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Movement, Technological Mediation and Embodied Interactions, in the Education of children with autism.

by

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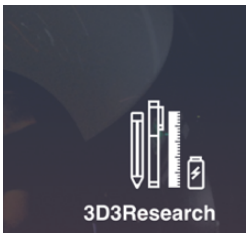
transtechnology research



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Acknowledgements

Whilst the PhD writing becomes a process of reflection in itself, on the research endeavours of course, but also as a place to document personal growth and experience. At certain points in this thesis I read it knowing what I was doing, where I was sitting, who recommended the paper, and who has kindly proof read which sections. This is the part of the thesis only I can see and read. It makes this document a very personal one.

Firstly, I need to reflect on how I even ended up here. Thank you to Ruth Way and Becky McKenzie who saw something in me as an undergraduate student and instilled confidence enough to enrol on my Master of Research Dance degree. The path you saw for me was beginning, but took off after the suggestion to go and meet Martha Blassnigg for a chat about research funding once the MRes was over. Little did I know that meeting would change my life. Martha was a dream! She took me under her wing from that very day and helped me see what the others had, she encouraged me to apply for a PhD with her (something that had never even crept into my mind beforehand). The first year of my PhD was so easeful, so enjoyable, and then her sudden death pulled the rug from underneath all of us. Martha, you are missed and I will forever be grateful for your influence and encouragement.

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Now for those special people, to name just a few here, it feels right to start with darling husband, Matt. We met just 6 months into the PhD and you have helped keep me grounded throughout it all… even if sometimes you are so rational about it that I have to remind you it is still a pretty mean feat. I love you dearly and feel so lucky to have gone on this ride with you, not only this PhD but our wedding (surrounded by our loved ones), our travels around the globe, all the house moves (mainly my fault, sorry!) and now to be settled into our new life and jobs in Bristol. Reflection is a wonderful thing hey, but not as wonderful as you!

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

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A programme of advanced study was undertaken, based with the Transtechnology Research Department in the School of Art and Media, and through a Post Graduate Certificate in Autism (Children) via Birmingham University and a Post Graduate Certificate in Therapeutic Play via Leeds Beckett University. Relevant Seminars and Conferences were regularly attended, at which work was presented. The following list of publications, conferences and academic workshops evidence all public outcomes completed during the Doctoral Programme. Any further information is available online: http://www.trans-techresearch.net/research/phd-research/phd-candidates/abigail-jackson/

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Research Dissemination

Publications

Jackson, A. (2018) Contingency in Embodied Interactions. In M. Punt & Drayson, H. (2017) Transtechnology Reader 2018. Plymouth: Transtechnology Research

Jackson, A. (2018) *A Resonant Touch.* In M. Punt & Drayson, H. (2017) *Transtechnology Reader 2015/17.* Plymouth: Transtechnology Research Pp: 102 – 115

Stamboliev, E & Jackson, A. (2018) *Human Devices: Instrumentation of Physicality in Performance* In M. Punt & Drayson, H. (2017) *Transtechnology Reader 2015/17.* Plymouth: Transtechnology Research Pp: 90 – 99

Łucznik, K., Jackson, A., Sakuta, A., & Siarava, E. (2017). Let's Improv It: The embodied investigation of social collaboration [Special Issue]. *AVANT*, 8, 301–310. doi:10.26913/80s02017.0111.0027

Jackson, A. (2016) Empathy. Mimicry. Touch. In. S. Denham & M. Punt, ed. (2016) Off the Lip, Transdisciplinary Approaches to Cognitive Innovations, Conference Proceedings, Plymouth: CogNovo and Transtechnology Research. Pp: 146 – 160

Jackson, A. (2014) Re-contextualising Empathy and Consciousness within the Study of Developmental Disorders In. M. Punt & M. Blassnigg, ed. (2014) Media Archaeology and Cognition – Transtechnology Reader 2014/15, Plymouth: Transtechnology Research Pp: 208 – 245

Conference Papers

Technology in the education of autistic children: the lasting effects on isolation through adulthood. Autism: A Morning of Sharing - Tables, Talks and Tea, 2018 at Plymouth University [Sept 2018]

Let's Improv It: the embodied investigation of social collaboration. Off the Lip Conference, 2017 at Plymouth University. In collaboration with Klara Łucznik, Aska Sakuta and Eleonora Siarava [Aug 2017]

Movement, Technological Mediation and Human Interaction: Case studies through Participatory Action Research. Methodological Innovations Conference, 2017 at Plymouth University [May 2017]

Evaluation of collaborative practice for autistic participants: Case studies of Participatory Action Research from interdisciplinary research and Occupational Therapy. Methodological Innovations Conference, 2017 at Plymouth University. In collaboration with Lauren Flook [May 2017]

Autism and Movement: How the body becomes a tool for interaction. The Beyond

Words Conference at Plymouth University [March 2017]

Seminar Presentations

Contingency in Embodied Interactions. Transtechnology Slow Conference 2017/18 Revisiting Ideoplasticity: Contingency, Action, and Imagination at Plymouth University. [April 2018]

Collaboration Through Movement and Touch. The Performance. Experience. Presence (P.E.P) Research Group at Plymouth University. [Nov 2016]

Human Devices: Instrumentation of Physicality in Performance. Transtechnology Research Department's Tropes of Affect: Devices, Narrative and Illusion at Plymouth University In collaboration with Eugenia Stamboliev [Oct 2016]

Ephemeral Affections - A Resonant Touch. Transtechnology Research Department's Cognition and the Image of Affection: Instrumentation, Realism and Technology at Plymouth University [Jan 2016]

Workshops

'Flocking' as an Embodied Sharing of Situational Conditions. Embodiment Practice and Performance in the Arts Conference 2018, Canterbury Christ Church University. In collaboration with Aska Sakuta [April 2018]

Let's Improv It. Embodiment Practice and Performance in the Arts Conference 2018, Canterbury Christ Church University. In collaboration with Klara Łucznik, Aska Sakuta and Eleonora Siarava [April 2018]

Let's Improv It. Dance & Somatic Practices Conference 2017, Coventry University. In collaboration with Klara Łucznik, Aska Sakuta and Eleonora Siarava [July 2017]

A Space to Wonder. Dance Fields Un-Symposium, Coventry University. In collaboration with Klara Łucznik [Nov 2016]

