stuff that makes a buzz that only I seem to be constantly aware of. About two months before the bulb is about to go the frequency of the buzz changes to one that doesn't harmonise with all the others. I wish they would change the bulb then instead of waiting for it to stop working. The noise of all the people talking and the phones and the printers and the computers (the fans inside computers produce a breathy but nauseating hum that I am also constantly aware of)... It is a similar environment to the one I remember in school classrooms. Almost impossible to work in unless I totally shut myself off from the outside world... And now, as then, I get into trouble for that.’*

4.3.4. Colour

Alzheimer’s Design describes colours specifically suitable for the vision impairment that often accompanies Alzheimer’s:
‘An overall loss in the ability to distinguish hues of low saturation from white or grey is a common feature…to increase effectiveness, designers should avoid using pastel

colours altogether, and avoid placing white or grey against any colour of similar lightness.'

One of the people with Asperger syndrome we consulted with, described the world as she perceives it, using the analogy of colour-blindness:

'To imagine the way I navigate a place you need to imagine it in 3D and then paint every surface grey in your minds eye so you are just moving around within a space only defined by its shape and structure. My eyes work like everybody else's, so I see what you see, but I do not experience it like you experience it.
My brain takes in all the same information, but it uses it differently. My senses are overwhelmed... I am either trying to block it out or I am seeing too much of the details to scan the whole scene for things like signs or coloured markers. I have to rely on different information to find my way about and so I have different needs, experiences, and priorities.'

All of the people with autism consulted with for this report expressed strong views about colour, saturation and depth perception:

Changes of colour on the floor are tricky, because they can tamper with perception of depth I can't see whether what's being indicated is a step up or a step down, or not.

There has been extensive research on the impact of colour on mood. The table below summarises research around colour and 'mental disorder'. The wording on this graph has been changed in places where we have deemed it too offensive to include, but even what remains speaks volumes about the lack of dignity accorded to participants.

The nature of certain of the tests themselves is perhaps most offensive. Fenton and Penney's experiment involving light would seem both obvious and cruel, as well as being potentially dangerous, considering that some people with autism are also epileptic. Nevertheless, however unethical the means of obtaining such 'results', once established, they should not be ignored.

Authors	Date	Subjects	Interventions	Results
Cernovsky ZZ et al	1997	20 women with Bi-polar disorder and 23 normal controls	Rank order of colour preference cards	Bi-polar disorder patients preferred black and red as room colours
Fenton DM and Penney R	1985	5 autistic and 5 learning disabled patients	Ambient lighting, either incandescent or fluorescent	Autistic stereotypes increased with fluorescent
Frazer DW	1980	30 elderly 'psychiatric' nursing home residents	Many changes to dayroom, including colourful furniture, wall panels, craft materials and lighting	Passive behaviours decreased
Gulak MB	1991	State hospitals	7 guidelines on physical structures	Architecture will become therapeutic
Gutkowski S et al	1992	Mental health care	5 additional doors, brighter paint, improved lighting	Positive effects for staff, patients and families
Holmes CB	19985	1143 psychiatric outpatients, aged 11-93 years	Luescher colour test (of preference)	Difference between sexes but little change with age
McKenzie J-A	1993	27 elderly nursing home residents with dementia	Change in environment colour	No change in aggressive behaviours
Van Someren EJW et al	1997	16 elderly people with dementia	Indirect natural illumination	Rest-activity rhythm grew more stable

Fig. 4: "research reports linking colour or lighting and mental disorders". Taken from *Therapeutic Environments for mental health: a one day symposium at the RIBA.*

examples of colour contrasts found to be successful in the context of designing for people with Alzheimer's.

Good colour choices for contrast	Poor colour choices for contrast
Light colour against black	Dark green against bright red
Dark colour against white	Yellow against white or similar lightness
Light yellow against dark blue	Blue against green
Dark red against light green	Lavender against pink

Fig. 5: recommended colour combinations for contrast. Taken from *Alzheimers Design.*

Colour as a wayfinding tool has been shown to be successful, but only when used in conjunction with other cues. This is true for people with dementia too, though for different reasons. Designing for Dementia cites case studies, which indicate that the use of colour in itself, is an inadequate cueing device [p.17].
There may be a visual preference amongst people with autism for a uniform use of colour.

