"Eliminating Social Exclusion" (EliSE)

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Fair Traveling &Social Barriers

IO4 aims to create an interactive toolkit (the "Fair Traveling" toolkit) for supporting families of children with special needs when they are traveling as well as social educators. The main result is Recommendations for:

a) social educators;

b) social services;

c) companies delivering travel services.

The interactive toolkit is based on the difficulties studied by IO1 for parents for active participation (their own and their children's) in social life:

1. Difficult mobility of the child and the family

2. Lack of accessibility in the environment

3. Problems with the child's behavior in public places

4. Perception of negative public response and lack of acceptance by the community

5. Child safety in public places

Of late there has been growing interest in the potential of technology to support children with Autism Spectrum Disorders (ASD) with social and life skills. There has also been a burgeoning interest in the potential use of mobile technology in the classroom and in the use of such technology to support children with ASD. Building on these developments, the EliSE project has developed a mobile toolkit support application for smartphones, based on the principles of persuasive technology design, which supports children with ASD with social and life skills functioning – areas of ability which tend to be impaired in this population. Data was gathered using from teachers using direct classroom observation, individual semi-structured interviews, and questionnaires. Semi-structured interviews were also used to collect data from some parents and children. new factors are also identified, including student awareness of difficulties and associated motivation to change, and the preference of some children with ASD to receive persuasive messages from mobile devices. Particular issues related to the cognitive structure of children with ASD are considered. Further design guidelines are proposed for future implementations of similarly purposed technology tools student awareness of difficulties and associated motivation to change, and the preference of some children with ASD to receive persuasive messages from mobile devices. Having ASD, consequentially, leads to a very high risk of marginalization and social exclusion, with adolescence and early adulthood being especially

critical periods for individuals with ASD. They have a highly decreased chance of finding adequate jobs (and jobs at all), of managing an independent life, and of establishing long-term interpersonal relationships.

There is a parallel interest in the use of mobile technology to support people with cognitive disabilities due to traumatic brain injury, stroke or Alzheimer's disease, particularly in respect of providing support for travelling. The MAPS-Lifeline prototype (Carmien, 2004; Carmien et al., 2005) created a GPS-based mobile device system, which included dynamic monitoring by caregivers. Lindström (2007) reports on Swedish trials of navigation assistance systems based on mobile technology and GPS for people with cognitive disabilities. User reports indicated that reliability and ease of use were design priorities. The Opportunity Knocks project (Patterson et al., 2004) created a mobile GPSbased application to provide cognitive assistance to users with cognitive impairments using public transport. The system automatically detected the user's current mode of transportation, and using a heuristic learning algorithm, detected when the user does something unexpected such as missing their usual train station. Brown et al. (2011) report on their development and evaluation of an initial prototype of a GPSbased Android application to support route navigation based on serious gaming. Users with intellectual disabilities and sensory impairments rehearsed potential routes using the application games, potentially reducing reliance on the need for guidance and support during travel.

The HANDS software consists of a web based flexible toolkit that teachers use to develop specific support and intervention sequences specific to the need of each child. These sequences consist of a series of linked screens, each of which can include customizable text, images, video and sound. These customized "Personal Trainer" sequences can be linked to the associated comprehensive diary function also included in the software. Personal Trainer sequences can be stored as templates, and a sharing function allows teachers to adapt existing sequences for other children. The system also includes an electronic footprint feature that creates a log file record for every use of the mobile application by the child. The application was developed using Windows Dynamic Mobile and smartphones used included the HTC Diamond and HTC Touch HD. A pilot implementation in Android 2.2 was also undertaken. The intent of the designers in implementing this is to persuade users to be fair and honest in their transactions on the site. HANDS was one of the first projects to apply Persuasive Technology Design for use in educational settings. Based on the qualitative evaluation of the first prototype (Mintz et al., 2012), a number of improvements were introduced in to both the design and implementation procedure for the second HANDS prototype ("Prototype 2"), which was developed in the summer of 2010. These improvements included a more intuitive and less cluttered graphical user interface. Further, due to more extended beta testing with teachers before the application was released to the children for use, there was also a significantly higher degree of technical stability. Based on the pooling and sharing of the teachers' experience of using Prototype 1, there was also an improved online guidance system which included pedagogic case studies based on instances of successful use, and a shareable image library. Sharing of the ongoing development of best practice use between teachers was also facilitated by regular online meetings where experiences with individual children were shared. Teachers were asked to make use of the best practice examples derived from the experience in Prototype 1 and to choose a relevant life skill related situation and social skill related situation that proved to be difficult for the child. For example, for one child the life skill task was getting on the bus independently and the social skill task was to use the telephone and pass on a message to their teacher. Teachers took the primary

responsibility for designing interventions to support life or social skill functioning in the context of these situations.