A Space to Wonder. Off the Lip 2016 Transdisciplinary Approaches to Cognitive Innovation, Plymouth University. In collaboration with Klara Łucznik, Eugenia Stamboliev and Ali Northcott [Oct 2016]

Let's Improv It. ColLaboratoire - The CogNovo Summer School, 2016, Plymouth University. In collaboration with Klara Łucznik [Aug 2016]

Poster Presentations

Mimicry, Empathy, Touch & Technology. Postgraduate Society Research Showcase, Plymouth University. [Mar 2018]

Let's Improv It. Dance Fields: Staking a Claim for Dance Studies in the 21st Century, Roehampton University. In collaboration with Klara Łucznik, Aska Sakuta and Eleonora Siarava [April 2017]

External Research Roles

Senior Research Associate with The University of Bristol
Oct 2018 – Present

This post is within The School of Psychological Science at The University of Bristol. The role of Senior Research Associate sees me lead on a project titled: "AboutFace: Testing an app to improve emotional face processing in autism spectrum disorder ASD". The project is funded by the MRC Integrative Epidemiology Unit at the University of Bristol and requires close work with external collaborators, in particular those in local schools dedicated to the education of autistic children. The project involves preliminary testing of an app-based intervention that teaches emotional processing and facial recognition, and has been specifically designed for use with autistic children. My role will include further development of the intervention that will run alongside the app, and entails working closely with staff and students at the participating schools to identify how the intervention can be integrated into the wider educational framework.

SEN Research & Development Associate with The University of Lincoln
June 2017 – November 2017

The post is in partnership with Innovate UK and The Knowledge Transfer Partnership yet is situated in the School of Psychology in the College of Social Sciences at the University of Lincoln. The role is to assist in the research connected to technology-based strategies that show promise for mediating learning for people with autism and/or Special Educational Needs (SEN). I am also responsible in assisting the management of the project, publish findings and disseminate the research at academic conference, as well as work closely with the technology designers, schools and pupils to develop and deliver new play activities and training for teachers.

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Thesis Abstract

The thesis offers insight into an embodied practice informed by childhood development studies, cognitive science, and pedagogy as an iterative approach to develop creative alternatives to the application of solo engagement with technologies in the education of autistic children. Through the diverse experiences enabled by the project's dual practice and theoretical approach, this work evidences alternative ways to reflect on the education of autistic children, and reports methods that can offer the education sector ways to support children exposed to computer technologies in education through more holistic methods.

The thesis advocates for an approach, developed through the practice-research method, that works with computer technologies socially, to engage children, rather than resorting to the commonly seen isolated interactions. The concept of a hybrid offers an alternative to binary, either/or, approaches to consider the role of ICT in special needs education, and instead suggests a more productive triad of approaches premising adaptation over compromise. This triad, suggests three areas of interest; autism, education and technological advances. By applying techniques such as improvisation, somatic movement techniques and participant observation, the thesis proposes a reconsideration of existing interventions in order to promote holistic development, rather than short-term temporary solutions.

The practical research of one-to-one movement interactions, with autistic children, is a method basing its approach at the intersection between traditional interventions and therapies, reliant on human interaction, and more recent technological advances developing as a result of ICT use in schools. The focus on the diagnosis of autism leads the thesis to focus on themes relating to human interaction. Empathy, mimicry and touch are developed as central concerns due to their placement in literature surrounding both childhood development and movement practices.

The thesis suggests how Dance and Movement practices may offer insights into adapting such engagements with technologies within the education sector. The research advocates for a hybrid model throughout the education of autistic children. It reports a body of practice-research using movement with autistic children, as the participants, that situates and explores themes of embodiment.

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Introduction

During my BA Hons Dance Theatre degree, I was introduced to Contact Improvisation, Somatic Movement Practices and Community Dance. At the time, these three techniques and approaches taught me about inclusivity and the benefits to movement for a wide variety of people, regardless of ability. Community Dance in particular saw us encouraged to find a 10-week placement and I sought for a school setting with children of mixed ability. This experience allowed me to implement movement and social interaction when supporting pupils who had limited verbal communication, and often isolated themselves from their peers. The field of Community Dance is inclusive in its design and delivery, inspiring acknowledgement of the potential to create a more holistic environment for development and personal growth.

Prior to this my only knowledge of autism was through Mark Haddon's 2004 novel titled *The Curious Incident of the Dog in the Night-time*[1]*.* This book is written from the point of view of a 15 year old autistic boy and gave me a limited insight into how autism might manifest itself. Yet, in the placement setting I unknowing gravitated to a number of autistic children, and was later asked about my interest in autism, which I had not yet developed. This conversation inspired me to learn more and even at this early stage I felt passionate about working with these children, and made autism a focus in my undergraduate degree dissertation. This naturally led to employed work but also to the Masters of Research, Dance, where I focused on non-verbal communication and through time spent with autistic children in the school environment I began to consider the impact of the increased use of Information Communication Technologies (ICT) in the education of autistic children.

This experience influenced the PhD topic and helped shape the thesis argument. Due to the exposure to ICT in education, I have chosen to establish a brief historical overview of its placement in the UK school system in the first chapter. By highlighting the potential impact associated with autistic children's use of ICT I acknowledge the extent of denial surrounding the detrimental effect

[1] This text is also reference in Nicola Shaughnessy's 2016 paper titled *Curious Incidents: Pretend Play, Presence, and Performance Pedagogies in Encounters with Autism.*

this may have on social skill development. These considerations will offer reinforcement for my experiences through the practical research, therefore the methods used in response to the problems realised, by promoting adaptation, show the application of technologies in movement sessions with autistic children. This thesis aims to highlight the benefits of adaptation when considering how technologies could, and should, be approached in the education of autistic children. Creativity is advocated for, to reduce the adverse effect conventional, solo use, technologies have on social interaction. My thesis shows how this understanding, when applied, could promote holistic development through embodied interactions. When considering the need for this work, Nicola Shaughnessy has stated the following:

> The autistic state is associated with isolation and withdrawal from the social world; the container is a recurrent metaphor in writing about the condition. Those with the diagnosis are locked in their own world while 'neurotypicals' search for the key to open the doors to access and understanding. Such metaphors are problematic, however, reinforcing negative and 'deficit' models of disability and compromising personhood by reducing individuals to condition. (Shaughnessy, 2013: 322)