4.3.5.Texture

Textural contrasts have been incorporated into design for people with dementia and Alzheimer's: beading around doorways, for example. Designing for Dementia suggests that the design should "use the building as a language". Cues should be unobtrusive, yet obvious. They should reward decisions, which are always "right ones". Dead ends, where they can't be avoided, are minimised with decorative features – plant pots on tables, for example.

5. Physical Features, Safety and Risk

What material we have located about learning disabilities and architecture, tends to be about making a physical environment robust, which, arguably, amounts to little more than damage limitation. We have acquired, from the National Autistic Society, an example of building guidelines for people with autism, which focuses almost entirely on 'strengthening' the physical environment to cope – e.g. reinforced floors,

toughened glass windows. This focus on containment is negative, and has nothing to do with creating genuine access.

5.1. Stairs

Ros explained that when she arrives at a staircase, she almost does a little dance. She has to walk, stop and readjust to the new demand. If someone interrupts this process, it can be very difficult. Going down stairs is much harder than going up. Slopes are easier than stairs physically, but more frightening although for some people slopes present a more difficult surface than steps. Some steps are hard to manoeuvre if they are of an unconventional size or their edges are not clearly visible:

> *"The brain is stuttering almost*."

5.2. Doors

Ros explained: *I like push away doors rather than ones that come towards you*' and said that on the whole, she prefers things that move away from her space rather than come "*into my face*". She said that on a practical level, it is easier to push something away. She described sliding doors as being difficult because they interrupt her walking pace and she can't make the change quickly enough. She has bumped into sliding doors before. She spoke about balance issues and the difficulty in judging when to slow down. Revolving doors are awful – they fill her with fear and she rushes through them with her eyes shut. Timing is very difficult, and it is hard to judge distances. You can feel trapped inside them. We know that for some people who have difficulty adjusting to unexpected situations, transparent panels in doors can reassure and prepare the person for what lies ahead.

5.3. Corridors

Ros really likes them. "The straighter the better." Long, institutional corridors are "wonderful". She described running along one of these corridors at the Maudsley Hospital and leaping up to bash the panels just under the empty doorways along the way, enjoying the challenge of this and the self-stimulation of the banging. Here is

another case where existing design principles may not be easily transferable between people with different conditions: where someone with dementia might find long corridors intimidating and disorientating, a person with autism may find their clean geometry and predictability exhilarating.

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Appendix 1
More Detailed Description of the Project:
Close to the Wall
Cognitive impairment, access and the built environment

Project Objectives

• Over 15 months this project will attempt to establish experimental, discursive collaborations between an artist/s, psychologist and architects which examine the impact of severe neurological impairment on the perception of space and the built environment

• This work will prepare the ground for further, more detailed research leading to the production of an exhibition and/or publication of art and theory on the subject of 'access' for people with severe cognitive impairment

Perceived Outcomes

• increased understanding of the barriers to accessing different kinds of urban spaces for people who have severe neurological impairments

• identification of potential stakeholders in more developed research and the production and dissemination of results – e.g. People who have severe mental impairment, Advocacy Groups, Architecture Foundation, architects, technologists, designers, manufacturers, disability professionals, and families

• consultation and work with people who have severe impairment and their advocates and carers, service providers and educationists resulting in plans for inventive and experimental environments

• a series of small-scale texts, artworks and constructions that communicate different ways of perceiving and experiencing space

The functionality of space, and its appropriateness to its users, is the primary concern of our research. Within the sphere of disability, which may include physical, visual and cognitive impairment, this embraces aspects of physical access, which in turn touch upon issues of social inclusion. We regard these as aspects of entitlement

within the broader framework of human rights and therefore of an ethical nature. In a society which aspires towards inclusion and pluralism as desirable ends, we would hope that the potential for practical application of any results we may accomplish would likewise have some social and cultural value, and be able to contribute to these issues.

Although issues of inclusion and access are currently the focus of much attention, legislation and guidance, the needs of people with severe cognitive impairment are rarely considered.