Autism is characterised by differences in social skills, limited communication abilities and repetitive behaviour, which often result in increased reliance on other people. Transportation is but one task that is commonly burdened on family members. Public transport is an inexpensive and widely available form of travel which facilitates independence. However, it presents unique challenges for individuals on the spectrum, as it requires complex skills including, but not limited to, understanding abstract information (e.g., maps, service schedules, etc.), problem-solving unexpected situations and timely management of transfers. As such, most individuals on the autism spectrum do not use public transport and have never considered using it. Here we evaluate the effectiveness of an autism-specific public transport app, OrienTrip, with autistic individuals and allied health professionals. It found that OrienTrip is effective in facilitating public transport use for autistic individuals. Individuals on the autism spectrum expressed their satisfaction with the app and agreed that it makes public transport easy to use. Similarly, allied health professionals also indicated that OrienTrip is helpful in assisting autistic individuals use public transport safely. Autism is a condition characterised by differences in social skills, limited communication abilities and repetitive behaviour, which often result in increased reliance on other people for everyday practices. Transportation is but one task that is commonly burdened on family members. Public transport is an inexpensive and widely available form of mobility, which facilitates independence and frees the burden of assisted travel. It also has noted support among autism communities for its capacity to provide greater autonomy and improve quality of life. However, this form of travel presents unique challenges for individuals on the spectrum, as it requires skills including, but not limited to, understanding abstract information (such as maps, service schedules, signs and landmarks), problem-solving unexpected situations, and timely management of transfers. As such, we have developed a public transport trip-planner mobile application called OrienTrip, which was co-produced with autistic individuals, to make public transport use easier for people on the autism spectrum. Here, we evaluate the effectiveness and efficacy of OrienTrip through two pilot studies. OrienTrip is a public transport trip-planning mobile application co-produced by autistic individuals to facilitate independent travel for people on the autism spectrum. Five principles guided the development process. These are (1) safety, (2) increasing spatial awareness, (3) facilitating communication, (4) alleviating anxiety and sensory overload, and (5) simplifying trip planning.

Mobility Barriers

The most important objective of the survey was to identify the mobility barriers encountered by adults with ASD. Pertinent to this objective, a number of questions were included in the survey that addressed issues related to the use of a specific mode, including walking, driving, taking rides from others, and taking public transit. The responses from the survey are summarized below for each mode.

Barriers to Walking

The survey respondents were given a list of potential barriers that could prevent them from walking in their neighborhoods. The list included the absence or poor quality of sidewalks, the absence of streetlights, poor quality of intersections or street crossings, traffic speed and volume, crime, and the absence of destinations nearby. In addition, the respondents were allowed to select a separate category called “Other” and specify barriers that were not in the list. The barriers selected by most

respondents from the list were absence of destinations (25.0% of respondents), traffic speed and volume (24.9%), and absence or poor quality of sidewalks (17.4%). The barriers selected least commonly were crime (5.3% respondents), absence of streetlights (8.7%), and poor quality of intersections and crossings (11.9%). Perhaps more important, 28.2% of the respondents selected the "Other" category and invariably specified their impairments related to the disability as barriers to walking. Thus, although the responses showed that some of the environmental barriers to walking encountered by the general population are also encountered by persons with ASD, the latter encounter additional barriers because of their impairments.

Although individuals without ASD might not think of walking in their neighborhoods as a difficult task, walking requires certain skills and abilities that many persons with ASD do not have. To examine whether the respondents had the critical skills to walk safely in their neighborhoods, they were asked whether they had any difficulty with various aspects of walking. Once again, they were given a list and instructed to indicate whether they had difficulty with one or more aspects. The responses are summarized in Table 5. It is evident from the responses that such basic skills as crossing roads, judging vehicle distance, and determining direction, which persons in the general population take for granted, are difficult for a large proportion of persons with ASD. In addition, a substantial proportion of persons with ASD also have to deal with distractions while walking because of their disability. Because of these difficulties, 53.5% of the respondents indicated in response to another question that they did not know how to safely cross a road without assistance from others.