That being considered, the concerns regarding a *neurotypical aiming to unlock the doors* has been mitigated through an ethnographic approach and participant observation method. This thesis uses practice with autistic participants to ensure a project that is mindful of the current effects technology has on a child's educational experience, to ensure this research promotes positive change. This will allow us, as adults interacting with autistic children, to introduce positive approaches whilst drawing on emerging research to ensure we are open minded to the developments within industry, and adapt technologies not fit for purpose. It is also supported by approaches, like my own, where the experience of interacting with autistic participant influences the direction of the theoretical research. This decision was based also on the need to mitigate the risk of becoming another researcher silencing the voice of the autistic individual, as articulated here by Damion Milton:

> Although, compared with many categorisations of disability, autism has attained a great deal more public attention and one could say that the label has become a fetishised commodity and even a global industry (Mallet 2011), it is an industry that silences the autistic voice from any participation, other than in the form of a tokenistic gesture. Therefore, far from owning the means of mental production about one's own culture, the 'autistic individual' often becomes the 'product' of the industry, the 'thing' that is 'intervened' with. 'Services' are provided for the

> carers of ‘autistic people’, often with little attention given to the needs of the ‘autistic person’ as they perceive them to be. Autism is not just an ‘invisible disability’ to many in terms of a behavioural definition; the ‘autistic voice’ is made ‘invisible’ within the current culture of how knowledge is produced about ‘autistic people’, often excluding empowered ‘autistic advocates’ from the process. (Milton, 2012: 885)

As an attempt to avoid these concerns ethnographic and participant observation methods were applied in the context of my thesis is Specialist Education[2] for primary school aged autistic children - in the United Kingdom - and aims to examine the effect of the influx of computer technologies, whilst acknowledging that the digital world is now present in our everyday lives. My research concentrates on the variety of effects that daily engagement with computer technologies may have for autistic children; a diagnosis explored fully through Chapter Two. The thesis aims to highlight the increased use of these technologies in the education sector, whilst revealing that the adverse effects have the potential to outweigh the considered benefits if adaptation is not prioritised. It situates the discussion through a thesis that also offers a practical methodology; which moves us closer to addressing the problems[3] by encouraging embodied interaction with technological mediation embedded in the practice. So, by suggested processes of adapting computer technologies, I am not proposing a short-term solution. This is a presentation of research, connecting between disciplines, that can be seen to promote the use of computer technology in the education of autistic children, but argues that it needs to be done so alongside, or embedded in, creative tools, to begin to introduce embodied interactions.

Chapter Outline

Through the main body of this thesis I acknowledge the core disciplines my research is in association with, that being The Arts and The Social Sciences primarily, as well as critically offering an explanation for the direction of the

[2] The *SEND code of practice: 0 to 25 years* (available on the gov.uk website) states the following: For children aged two or more, special educational provision is educational or training provision that is additional to or different from that made generally for other children or young people of the same age by mainstream schools, nursery schools, mainstream post-16 institutions or by relevant early years providers. For a child under two years of age, special educational provision means educational provision of any kind.

[3] The problems in question will be contextualised throughout the first two parts of the thesis yet will be explicitly addressed in Chapter Five and Chapter Six.

research project. Within the thesis the argument has been split into three Parts; the rationale being to demonstrate this interdisciplinary topic. These Parts then feature two separate chapters each to the research process, from its initial stages, in the form of topic specific contextualisation. This will allow the presentation of knowledge acquired; concluding the thesis will be a report on practice outlining the application of research through the practical research (evidence through Chapter Six).

Part One addresses *Computer Technology in Education, Autism & Neurodiversity,* by offering the reader a comprehensive understanding of the placement of computer technology in the education sector. This is supported by a thorough overview of the integration of Information Communication Technologies (ICT), in mainstream and in Special Educational Needs (SEN) schools. The presentation of Neurodiversity will then focus on autism through a historical context of diagnoses, as well as in the wider context of the thesis argument.

The first of the thesis is titled *Chapter One: Computer Technology in Education,* and will explicitly address the use of ICT in Education in the broadest sense, sharing knowledge of the public introduction of from the 1980s and the resulting increased reliance on ICT in the education sector. This historical overview will highlight key developments and the pressures on (and from) industry to create educational software and hardware. The influence of technological integration will provide evidence of their place in inclusive school environments; the chapter will end with an overview of their placement in Special Educational Needs (SEN) schools and how autistic children interact with them. This chapter will form the basis of the discussion about the use of ICT and how this has been validated through teaching styles, initially, and our daily lives, as well as the development of specific ICT based interventions for those with a diagnosis of autism[4].

This process will allow for a more specific introduction of *Neurodiversity*, whilst addressing autism in the context of education, through Chapter Two; titled *Chapter Two: Autism & Neurodiversity*. Information will specifically position autism in the wider research project by giving contextual information including a detailed historical overview of the initial research by Leo Kanner and Hans

[4] Which become the focus of chapters three and four.

Asperger which led to the formal classification of autism in the late 19th Century. This chapter develops an explanation of the diagnostic process, used within the United Kingdom, by introducing the work of Lorna Wing and Judith Gould, whose research was paramount in the concept of the autism as a *spectrum*, as well as establishing *The Triad of Impairments* (1979). The introduction and explanation of this diagnostic framework will allow for research concerning the outcomes of autism and how this may be evidenced for a child holding this diagnosis.

Furthermore, this second chapter will contextualise autism and the wider field of Neurodiversity by addressing how autism is historically discussed as being part of a group of psychiatric conditions originating in childhood that involve serious difficulties in various areas. The historical overview will support an understanding of *The Triad of Impairments* by giving specific information to attend to the placement of Social Communication, Social Imagination and the *Theory of Mind*, and Social Interaction - in the diagnosis of autism. The latter section of the chapter will acknowledge research into late diagnosis or misdiagnosis, additional diagnoses and those diagnoses that present similar outcomes to a diagnosis of autism.