The whole project will be responsive and collaborative. The combination of disciplines plus the direct involvement of disabled people will enable a unique approach to evaluation. The ideas will be tested in the development and consultation phase by direct involvement of a number of individuals with severe cognitive impairment. Evaluation, of necessity, will consist of a form of continuous assessment. Specific evaluation material will be devised in order to achieve some measure of objectivity.

In the first instance, the project team will define a consultation and evaluation strategy. One that is as accessible and open as possible in order to allow for the creative use of documentation media. This will help to facilitate consultations with a range of individuals who may have very different, specific and unique ways of engaging and communicating their experiences and needs.

Consultation

- Throughout the project we will conduct phased consultation with people who have severe cognitive impairments and their carers and advocates through video/audio recordings, interviews and questionnaire

We will employ a range of consultative and evaluative tools such as:

- Questionnaires about spaces for example where do individuals function well? What kinds of spaces do they know of where their impairment is least disabling? We will share and then analyse this information in discussion (recorded and transcribed)

- Video recordings of people in different environments
- Journal notation of above
- Verbal accounts of above
- Project team discussions (transcribed) at regular intervals throughout the project

We will conduct evaluation at key points throughout the project which will monitor methodology, effectiveness of documentation and consultation and the general management and administration of the work.

- Consultation: how effective is our methodology?
- Have objectives been met?
- Were objectives realistic?
- What fresh insights and/or understanding, if any, have been achieved?
- Analysis of outcomes

Quantitative methods

- Continuous overview and distribution of projects costs – budgets and actuals.

We will set up a specific project account in order to accurately monitor income and expenditure

Monitoring of:

- the project work plan against timetable of work – Project Targets: did we meet them?

Documentation

For use of project team:

Transcripts of project meetings

The project team will conduct a written dialogue throughout the project, sharing knowledge, insight and bringing together each area of enquiry.

Video – used as a simple record and edited in way that avoids over interpretation – an unmediated records of an events

Journal

Close to the Wall

Discussions with people, advocates, carers recorded in written notes, on mini disc and video questionnaires

Appendix 2

Research Results from Business 360 initial websearch

Some, but not all, of the references and leads located have been followed up in the main report.

Keywords: access, built environment, severe cognitive impairment

Description: we are beginning a project on the accessibility of the built environment (or urban environment or buildings) for children and adults with severe cognitive impairments (or severe learning disability, severe mental retardation) or autistic spectrum disorders (autism, asperger's syndrome).

We imagine there may be research from these disciplines (and others): architecture, occupational therapy, psychology, rehabilitation, interior design, disability studies. We are interested worldwide and across any time period.

Purpose: There is an enormous amount of information on making environments accessible to people who are physically disabled (e.g. wheelchair users) or who have sensory impairments (e.g. who are blind or partially sighted, deaf or partially deaf). We are NOT interested in this research ˆ we are specifically trying to find research about making the environment more accessible to people whose primary impairment is cognition ˆ i.e. understanding and knowing, or autism ˆ i.e. perceiving and understanding. We are aware from our own work that these children and adults find certain spaces extremely difficult, but we do not know of existing research in this area....

Summary:

We have found a number of references in public sources that talk about accessibility issues for people with cognitive disabilities, and particularly autism, but there is far less available than there is for similar issues relating to physical disabilities.

We also conducted a search of commercial sources and found nothing of relevance, and so decided to extend the search by making a series of phone calls, talking to a variety of organisations in the UK and US, which suggested that research and effort

in this area is more advanced in the US than the UK. We are waiting to hear back from some of the organisations in the US, and we will revise this report and re-send it if and when they do contact us. We also mention several further leads which we have not pursued. Broadening the scope of phone interviews to other countries might also unearth useful additional information.

Download full sources/additional files here

Chapter 2 <http://www.clicknwork.com/stagereports/J03-19-2-4317/10092002130854.pdf>
MENCAP <http://www.clicknwork.com/stagereports/J03-19-2-4317/MENCAP.pdf>

Unfortunately, in this instance, despite looking in a wide range of commercial databases - Factiva, Alacra and Profound - we didn't find a single useful reference to include. We felt it would not be worthwhile sending any of the material reviewed as it did not meet the precise criteria requested. The specialist publications where such research may appear are probably not available via the commercial databases and it is our opinion that there will be more worthy information on the public web.