Barriers to Driving

Unavailability of vehicles in their households is not a barrier to driving for most surveyed adults with ASD. The survey revealed that only 3.6% of the respondents lived in households without any vehicles; 26.4% lived in households with one vehicle, 46.9% lived in households with two vehicles, and 23.1% lived in households with three or more vehicles. However, only 9.3% of the adults with ASD had a driver's license and many used it only as an identity card instead of as an actual license to drive. Of the 47 individuals who had a driver's license, 61.4% mentioned that they had some form of difficulty when driving. In response to a question inquiring about specific difficulties, 55.3% of the persons with a driver's license mentioned difficulty dealing with traffic, 34.0% mentioned difficulty caused by distractions near roads, 27.7% mentioned difficulty judging distance, and another 27.7% mentioned difficulty with parking. Because of these difficulties, 26.1% of those with driver's licenses did not drive at all, 19.6% drove less than once a week, 30.4% drove once or more a week, and only 23.9% drove daily.

Recommendations

Guideline 1: work with the children to identify needs

Our evaluation indicates that in line with the general literature on persuasive technology, mobile persuasive interventions for children and young people with ASD are more likely to be effective if the child is both a) aware of difficulty/issue and recognizes as such, and b) motivated to achieve positive behaviour change. Teachers should develop interventions for similar systems based on a recognition of the fact that student awareness of needs and internal motivation for behaviour change is a key mediating factor. Rather than starting from a position of "teacher knows best", they should work collaboratively with children and young people to identify interventions that the child or young person themselves assents to. Further, strong consideration should be given, in school based

implementations, of such systems, to increasing the autonomy of the child or young person in terms of their level of control over the interventions that are developed for them on HANDSlike systems.

Although some level of adult supervision and facilitation will always be required in school based implementations, the balance should be "tipped" further towards the child's own control of the development of interventions.

Guideline 2: identifying which children will benefit most

In Guideline 1, we recommend that teachers focus on identifying needs from the child's perspective. This is clearly crucial, however, some children will, due to cognitive impairments, find it much more difficult to be aware of social and life skill difficulties that are important factors contributing to their exclusion from educational and social opportunities. In such cases, instantiating behavioural messages on HANDS-like systems is not likely to contribute to bringing about positive behaviour change.

Alternatively, our evaluation indicates that some children with ASD may be particularly well suited to the use of this technology. Children who do have an awareness of social and life skill difficulties that are proving to be obstacles to inclusion, and who are concomitantly motivated towards behaviour change, are much more likely to prove receptive. Further, our finding that some young people with ASD may have a preference to receive behaviour change messages from mobile devices rather than from adults is particularly important, especially given the existence of two potential explanatory accounts for this phenomenon. The first of these accounts, an underlying impairment in cognitive processing speeds, could also have potential application to other groups with this type of impairment, such as young people with Attention Deficit/Hyperactivity Disorder (see Mayes & Calhoun, 2007). The second account, which explains the preference based on the young person's desire for autonomy, i.e. it's better than being nagged by your teacher, further emphasizes the need to put more stress on the views of young people with ASD when making decisions about which interventions to implement and how to structure them.

References

Amber, N., Schrodt, P., Witt, P., Elledge, N., Jernberg, K., & Larson, L. (2009). A meta-analytical review of teacher credibility and its associations with teacher behaviors and student outcomes. Communication Education, 58(4), 516–537.

Aurora. (2000). The Aurora project. Retrieved 25.11.11, from. updated 2008. http://www.aurora-project.com. Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. Psychological Review, 84(2), 191–215. http://dx.doi.org/10.1037/0033-295X.84.2.191, American Psychological Association.

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. Journal of Social and Clinical Psychology, 4(3), 359–373, Guilford Publications. Retrieved from. http://www.atypon-link.com/GPI/doi/abs/10.1521/jscp.1986.4.3.359.

Bandura, A. (1991). Human agency: the rhetoric and the reality. American Psychologist, 46(2), 157–162. http://dx.doi.org/10.1037/0003-066X.46.2.157.

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? Cognition, 21(1), 37–46.

Bernard-Opitz, V., Sriram, N., & Nakhoda-Sapuan, S. (2001). Enhancing social problem solving in children with autism and normal children through computer-assisted instruction. Journal of Autism and Developmental Disorders, 31, 377–384.

Brown, D. J., McHugh, D., Standen, P., Evett, L., Shopland, N., & Battersby, S. (2011). Designing location-based learning experiences for people with intellectual disabilities and additional sensory impairments. Computers & Education, 56(1), 11–20.

Carley, K. (1990). Content analysis. In R. E. Asher (Ed.), The encyclopaedia of language and linguistics. Edinburgh, UK: Pergamon Press.

Carmien, S. (2004). Task support for people with cognitive impairments and their caregivers. American Journal of Occupational Therapy, 4, 1–4.