Part Two of this thesis is titled *Interventions,* and will introduce and evidence the wider educational setting for autistic children; underpinning a more rigorous critique of the reliance of computer technologies in the education sector. To do so *Chapter Three*: *Traditional Interventions in the Education of Autistic Children,* provides an outline of pedagogic techniques and therapeutic interventions with more clarity, by referencing traditional interventions that are used independently of technological mediation within the education system. Here Early Intervention will be introduced alongside individualised interventions used within UK schools, specifically for autistic children. These have been chosen due to their focus on individuals and therefore being adaptable in nature: *Treatment and Education of Autistic and related Communication handicapped Children* (TEACCH), *Picture Exchange Communication System* (PECS) and *Intensive Interaction*. Therapeutic Interventions (also seen applied within the education sector) will be introduced by first discussing my training in Play Therapy, but also commenting on Occupational Therapy, and Speech and Language Therapy.

To resolve Part Two, the conversation acknowledges ICT's place within this framework (the education for autistic children) underpinned by the inclusion

of interventions and approaches that are reliant on ICT in *Chapter Four: Technological Interventions in the Education of Autistic Children*. This chapter aims to evidence specific interventions, and address the placement of ICT within existing educational environments more broadly. There will be comparison to the previous chapters to allow a broader understanding of their placement. Additionally, the final section will be a commentary on Systematic Reviews of interventions that are reliant on, or based around, the inclusion of ICT as a platform for working with autistic children.

Part Three is titled *Technology in Education: What's the Problem?,* and references information presented through the four previous chapters in greater detail. Again, the diagnosis of autism in focused upon to acknowledge potential problems caused by such technologies for autistic individuals, which highlights social difficulties intrinsic to the diagnosis. Here I also introduction of what technology has seemingly replaced: human interaction. Therefore, the reduced use (or lack thereof) of empathy, mimicry and touch in education is explored as three key themes, due to being used throughout the practical interactions and solutions in Part Three. Their inclusion here is also a comment on the iterative approach and my role as a reflexive practitioner as the inclusion of empathy, mimicry and touch in the thesis is following their place in the interactions with the autistic children.

Chapter Five: Reviewing creative tools, technologies and therapeutic techniques in the education of autistic children, aims to critique the influx of technology in the UK schooling system over the past 30 years. This research draws on Chapter One, then evaluates how the use of conventional, solo use, technologies may not be categorically positive for all those with Special Educational Needs, especially those evidencing difficulties in social understanding across three areas of social skill. This process is then repeated to give context to why a new approach was developed. In doing so I will address the limitations of existing interventions (traditional and technological), therapies and creative approaches. This research will offer insight into the need move for interactions with technology to be more to the inclusion of the body, yet questions if autism research and existing interventions are able to premise embodiment.

With this research underpinning the placement of the body in the wider discussion of autism, education and our engagement with technology, *Chapter*

Six: A Report on Practice; the Foundation for New Knowledge will address the placement of human interaction within the wider context of this research project. Again, this section will be reliant on the understanding of autism in the first section of the thesis, but will also utilise comparative information about childhood development more broadly through introducing empathy, mimicry and touch (in relation to the rationale for it inclusions in practice). When supporting these within a theoretical context literature from childhood studies understands these three elements as vital in the infantile years of 18 months - five years. They are evidenced as fundamental processes in the development of communication, both verbal and nonverbal, as well as social skills and understanding of the *self* and the *other*. Therefore, Chapter Six outlines to practice to frame human interaction and childhood development and will situate the placement of Empathy, Mimicry and Touch in the Practice-Based research elements of the PhD. Chapter Six then concludes with an acknowledgement of their placement in the practical research with the aim to unite literature from autism and childhood studied to show the importance of these elements. The chapter will also offer insight on the rationale for structure and content of the practice along with the programme of workshops some limited information about the participants that took part. The chapter is also supported by the first draft of a teaching manual to accompany the practice and explore how the approach might be applied in education, in doing so some case studies and experience from my experience will be shared to offer insight into how to adapt to individual need and how to become more confident with the methods.

The Conclusion will accomplish a sense of summary for the project as a whole in addition by proposing future uses for the practical element of the research. This section will also allow the discussion of alternative uses of ICT, and how this will have an ongoing benefit to the child interacting with it, to be more established. The final aim is to allow the reader to recognise that this research project has developed a specific argument whilst also achieving the aim to create a conversation that will encourage an application wider than that for autistic children; and has done so by developing a conversation promoting embodied interactions alongside technologies to support holistic developments.

Project Aims

As part of the introduction it feels relevant to reflect on the preliminary decision-making process underpinning the research project, and in particular the establishment of project aims. These aims are included to help articulate what insights the research seeks to produce, by helping to structure the practical research, and are a framework by which I reflect on the PhD developments:

1. To identify and investigate current interventions, for autistic children, that use audio visual technology as a key developmental aid, and to examine the benefits of expanding these applications to be inclusive of human interaction through creative movement.
2. To illustrate the use of pragmatic reflections, and analysis, to promote a comprehensive understanding of the developments of an autistic child, to help expand current understandings surrounding autism; with particular focus given to discrete, non-verbal, communication.
3. To critically investigate audio visual technology in the context of creative movement, imitation and mimicry, and autism throughout a research project that will make links to research in these individual fields, whilst contributing to knowledge about human interaction.
4. To explore the effectiveness of audio visual technology in the development of a creative intervention for children on the autistic spectrum, situated in reflexive movement principles and the benefits of human interaction.
5. To investigate the benefits to approaching education and interactions with technology with the body in mind, with specific interest in how dance and movement practices can bring an embodied insight into the field of autism.

The PhD process was iterative in its approach, and this is evidenced through the written thesis in varying degrees. Aim one is addressed more broadly than originally proposed, and demanded more attention, which was responded two by dedicating chapters Three and Four to this area (by directly identifying and investigating current interventions, for autistic children, with Chapter Four focusing on interventions that use technology as a key component). The latter part of this aim is also attended to through chapters Five and Six as clearly outline the benefits of expanding these applications to be inclusive of human interaction through movement and embodied interactions.

The second aim was very clearly the key theme for Chapter Two. This particular chapter spends an extensive amount of time ensuring that a comprehensive understanding of autism as a diagnosis (and the developments of an autistic child), are established early in the thesis to support the context in which to read the following chapters. This is important to help expand current understandings surrounding autism with particular focus given to communication

but goes further to explore dual and misdiagnosis, and other diagnoses often a comorbidity of autism, and briefly addressed the contentious issue of gender.