We have, however, attached Chapter 2 of the book, "Designing for Special Needs", by Maurice Harker and Nigel King, which is available for purchase at £15. You can download this from the link above (Chapter 2).

We have also phoned a few places to see if they have any knowledge of useful research in this area. In the UK:

1. We talked to the Centre for Accessible Environments, and they suggested we call MENCAP and MIND

2. MENCAP (0207 454 0454): we talked to Clare McKitrick. They focus at the

moment on communicating with people with a learning disability - how to write and design your communications for instance. Clare suggested we talk to the Nora Fry Research Centre at Bristol University. Clare also suggested we look at anecdotal evidence in documents located at http://www.mencap.org.uk/html/publications_library/publications_library_intranet_community_services.asp, and particularly their 'Arts for All' document (http://www.mencap.org.uk/download/2002.211accessarts.pdf), which we have downloaded and attached to this report - you can download it from link above (MENCAP).

3. Nora Fry Research Centre. They have not covered this issue at all, but suggested we talk to:

4. British Institute of Learning Disabilities: 01562 723010. We talked to their publications department, and they said that BILD members can do a literature search on their site. They do also have some publications on their site (http://www.bild.org.uk/publications/index.htm) and although some deal with housing/accommodation issues for people with learning disabilities, were not sure whether these would apply to people with severe cognitive impairment

5. Foundation for People with Learning Disabilities: 0207 802 0300 ˆ none of their research touches on this

6. MIND: not something they cover but suggested we talk to:

7. Young Minds: 0800 018 2138 (but are only there Mondays and Fridays)

8. Autism Independent UK: 01536 523274 (we left a message to call us back)

9. National Autism Society: 020 7903 3599 (Information Centre). They said that we would probably find little research. They have guidelines (but only in hard copy, and have put them in the post)

10. BIBIC: 01278 684060. We talked to Viv Streeter who confirmed that they have nothing relevant, but suggested we talk to Headway and the Joseph Rowntree Foundation, both of which have done work in the area of accessibility. We have as yet not contacted either of these organisations.

We have also contacted a number of organisations in the US where this matter seems to have higher profile. Many of those we contacted have yet to get back to us with full comment ˆ we will update our results when we get feedback ˆ but it is clear that there are many leads and resources to tap in the US. To date we have contacted:

11. The National Council on Accessibility (812 856 4427) who referred us to

12. The US Access Board (1 800 872 2253), which sets guidance for building design. We left a message and have yet to hear back

13. National Council for Disability (202 272 2004), where we left a message and have yet to hear back

14. National Center of the Dissemination of Disability Research (512 476 6861), where Lynn Harris referred us on to five researchers and academics across the US who are active in this area. At this stage we have not contacted these people.

15. US Department of Housing and Urban Development (202 708 1112) who had little of use to say and referred us to the Equal Employment Opportunity Commission, which they assured us had responsibility for this matter.

16. The Access Board (202 272 0080), Œa federal agency committed to accessible design,, where we left a message and have yet to hear back

17. ICC (International Code Council) (1 800 877 2224), which sets standards for building codes which, if adopted by a jurisdiction, become law. Presently the code

does not include any guidance on accessibility for people with mental impairment (Œmental disabilities,, in their terminology), but Roddy Barret noted that in their latest discussions the issue was raised for the first time.

18. Adaptive Environments (617 695 1225), Œworking to make the world fit for all people,, where we left a message and have yet to hear back.

Designing for Special Needs
July 2002
This is a book, published by the RIBA, and written by Maurice Harker and Nigel King, which provides "An Architect's Guide to Briefing and Designing Options for Living for People with Learning Disabilities" (available for purchase at £15).

There is also a link on this page to a PDF document related to this, which, we believe, is Chapter 2 of this book.

We have attached the document, and you can download it from the link near the top of this report.
This important new handbook brings together for the first time everything the architect and client need to know on how to design buildings for people with learning disabilities.