Carmien, S., Dawe, M., Fischer, G., Gorman, A., Kintsch, A., & Sullivan, J. F. (June 2005). Socio-technical environments supporting people with cognitive disabilities using public

transportation. ACM Transactions on Computer-Human Interaction, 12(2), 233–262.

Carter, A. S., Volkmar, F. R., Sparrow, S. S., Wang, J.-J., Lord, C., Dawson, G., et al. (1998). The Vineland Adaptive Behavior Scales: supplementary norms for individuals with autism. Journal of Autism and Developmental Disorders, 28(4), 287–302.

Charman, T., Howlin, P., Berry, B., & Prince, E. (2004). Measuring developmental progress of children with autism spectrum disorder on school entry using parent report.

Autism: The International Journal of Research and Practice, 8(1), 89–100. http://dx.doi.org/10.1177/1362361304040641.

Cohen, L., Manion, L., & Morrison, K. (2007). Research Methods in education (6th ed.). London, UK: Routledge Falmer.

COMScore. (2012). 2012 Mobile future in focus [Online]. Available. http://www.comscore.com/Press_Events/Presentations_Whitepapers/2012/2012_Mobile_Future_in_Focus

Dautenhahan, K., & Werry, I. (2004). Towards interactive robots in autism therapy: background, motivation and challenges. Pragmatics and Cognition, 12(1), 1–35.

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: a macrotheory of human motivation, development, and health. Canadian Psychology/Psychologie Canadienne, 49(3), 182–185. http://dx.doi.org/10.1037/a0012801.

Dexter, S. L., Anderson, R. E., & Becker, H. J. (2000). Teachers' views of computers as catalysts for changes in their teaching practice. Journal of Research on Computing in Education, 31(3), 222–232.

Farr, W., Yuill, N., & Raffle, H. (2010). Social benefits of a tangible user interface for children with Autistic Spectrum conditions. Autism, 14(3), 237–252.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: a hybrid approach of inductive and deductive coding and theme development.

International Journal of Qualitative Methods, 5(1), 80–92.

Fogg, B. J. (2003). Persuasive technology. Using computers to change what we think and do. San Francisco, CA: Morgan Kaufman Publishers.

Fogg, B., Cuellar, G., & Danielson, D. R. (2008). Motivating, influencing, and persuading users. In J. A. Jacko (Ed.), The handbook of human-computer interaction (pp. 359–370).

CRC Press.

Fogg, B. J., & Eckles, D. (2007). Mobile persuasion. 20 perspectives on the future of behavior change. Stanford: Stanford Captology Media.

Fombonne, E. (2003). Epidemiological surveys of autism and other pervasive developmental disorders: an update. Journal of Autism and Developmental Disorders, 33(4), 365–381.

Frith, U., & Happé, F. (1994). Autism: beyond "theory of mind". Cognition, 50(1–3), 115–132, The MIT Press.

Gentry, T., Wallace, J., Kvarfordt, C., & Lynch, K. B. (2010). Personal digital assistants as cognitive aids for high school students with autism: results of a community-based trial.

Journal of Vocational Rehabilitation, 32, 101–107.

Glover, D., & Miller, D. (2001). Running with Technology: the pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school. Technology,

Pedagogy and Education, 10(3), 257–278.

Hammersley, M., & Atkinson, P. (2007). Ethnography in practice (3rd ed.). London, UK: Routledge.

HANDS Project. (2011). The HANDS project. Retrieved 28.12.11, from. www.hands-project.eu.

Haskins, B. G., & Silva, J. A. (2006). Asperger's disorder and criminal behavior: forensic psychiatric considerations. Journal of the American Academy of Psychiatry and the Law, 34, 374–384.

Howlin, P. (2004). Autism and Asperger Syndrome: Preparing for adulthood. London, UK: Routledge.

Jason, J. T., & Herring, J. E. (2005). Teacher influence in the classroom: a preliminary investigation of perceived instructor power, credibility, and student satisfaction.

Communication Research Reports, 22(3), 235–246.

Lindström, J. (2007). Safe navigation with wireless technology. In P. R. W. Roe (Ed.), Towards and inclusive future: Impact and wider potential of information and communication technologies. Brussels: COST.

Luna, B., Doll, S. K., Hegedus, S. J., Minshew, N. J., & Sweeney, J. A. (2007). Maturation of executive function in autism. Biological Psychiatry, 61(4), 474–481. http://dx.doi.org/ 10.1016/j.biopsych.2006.02.030.

Matzen, N. J., & Edmunds, J. A. (2007). Technology as a catalyst for change: the role of professional development. Journal of Research on Technology in Education, 39(4), 417–430.