The third aim begins in the very first chapter of the thesis where the critical investigation is introduced by addressing the cursory integration of ICT in the education system. At this stage though, the conversation is not inclusive of concerns connected to the placement of movement, imitation and mimicry (or lack thereof) in the education of autistic children. In fact, it felt necessary to give this area of the third aim explicit attention so is addressed at length through chapters Five and Six where the research project is shown to make links to ideas in these individual fields, whilst contributing to knowledge about embodied interactions. Upon reflection aim three could have been absorbed into aim four, as chapters Five and Six clearly express the effectiveness of audio visual technology in the development of a creative intervention for children on the autistic spectrum, situated in reflexive movement principles and the benefits of embodied interaction. Likewise, the latter two chapters of the thesis also address an investigation into the benefits of approaching interactions with technology and the body equally. Here the specific interest of how dance and movement practices can bring an embodied approach the field of autism is presented alongside the work of two other key researchers, Wendy Keay-Bright and Nicola Shaughnessy, and by reflecting on the work of cognitive scientist Alissa Antle.

Research Questions

To support the project aims, five research questions were also recognised, and are used here to ground the aims, shape the thesis argument, and introduce practical research methods. The first question was as followed;

1. What are the necessary processes to understand discrete, non-verbal, communication, and attempted verbal interaction, and in what ways can my project give emphasis to the benefits of this, throughout my practical research, to be understood holistically?

Upon reflection, it became more appropriate prioritise holistic interventions over those specifying individual elements of a child's learning and/or development, throughout, which hadn't been clearly articulated at the time of forming the research questions. This is not to say that discrete, non-verbal communication and attempted verbal interactions were not focused upon with individual children,

but the question itself misplaces the emphasis. Holistic and individualised approaches were prioritised throughout the practical sessions, with additional developments in verbal communication, in individuals, noted then as a positive by out-put of holistic intervention mechanisms[5]. In respect of this, the second research question focused more on the holistic, and namely the movement elements of the interactions, in the following format:

2. Can the placement of mimicry in early childhood studies - and its links to social understanding, empathy and language acquisition - and its use through movement practices - such as Contact Improvisation and Somatic Movement Practices - provide a method through the practice in this research project?

So, despite the complexity of this question, I feel confident that this thesis goes on to answer the research through extensive research into mimicry[6], with the addition of empathy and touch (which are seen with equal importance) the positive attributes of movement and practical research are presented at length. The themes of empathy, mimicry and touch became apparent as important through the MRes practical inquiry, and became even more imperative through the PhD practice. This clearly shows that the iterative approach applied offered the opportunity to understand the three from a theoretical context. Not only are they both addressed throughout literature from autism, but they are all seen as vital developmental experiences in the infantile years. This is evidenced through Jean Piaget, a Swiss psychologist who's work on child development focuses on his theory of cognitive development, and his text *Play, Dreams and Imitation in Childhood* (1951). Here is discusses six stages of imitation in the infantile years;

> Stage I: Preparation through the reflex,
> Stage II: Sporadic imitation
> Stage III: Systematic imitation of sounds already belonging to the phonation of the child and of movements he has already made and seen Stage IV : I. Imitation of movements already made by the child but which are not visible to him
> Stage IV : II. Beginning of imitation of new auditory and visual models.

[5] As seen in the case studies within the first draft of the teaching manual in Appendix 6.

[6] Here is can been seen that mimicry and imitation are, at times, used interchangeably. Despite this, the thesis prefaces mimicry and has understood this through Susan Jones' paper *Imitation in Infancy The Development of Mimicry.* Here she concludes:

> In summary, the present data suggest that imitation is not a single competency, with a single underlying mechanism. Instead, it is likely that imitation is a collection of different ways of combining and using different kinds of knowledge (see Want & Harris, 2002). Mimicry is one form of imitation, and its drawnout developmental course suggests that it, too, is not the output of a single specialized mechanism, but instead is the emergent product of a large number of component kinds of motor, cognitive, and social knowledge and motivation. Each component is likely to have its own complex developmental course (Thelen & Smith, 1994). (Jones, 2007: 598).

Stage V : Systematic imitation of new models including those involving movements invisible to the child.
Stage V I: Deferred imitation.
(Piaget, 1951).

He connects this work to the importance of play and sensory-motor skills which all bare influence on the work presented through the final two chapters of this thesis, where the practical research decisions are most heavily addressed.

Likewise, the rationale for the third research question was a topic addressed in more detail throughout the final two chapters, but can also be seen to be grounded in the first four chapters. The third research question asked:

3. How will the effects of imitation and mimicry in collaboration with projected images, enhance the understanding about the importance of self-referential ability, to aid the development of empathetic understanding and social interaction, communication and imagination, be used in knowledge exchange?

Here self-referential ability is also considered through conversations of autism and the development of complex empathetic understanding, as self-referential ability[7] (or cognition) relates to the process of relating external information to the self. In this research question, I connect this process to the idea of projected images used in the practical research as a means to support ones self-referential ability and to compliment and extend on the use of mimicry through the human interaction and the human-computer interaction that is afforded through the practical research for this PhD project. This is particularly important if we review Piaget's work again where he states: The extension of transfer to new signals then accounts for the transition from the circular reaction (self-imitation) to imitation of others, and here again assimilation is not a prerequisite for imitation but the consequence of it' (Piaget, 1951: 17). Therefore, this implementation of mimicry and the use of live feed footage all offer space for the *self-imitation* (as Piaget refers to it) or *self-referential ability* (as Lombardo et all refer to it) to be encouraged.

Overall, I feel that the fourth question connects to most of the thesis themes and projects the thesis argument forward by considering future impacts of the research. This fourth question considered:

4. How can research into technological mediation and creative movement enhance knowledge about the benefits of working towards the promotion of human interaction, with focus on working developmentally with autistic children?

[7] As seen through the 2007 text *Self-Referential Cognition and Empathy in Autism* (Lombardo, Barnes, Wheelwright & Baron-Cohen).