A series of case studies and lessons for good design are complemented by chapters explaining: what learning disabilities are; what housing and support options are currently available; the importance of a design brief that properly recognises individual differences and needs; and existing standards.
http://www.ribabookshops.com//search/IdxCat/3438.asp?
3. Good

Housing for Mentally Retarded in Notteroy

Close to the Wall

This MOST - Best Practices web page describes the changes in the life of Kristina who is severely mentally retarded and also physically handicapped and how moving from her from an institution to a housing complex has had a positive impact in her way of life. MOST is a UNESCO program that promotes international, comparative and policy-relevant research on contemporary social transformations and issues of global importance.

The project is a housing development for young mentally retarded persons in a small municipality in Norway.

The qualities of the project lie partly in the physical planning/product, partly in the adjustments made in the use of the physical environment and the allocation of services to the mentally retarded - the goal being the further improvement of their living conditions. In addition, the project exemplifies the aims and a concrete result of the major social reform concerning the mentally retarded which has recently been carried out in the country and which has improved the lives of thousands of handicapped persons....

The integration of Kristina and the other mentally retarded in the local neighbourhood has caused no negative responses. However, close social relationships between the handicapped and the other members of the neighbourhood have not developed as yet. Apart from exchanging greetings and occasional encounters, contact is limited. The atmosphere is, however, friendly and positive and Kristina and the other mentally retarded residents have become a natural part of the neighborhood.

Today, Kristina is well established in her home in N¡tter¡y - a new living environment from which she undoubtedly has profited . She has become more relaxed and shows greater contentness, especially in the last year after been given more privacy. This corresponds with the elimination of the common-rooms in 1994 - an action which was specially beneficial to Kristina, who is not a very social person at heart. The closing of these common-rooms, which until 94 were used as initially planned for common meals and gatherings in the evenings, was motivated by two circumstances. Experience showed that the social bonds between the various individuals did not justify their use. In addition, it became clear that the shear

existence of the common-rooms indirectly proved restricting to privacy and individuality in services to the tenants. The main lesson learned was that collective living cannot be based on similarities in handicaps. As for everybody else, individual needs and wishes must be taken into consideration in the choice of housing and household composition.

The future use of the common-rooms is currently being discussed. Most probably they will be used as an additional flat. An adaptation to such a purpose is physically very simple and inexpensive, due to the fact that such a rearrangement is fully allocated for in the design (thanks to foresightedness by the planning committee/architects and quality in the architectural design.)

http://www.unesco.org/most/westeu11.htm

3. Good

Train and Station Services for Disabled Passengers

This reference enumerates and discusses the proposals given by the National Autistic Society in relation to making railways more accessible to people with autism and Asperger syndrome. It also discusses the difficulties experienced by these people in different environments.

Characteristic of autism and Asperger syndrome is a constant and high degree of stress which has a number of effects on behaviour (see Notes), and is exacerbated by confusing and unpredictable environments. This can be assuaged by a level of predictability in the built environment. Therefore, for example, the unannounced late arrival of a train can cause a high level of stress to a person with autism and Asperger syndrome ˆ announcements (both by speaker and by display) of delays are essential to minimise this impact.

People with autism and Asperger syndrome often have difficulty with aural stimuli, which are exacerbated by poor acoustics. Thus, clarity in both the quality and content of announcements will reduce stress levels, and assist a person with autism

or Asperger syndrome in their capability for using the railways. Announcements being made when a train is approaching the platform which are inaudible cause undue stress to people with autism. Similarly, a quiet waiting area in a busy railway station is vital for the person with autism and Asperger syndrome to take refuge from the many external stimuli.

Some people with autism have difficulty understanding what other people require of them, and therefore may give an inappropriate response which adds to confusion, stress and a sense of failure. Logical building design and use of pictorial information can assist by providing clear visual indications as to what is likely to be required of an individual in a specific area. The NAS would encourage the extension of the use of pictograms for emergency signage, toilets etc. to general signage.

In addition, as people with autism and Asperger syndrome tend to be visual learners, visual means of communication help them to understand and navigate themselves around an environment such as a railway stations which can be intimidating and complex to a person. Therefore, as visual thinkers, people with autism and Asperger syndrome are helped by visual support and the use of Œvisual structure, reduces stress levels of people with autism by making sense of the world, and the demands being made of them. Suggestions have been made to the NAS by service users for symbols or a key to clarify lists of trains arrivals and departures, such as a universally agreed symbol for London.