Mayes, S. D., & Calhoun, S. L. (2007). Learning, attention, writing, and processing speed in typical children and children with ADHD, autism, anxiety, depression, and oppositional-defiant disorder.

Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood and Adolescence, 13(6), 469–493.

Mechling, L. C., Gast, D. L., & Seid, N. H. (2009). Using a personal digital assistant to increase independent task completion by students with autism spectrum disorder. Journal of Autism and Developmental Disorders, 39(10), 1420–1434. http://dx.doi.org/10.1007/s10803-009-0761-0.

Meschtscherjakov, A. (2009). Mobile attachment – Emotional attachment towards mobile devices and services. In The Proceedings of the 11th International Conference on human-computer interaction with mobile devices and services, Mobile HCI'09. Bonn, Germany.

Miles, B., & Huberman, N. (1994). Qualitative data analysis: An expanded sourcebook (2nd ed.). CA: Sage.

Mintz, J., Branch, C., March, C., & Lerman, S. (2012). Key factors mediating the use of a mobile technology tool designed to develop social and life skills in children with Autistic

Spectrum Disorders. Computers & Education, 58(1), 53–62. http://dx.doi.org/10.1016/j.compedu.2011.07.013.

Mitchell, P., Parsons, S., & Leonard, A. (2007). Using virtual environments for teaching social understanding to 6 adolescents with autistic spectrum disorders. Journal of Autism and Development Disorders, 37(3), 589–600.

Moore, D., & Taylor, J. (2000). Interactive multimedia systems for students with autism. Journal of Educational Media, 25(3), 169–177.

Ozonoff, S., Pennington, F.,B., & Rogers, J.,S. (1991). Executive function deficits in high-functioning autistic individuals: relationship to Theory of Mind. Journals of Child Psychology and Psychiatry, 32(7), 1081–1105.

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Parsons, S., Mitchell, P., & Leonard, A. (2004). The use and understanding of virtual environments by adolescents with autistic spectrum disorders. Journal of Autism and Development Disorders, 34(4), 449–466.

Patterson, D., Liao, L., Gajos, K., Collier, M., Livic, N., Olson, K., et al. (2004). In N. Davies, E. D. Mynatt, & I. Siio (Eds.). UbiComp 2004: Ubiquitous computing, Vol. 3205 (pp. 433–450). Berlin, Heidelberg: Springer Berlin Heidelberg. http://dx.doi.org/10.1007/b99948.

Ploug, T., Hasle, P., & Oinas-Kukkonen, H. (Eds.), (2010). Proceedings of the 5th international conference on persuasive technology. New York: Springer.

Rayner, C., Denholm, C., & Sigafoos, J. (2009). Video-based intervention for individuals with autism: key questions that remain unanswered. Research in Autism Spectrum Disorders, 3(2), 291–303.

Shea, V., & Mesibov, G. (2005). Adolescents and adults with autism. In (3rd ed.). In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.)., Handbook of autism and pervasive developmental disorders, Vol. 1 (pp. 288–311) Hoboken, NJ: Wiley.

Tentori, M., & Hayes, G. (2010). Designing for interaction immediacy to enhance social skills of children with autism. In J. Bardram, M. Langhenreich, K. Truong, & P. Nixon

(Eds.), Proceedings of the 12th ACM international conference on ubiquitous computing (pp. 51–60). New York, NY: The ACM Press. http://dx.doi.org/10.1145/ 1864349.1864359.

Thweatt, K. S., & McCroskey, J. C. (1998). The impact of teacher immediacy and misbehaviors on teacher credibility. Communication Education, 47, 348–358.

Volkmar, F. R., Lord, C., Bailey, A., Schultz, R. T., & Lin, A. (2004). Autism and pervasive developmental disorders. Journal of Child Psychology and Psychiatry, 45(1), 135–170.

Wainer, A. L., & Ingersoll, R. (2010). The use of innovative computer technology for teaching social communication to individuals with autism spectrum disorders. Research in Autism Spectrum Disorders, 5, 96–107.

Wallace, S., Parsons, S., Westbury, A., White, K., White, K., & Bailey, A. (2010). Sense of presence and atypical social judgments in immersive virtual environments. Responses of adolescents with Autism Spectrum Disorders. Autism: The International Journal of Research and Practice, 14(3), 199–213. http://dx.doi.org/10.1177/1362361310363283.

Wing, L., & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: epidemiology and classification. Journal of Autism and Developmental Disorders, 9, 11–29.

Yin, K. (1981). The case study crisis: some answers. Administrative Science Quarterly, 26, 58–65