This question was the driving force throughout the whole thesis and is answered throughout the thesis in different ways. The question has been addressed as part of the iterative approach, which sees separate elements being presented in various ways across the thesis. Technology mediation and movement has been approached in combination, and the understood benefits of are reliant on the thesis taking a critical position on current model of ICT in education and the history of its introduction. The question also explicitly connects to the autistic community, and in order to answer this in detail, the second chapter proves vital. The question is also reliant of an understanding of what is currently being practiced in the education of autistic children, which is where chapters Three and Four show their importance. To promote the benefits of human interaction to address the effects a lack of human interaction is addressed and responded to through chapters Five and Six.

The final research question, upon reflection, seems to merely rephrase other questions and therefore is answered in many of the responses above. This fifth question stated the following:

5. Can the combination of creative movement practices and technological mediation create an environment that promotes development for an autistic child, as well as contributing to the progression of understanding about the interventions specific for autism?

As mentioned above each element of such a question (mainly the fourth research question) can be assigned to many areas of the thesis. Therefore, it has allowed for the body of the thesis to be connected to specific interests that were motivators at this early stage. Another point of reflection comes in the following section with outlines decisions based on the methods chosen and the ways in which the practice has been defined.

Prologue: Methods and Defining Practice

Methods

Throughout this introductory subsection the methods used within the PhD are address for their importance in understanding the overall process and practice. I outline how they helped structure the written thesis while affording a sense of reflection and future applications. Here I establish the rationale for their inclusion, how they shaped the project, and lastly how any limitations within the methods were overcome. In writing this section it become important to establish how the methods influence each other through the iterative approach to research.

Above I have taken the time to outline the research questions posed early on in the PhD process, and summarised the rationale for the focus on holistic developments of autistic children, through the placement of mimicry, empathy and touch alongside ICT, and with influence from Contact Improvisation and Somatic Movement Practices. The training in Contact Improvisation supported me to explore the developmental potential of movement, for individuals, through expressive movement and the development of a tactile relationships in a creative environment. Alongside the practice I began to explore methods associated with the process of embedding oneself within the environment they are studying. Due to this the two complimentary methods of Participant Observation and Ethnographic Research will also be address throughout this prologue.

To situation the practice at the heart of this section, I reflect on the use of Contact Improvisation to influence my decisions as a facilitator, rather than being embedded as technique taught to the participants. This allowed me to embed the following principles into my role:

> Movement is both expressive and practical. It contributes to, and mirrors, human growth and development. As instinctive forces, intuitions, rhythms, and passions drive us, our bodies respond to unspoken needs and desires, interpreting the continuous flow of internal and external signals and determining the appropriate form of action. (Blom & Chaplin, 2000: 3).

This approach was then complimented by Somatic Movement Practices. The word Somatic originates from the Greek word *soma* meaning living, aware, bodily

person; therefore, there is also an importance for the self within any exploration or investigation and movement is seen as a vital experience. The process allows the facilitator to embody the offerings transferred to you by your participants, and when used in collaboration with techniques from Contact Improvisation allowed me, as the facilitator, to be grounded in the embodied interactions. With this understanding, the movement sessions offer acceptance of equal development through opportunities affording experiential investigations that are process orientated, rather than relying on the hierarchy of goal orientated teaching seen so often in Western culture[8].

> The basic concept of Somatics is both psychology and integrative movement studies is the holistic idea of human beings. [Holism] is the theory that whole entities, as fundamental components of reality, have an existence other than as the mere sum of their parts. (Fraleigh, 2004: 64)

My research questions also outline interest in how human interaction and technological interactions can co-support developments for autistic children; a diagnosis presented in the *Diagnostic and Statistical Manual of Mental Disorders – Firth Edition* (2013). The DSM-5 will be referred to through the thesis to give context to the diagnosis along with the more focused research presented in Chapter Two. Throughout the research questions I include the diagnosis of autism and the effect of self-referential abilities on empathic understanding, whilst exploring whether the practice could lead to more understanding about autism specific interventions. By reflecting on the research questions, I now acknowledge the ambition I held helped me to acknowledge the benefits of defining the practice and reflecting on my considerations around Practice-as-Research PhDs.

One of the early, and primary, motivators for this research is how and where it would become situated when considering its multiple disciplines, and the Practice-as-Research pathway enrolled upon. My PhD was funded by the Arts and Humanities Council, as part of The 3D3 Centre for Doctoral Training, which saw 10 Practice-as-Research (PaR) PhD projects, in each year cohort, researching topics proposing to influence creative and design opportunities for the future. Collectively we were exploring the possibilities and challenges presented by rapidly evolving technologies, including the interface between digital

[8] The common idea that the teacher knows best and that there is one model of learning for all.

processes and traditional methods. Therefore, not only was the multidisciplinary approach recognized throughout the application process, but so was my emphasis on the use of practice as an irrefutably influential element of the PhD.

Prior to the PhD I had embedded practice in previous research, that engaged autistic children as participants, throughout both my undergraduate dissertation and my Master of Research Dance. When beginning the PhD, it was clear that the practice had clear roots, as a method, not only in the discipline of dance and movement, but was also linked to my identity as a researcher, meaning it was naturally included instead of being done so only as a condition of the funding. Therefore, experientially, practice and research complimented each other to harbour evidence, and this influenced the decisions I would make going forward. But, my approach to Practice-as-Research methods was still evolving, therefore I employed additional methods and personal experience to find a process best suited to my research and participants (with Ethnography research and Participant Observation being the main focus).

Revising traditions offered the space to create more clarity around the decisions made about the practical elements and how they aligned with existing methods. To understand the historical placement of Practice-as-Research PhD's I sought information through the personal insights offered by Robin Nelson in his text *Practice as Research in the Arts* (2013). This text yielded a more thorough consideration for the gravity that practice can hold within academia, but also left me with multiple questions regarding my choice of submission and the placement, or lack thereof, of documentation within my own PhD (a subject discussed below). Nelson states on many occasions that for a PhD to qualify as Practice-as-Research (PaR) it needs to involve:

> [A] research project in which practice is a key method of inquiry and where, in respect of the arts, a practice (creative writing, dance, musical score/performance, theatre/performance, visual exhibition, film or other cultural practice) is submitted as substantial evidence of a research inquiry. (Nelson, 2013: 9)