So for example, changing trains and reaching a different platform will often prove challenging to a person with autism or Asperger syndrome, who finds change difficult. Accurate information in advance and clear signage can alleviates this stress.

Some people with autism and Asperger syndrome are social isolates; many have difficulty making social relationships, and prefer to operate on the fringes of social groupings. Building design, such as wide corridors, can assist in avoiding unnecessary stress in social settings. So, for example, the NAS would advocate the installation in trains of more seats in pairs facing the back of the seat in front, rather

than seat layouts where two sets of seats face each other. People with autism and Asperger syndrome can find being seated directly opposite a stranger intimidating.

http://www.nas.org.uk/policy/consult/trains.html

2. Very Good

One of our consultees with autism, Ros, took issue with this NAS guideline for train seating, explaining that a lot of people with autism find restricted spaces very claustrophobic, and also not being able to see beyond their immediate vicinity means they don't get any warning about what's going on, which means things can suddenly come upon them, which can be very frightening.

Accessible Schools: Planning to increase access to schools for disabled pupils

This reference discusses how some environmental factors affect the stress levels for children with autism spectrum disorder (ASD) and gives some of the ways schools can be made more accessible to these children.

For many of these children, seemingly incidental environmental factors will greatly increase stress levels, potentially leading to challenging behaviour and reducing their opportunity for learning. Background noise or harsh lighting can cause physical pain in children with sensitivity in those areas.

Acoustics-Sensitivity to noise in ASDs can be exacerbated by a lack of sound dampening measures in areas such as school halls, dining rooms and craft rooms.

Lighting-For all children with ASD, the installation of daylight strip lighting helps to reduce stress and distraction caused by poor artificial lights. In south or south/west facing classrooms, harsh bright sunshine can be combated by installing blinds. In addition, approximately 15% of children with ASD will also have epilepsy.

Smells-Specialist classrooms and school kitchens can be hugely stressful and distracting for a child with ASD who is particularly sensitive to smell.

Close to the Wall

Signage-Pupils with ASD benefit particularly from clear signing of classrooms and other relevant area, particularly when this is combined with easily understandable pictorial representation.

Classroom organisation-...reducing clutter and clearly defining space within the classroom can greatly assist pupils with ASD to access learning. In a mainstream setting, the needs of a child with ASD for a structured, low arousal environment might be accommodated through the provision of an individual work station, positioned away from the centre of the classroom.

http://www.nas.org.uk/policy/consult/acc_sch.html

3. Good

The Road to Decreasing Barriers Faced by People with Disabilities

July 18, 2003

This article discusses the major types of disabilities (which includes cognitive/language disabilities) and the common barriers being faced by people with disabilities. It also discusses some principles of universal design, intended to make the built environment more usable for everyone.

Some of the common barriers for people with cognitive/language disabilities included

** lack of access to information and special services and difficulties in problem solving (language impairments can cause difficulty in comprehension and/or expression of written and/or spoken language);*

** hi-tech environments that place pressure upon individuals or have high performance expectations that do not allow users to operate at their own comfortable levels;*

** overly bright environments that confuse and affect concentration; and*

** internal and external environments with signage that is difficult to read or understand.*

http://www.ohpe.ca/ebulletin/ViewFeatures.cfm?ISSUE_ID=319=1

<http://www.ohpe.ca/ebulletin/ViewFeatures.cfm?ISSUE_ID=319&startrow=1>

3. Good

Planning and Building Design Recommendations 1995

This is a dated article at unescap.org that details the type of building designs needed for the different types of disabilities, including cognitive.

People with cognitive disabilities are generally those with a mental illness, a developmental or a learning disability. To assist them to function in their surroundings, the built environment should incorporate a combination of cues such as those of sight, touch and sound, as well as signs, colours and texture.

http://www.unescap.org/decade/publications/z15009gl/z1500903.htm

4. Passable

Bus Accessibility Systems for Persons with Sensory and Cognitive Impairments

August 1993

This comprehensive study addresses issues related to people with cognitive and/or sensory disabilities and their access to transit services in North America.

The findings are based on existing programs and literature, as well as interviews of persons with cognitive and other impairments.