Throughout the process and in discussion with my supervisory team, it was quickly acknowledged that the practice itself was a key method of inquiry but the idea that any form of performance, or even documentation of the interactions themselves would be submitted as substantial evidence of a research inquiry felt problematic. Nelson has written extensively about documentation and this

understanding showed that my PhD fell between the lines of traditional and Practice-as-Research. My rationale for withholding any video documentation from the PhD submission is simple because it is not, and never was, intended to be performative. In that sense the tradition for documentation, throughout the Practice-as-Research framework, being premised as a means to retain the performative elements was not a valid justification for the documentation to be published. Furthermore, I connect with the predicament Nelson refers to in his third Chapter;

> More commonly problematic among PaR PhDs, in my experience, is the submission in which the inquiry has been identified but on a grander scale than the project will bear. Most often this is the result of a lack of understanding that practical inquiry is just as valid as theoretical, or a lack of confidence (sometimes on the part of the supervisor) in the praxis. Though the search for resonances between one discipline and another - say, between choreography and neuroscience or post-classical physics - is to be encouraged in accordance with my model and approach, it cannot simply be assumed that insights achieved in one domain correspond directly with explorations of another. (Nelson, 2013: 81)

In hindsight, I can clearly see that I have in fact fallen into what Nelson considered a common problem with those approaching PaR PhDs. Not only does the multidisciplinary aspect of the PhD resonate with Nelson's concerns regarding the mode through which insights are achieved and in turn recognised, within different discourses, but there was a lack of confidence in the definitive ways the practical inquiry has played a role in the process this PhD has taken, and therefore presented. It is both approaches that I did often find myself up against throughout the PhD journey, especially when talking to those from different disciplines about data and results.

But, without making this PhD a statement about Practice-as-Research, or trying to fight for its place within academia, I decided to pursue a traditional thesis from Chapter One – Five, with a report on practice becoming the structure for Chapter Six. Also, Nelson states that many examples of practice, in PhDs, falls into the habit of presenting case studies, that often dominate literature, and 'which do not always bring out clearly what constitutes as research (as subtly distinct from professional practice)' (Nelson, 2013: 3)[9]. I also saw early on that the varied approaches used within Transtechnology Research would allow me to

[9] In this thesis I have chosen to include case studies in the teaching manual presented in Appendix 6, rather than the main body of the text.

explore a wide range of approaches to practice in the world of research. If I could embed practice into my research I knew this could directly influence my theoretical choices through the experiences I was gaining. Therefore, I ensured that the practice was explored textually rather than visually, in the final submission.

By using the sixth chapter to offer evidence and examples connecting to the research presented in the main body of the text I could allow the practice to retain its fundamental place within the PhD process, rather than present this as a separate submission. Within the Arts, Practice-as-Research is often seen as one of many methods inclusive of practice, others including Practice-Led and Practice-Based and until beginning the PhD I had not given much consideration to the differences between the three. It seems though that there is much confusion between the three through literature and countries. Shaun May begins to address this in his 2015 text; *Rethinking Practice as Research and the Cognitive Turn.* Here he states the following:

> Perhaps the first thing to note about practice as research is that the term itself is rather contested. A brief survey of the literature will indicate an array of alternatives offered, and distinctions made, which can surely only serve to confuse the reader. (May, 2015: 4)

Much like I have above, he goes on to quote Nelson for some parameters, but also begins to offer a more in-depth argument regarding what is being done throughout practice as research projects and devotes much of this time to counter-act the idea of clear 'do's and don'ts' within PaR by situating the Cognitive Turn[10].

When considering, these considerations presented by both Nelson and May's reflection on his (and his counterparts) work, I understood the need to consider my own understanding of this method and begin to take some authority over the way in which my work would be interpreted. In doing so I could quickly see I was aligning more with the method of Practice-Based. In her paper *Practice*

[10] In brief, May reflects on the call to integrate cognitive science into performative work by the likes of McConachie and Hart in their 2006 text titled *Performance and Cognition: Theatre Studies and the Cognitive Turn.* May resonates with their argument that in doing so one could use cognitive science to enhance their research to also offer the prospect of interdisciplinary approaches that respond to tensions and allow for both performance studies and cognitive sciences to 'co-exist peacefully, and indeed productively, with other critical frameworks' (May, 2015: 7).

Based Research: A Guide (2006) Linda Candy, a writer and researcher focusing on creativity in art and science, introduces the method with the following definition:

> Practice-based Research is an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice. In a doctoral thesis, claims of originality and contribution to knowledge may be demonstrated through creative outcomes in the form of designs, music, digital media, performances and exhibitions. Whilst the significance and context of the claims are described in words, a full understanding can only be obtained with direct reference to the outcomes. (Candy, 2006: 1)

Yet, despite feeling as though this definition aligns more with the practice I needed to find my place within the varied uses of the term. This term offered me a way to clarify that the practice offered simultaneous functions to identify problems, support the research argument, extend theoretical bases and conclude with suggestions for a solution, and in turn new knowledge. Although, this being presented textually in the sixth chapter still means this does not bare resemblance to the true integration of the practice throughout the PhD process, but is a stylistic move in the PhD to best present practice as evidence throughout the thesis in a pragmatic way. Candy does offer some clarity by the means of this description of the differences for disciplines and approaches:

> There are differences in conceptual and applied uses of the term between those fields where it is most often found: design, health, creative arts, and education. There are, in fact, differences in the type of research in respect of whether it is practice-based or led. In design research, for example, where the nature of practice is a major research topic and is often conducted by research specialists rather than design practitioners, the emphasis is on achieving new knowledge about the nature of practice and how to improve it, rather than creating and reflecting on new artefacts. (Candy, 2006: 3)

Throughout the RDC2 transfer process, the formalisation of the practice itself was instigated. I soon began to think about the practical research in two parts, due to the dual roles as a facilitator and researcher. It is acknowledged that the practice is embedded in the previous dance and movement training, and therefore it was appropriate to describe my role as a movement practitioner/facilitator. With this in mind, Candy's connection to 'the nature of practice and how to improve it' (2006: 3) was a grounding statement for the use of practice. When reflecting on Practice-Based research in health studies she also includes 'systematic examination of intervention[s]' (2006: 3) which connected to areas of this thesis, albeit in education rather than health specifically. The final, and in some ways

clearest, connection to my work, by Candy, was during her reflection on the history of Practice-Based research, where she states:

> The crucial point is that in certain disciplines knowledge can be partly advanced by means of practice. The idea that has developed was that a research student, for example, would take, as the subject of research the practice of their own discipline. The research programme would consist of a continual reflection upon that practice and on the resulting informing of practice. (Candy, 2006: 4)

Following this I was clearer about the method in which I felt closest to and that was Practice-Based research. I had a body of practice from my own discipline and this practice was vital in the exploration of my research and in the development of a contribution to new knowledge. The practice was an iterative approach to research that allowed me to offer insight, to the reader, of how the theoretical knowledge shaped the interactions with autistic participants, but even more importantly how the participants themselves shaped the practice and offered new meaning to evidence in this PhD. It could not be separated out as an independent submission, it was influential throughout the PhD due to my abilities as a reflexive researcher; seeing the practice inform the theory and vice versa.