"The American with Disabilities Act (ADA)...requires transit agencies to provide accessible buses or equivalent services to persons with mobility, sensory or cognitive impairments. This study examines issues concerning persons with sensory

and cognitive impairments, and their access to fixed route transit services.

This study concludes that...personal interaction is needed to solve each individual circumstance with the transit user...Also, visual signage must be standardized to be effective, including consideration of location, lighting, contrast, and content." http://www.fta.dot.gov/library/technology/sci/sci.html

3. Good

Accessible Playgrounds for All Children

This reference is an article on the Idaho State website regarding accessibility of playgrounds to all children with different disabilities. It specifically criticizes the American Disabilities Act for not adequately covering children with cognitive disabilities.

Additionally, the needs of children with visual, sensory or cognitive disabilities have not been adequately addressed in the new ADA guidelines for playgrounds. Recent studies show that brain stimulation produced during play significantly contributes to the growth and hardwiring of neural circuitry and that play deprivation results in biological regression of brain development. Although the research community has been clear on the benefits of play, for children with disabilities, play is often seen as a luxury rather than a benefit for their education. Children with mental retardation and other disabilities continue to be marginalized from playgrounds and opportunities for play when it should be an important part of their education. (Today,s Playground, March 2000) (Couldn't access the original article)

http://www2.state.id.us/dhw/ecic/SN/accessibility.htm

4. Passable

Virtual Reality in Design Prototyping

This reference discusses the use of virtual reality facilities to help designers design buildings and facilities that would make public transportation more accessible to those having cognitive disabilities, without the expense and risks associated with building prototypes.

The CoVE project,s Virtual Bus Stop is intended to be such a testing ground for proposals that the Mobility for All project has on how to make public transportation more accessible, especially to those who have cognitive disabilities.

• In Immersive Visualization, a user,s head and hand are „tracked‰ ˆ position and orientation data for each are reported back to the application ˆ so that the user,s movements in the physical world can be translated into actions in the virtual world.

• This allows intuitive manipulation within the virtual environment based on natural head and hand movements.

Future iterations will include placement of touch screens in the scene, as well as additional interactive elements to allow more detailed simulation of next-generation, assistive public transportation systems.

http://www.cs.colorado.edu/~l3d/clever/assets/flyer/cove-bus.pdf

4. Passable

Mobility for All: Community Access through Intelligent Mass Transportation Systems

This reference gives an overview of Mobility for All, a Cognitive Levers research project which aims to find solutions in making public transportation more accessible to people who have cognitive disabilities.

The Mobility for All project is focused on lowering barriers to community access and mobility for those with cognitive disabilities. Since operating an automobile is not a viable transportation option, we are designing frameworks and technologies to make mass transportation systems more accessible for those with cognitive disabilities who are capable of working or living independently.

Close to the Wall

The Mobility for All project seeks to identify and overcome cognitive barriers in modern mass transportation systems. Our approach is to create collaborative partnerships with assistive technology specialists, urban transportation planners, cognitive neuro-scientists and information technologists to better understand the subtle complexities of this problem.

Our team has surveyed transportation systems in four major US cities. We have studied how patrons plan, navigate, move ˆ and learn to use these complex systems. We have identified essential navigation artifacts including maps, schedules, signs, labels, landmarks, and clocks. We have also analyzed cognitive challenges encountered while planning, waiting, and moving on public transit systems. These challenges are daunting for unfamiliar users as well as those with cognitive disabilities ˆ and illustrate opportunities for designing new assistive technologies and that will benefit both the cognitively disabled and general public.

Design concept: a Location-Aware, User-Supportive Bus System. We envision several technologies could provide mobile, intelligent, and personalized information in multiple modes (visual, auditory, tactile). These technologies would simplify route planning, display boarding cues, and provide other personally contextualized information about buses as they arrive. The technologies could also communicate special user needs (e.g. a destination or needed connections; physical access needs; etc.) using wireless or smart tag technologies so bus system operators can assist the rider in boarding the correct bus and making connections. Location-aware wireless technologies could also be used to monitor trip progress ˆ while maintaining privacy ˆ or notify a caregiver if there are problems. We are collaborating with caregiver communities who teach the cognitively disabled to use public transportation systems, urban designers, and city transportation system experts to design enabling technologies and implement an initial design prototype.

http://www.cu.edu/ColemanInstitute/Aspen-material/Posters/mfa2.pdf

4. Passable

Travel Training for Youth with Disabilities

Part of this site includes an article which describes the phases used to train youth with mental retardation how to travel in an urban environment. *Travelling independently on public transportation is one occasion when a person with a cognitive impairment must perform with absolutely no assistance. Training a person with a cognitive impairment to use public transportation requires a comprehensive and individualized instructional program.*

http://www.nichcy.org/pubs/transum/ts9txt.htm#cognitive

4. Passable

Residences for persons with Disabilities

May 21, 1999

This John F. Kennedy Centre for Research on Human Development web page details the finding of research carried out on behavioural architecture and mental retardation.

American society has been ambivalent about where infirm elderly people, chronically mentally ill people, and people with mental retardation should be housed. Since the mid-nineteenth century, such people have often lived in large congregate care institutions. In more recent years, the trend has been to house persons with developmental disabilities in group homes, and most recently, in supported living (a house or apartment, typically with two adults with disabilities and an adult without a disability who supports their living as independently as possible). Of course, many adults with disabilities continue to reside with family members...

Research conducted from 1991 to 1994 revealed differences that distinguished physical features of residences as a function of perceived homelikeness and significant differences in resident behavior in those settings. The nature of possible causal relationships among architectural features, staff behavior, and differences in resident behavior remain ambiguous. However powerful the influence of physical features of residential architecture may be, the impact of those variables is likely to depend on characteristics of the program carried out by the staff in the residence and staff skills and qualifications. One mechanism that may influence the way

architectural features influence staff behavior toward residents is by altering their expectations about the residents, i.e., staff judgments will be conditional upon the features of the setting in which the resident is observed. The aim of this project was to evaluate possible indirect architectural prostheses in residential architecture for people with mental retardation and its interaction with staff and program characteristics. We examined the relations between (a) staff and program characteristics and (b) effects of architectures features on (c) behavior of people with mental retardation and staffing in group homes varying in homelikeness. The long-term goal is to develop guidelines for design so that advocates, administrators, developers, and policy makers will have a clear understanding of the relation between physical features of residential environments and their programmatic consequences.

http://www.vanderbilt.edu/kennedy/topics/residdis.html#doing

4. Passable

Appendix 4 – taken from www.aspergerinformation.net

Visual Thinking

It seems more or less commonly accepted that many, if not all, autistic brains employ a visual form of cognition (referred to as "Thinking in Pictures" by Temple Grandin). If you are not sure what I mean by being a visual thinker, the best description I have found is that given in the following article by Temple Grandin **'My Experiences with Visual Thinking, Sensory Problems, and Communication Difficulties'**. The bit on visual thinking is about half way through so you might want to just scroll down to it.

I am very interested to know if it is really the case that people with autism are visual thinkers, so I have been asking the question 'Are you a visual thinker?' on the site for the last couple of months, and I have had 75 responses.

The results surprise me, because I can't believe that 25% aren't visual thinkers, or at least don't consider themselves to be. I think it is interesting that just as many neurotypical people as autistic spectrum people identified with the description of visual thinking as given by Temple Grandin.

I should make myself clear... I'm not saying that I don't think people with autism are visual thinkers, whatever they consider the definition of that to be. My concern is that we are so eager to define ourselves by how our minds work that we are making unjustified assumptions.

Humans rely heavily on the sense of sight. I would think it was very unusual if we did not visualise a great many of our thoughts, or at least have the ability to do so if we chose.

I think there are lots of different ways to think and I think most people employ all or a combination of some of them. Some people will be weaker in some areas and stronger in others. People with autism may well often be stronger visual thinkers than most, perhaps compensating for being weaker in other forms of thinking such as verbal or language based perhaps.

I think one of the real problems is that we have no vocabulary to describe ways of thinking. Instead we must borrow words from the physical world, such as 'seeing' and 'hearing', and because our own thinking is all we know, we have nothing to compare it to... a bit like trying to describe what 'big' is in a world where everything is the same size.

Close to the Wall

AMAS research

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