Alongside questions regarding Practice-as-Research methods, verses Practice-Based, I began to think more consciously about how I referred to the practice itself and in doing so made the conscious decision to avoid the word *dance*, as the word *movement* more truly reflects the practice. This was informed, firstly, by the perception people have of dance and how this leads to assumptions about set routines, taught sessions, rehearsals, music and groups of children (as none of these were regularly present in my practice). This was reaffirmed when looking at the definition of dance in the Oxford Dictionary; the verb and noun descriptions both reiterated why *dance* led to an incorrect perception of my research:

> **Dance (verb)**
> • Move rhythmically to music, typically following a set sequence of steps
> **Dance (noun)**
> • A series of movements that match the speed and rhythm of a piece of music.

These descriptions considered a particular rhythmical and musical input to constitute a dance, and there is purposefully no focus on this in the practical research. On the other hand, the word movement offers more attention to the actions of the body by removing the need for an outcome (in comparison to

choreographed steps or rehearsed routines). It also allows the conventional motivations, and considerations for how it relates to rhythm or music, to be detached from my project. Interesting to me is the inclusion, and focus, on development in the definition of movement:

> **Movement (noun)**
> An act of changing physical location or position or of having this changed:
> • The general activity or bustle of people or things in a particular place
> • A change or development in something
> • A group of people working together to advance their shared political, social, or artistic ideas

The following research into definitions of potential ways of describing my role show that the semantics do impact if others interpret my project correctly. I am confident that calling myself a movement practitioner/facilitator will offer a more sincere description of my role in practice, and that the interactions emphasise my embodied knowledge within the session. The way I facilitate is constantly developing through experience, as a reflexive practitioner, as the embodied knowledge about the child informs theoretical understandings and research motivations, alongside my training in dance and movement; inevitably vital to the implementation of practice. It is essential to keep both practitioner and facilitator present in this description for two reasons; practitioner adheres to the discipline being within the arts, while facilitator aligns with ability to aid the process of engagement and development:

> **Practitioner (noun)**
> • A person actively engaged in an art, discipline, or profession, esp. medicine.
>
> **Facilitate (verb)**
> • Make (an action or process) easy or easier.
>
> **Facilitator (noun)**
> • A person or thing that facilitates.
> • A person responsible for leading or coordinating the work of a group, as one who leads a group discussion.

After spending an extended time period attempting to understanding Practice-as-Research from the views of Robin Nelson I came across another term that I feel supports the dual role I have taken on. Despite having moved away from Practice-as-Research in favour of Practice-Based, this term appeared suitable as it was commonly applied to those who create research within a workplace that is conducted by individuals who also work in a professional field as opposed to

being full-time academic researchers. In my case the work I pursued was firstly an extension of my Masters of Research Dance, as previously mentioned, but also stemmed from an employed role working within the school I went on to conduct my practical research in. The employed role was as part of a Big Lottery and Plymouth Dance project which saw me as the lead practitioner in a Special Educational Needs school specialising in autism, for two years prior to the PhD.

So, if we take this context into account alongside the placement and importance of practice and the alignment between my professional role as a practitioner and my research role as a facilitator, the term practitioner-researcher may also offer a clearer insight for those external to the project to quantify my role in its entirety, despite leaving the term facilitator aside.

Following the need to find my place within the maze of Practice-as-Research and taking the path of Practice-Based, I soon began to clarify other ways in which the practice is a method. As a result, I acknowledged two influential methods, to reflect on how I explore my role as a practitioner-researcher. Through conversations with my colleagues and supervisors I was introduced to the role of a participant observer, which is used within anthropology (the study of humans) and to ethnographic research methods, which studies human culture, customs, habits and differences.

Used profusely in cultural anthropology, participant observation has been accepted in the research of various disciplines for a decade. The method was introduced to me by my original Director of Studies, Martha Blassnigg, who was a Cultural and Media Anthropologist, trained in Cultural Anthropology and Philosophy[11].

> A good part of what makes up the methods of participant observation, both the collection of information and analysis, is difficult to put into words. In part, it is because this is a method in which control of the research situation is less in the hands of the investigator than in other methods, even other qualitative methods. The investigator is reacting to the interacting with others in the events and situations that unfold before him or her. At the same time, investigators are bringing their own unique background and experience to the situation. (DeWalt & DeWalt, 2011: ix)

[11] Sadly Martha passed away in September 2015, just one year into my PhD studies, therefore despite offering great insight into anthropological methods, this was not continued throughout the latter stages of PhD.

The comments here regarding the difficulty of presenting this research in written context is true for the process I have experienced. The written context often reducing the experience into a simpler format, as the complexities of multiple actions happening simultaneously is a difficult concept to verbalise. During the MRes I was reliant on explaining the process through my intuitive reflections, without being able to attach this to an existing method or process of working. In Norman Denzin's 1997 test he discusses these written reflections when addressing the many types of ethnographic research. The follow description resonates with the aims of the, then MRes, and the current PhD:

> Ethnographic texts are the primary texts given for the interpretive, ethnographic project. These texts are always dialogical – the site at which the voices of the other, alongside the voices of the author, come alive and interact with one another. (Denzin, 1997: xiii)

When beginning to understand how this concern might be mitigated in writing I considered how to best describe my practice, which led to a discussion with colleagues concerning my dual role, of a practitioner-researcher. Although this adopted term had eased a process previously difficult to articulate it need to be address methodologically. Therefore, my deepening understanding of ethnographic methods aligned with the sessions facilitated, helping define the aim to immerse myself in the interaction to absorb as much information about the autistic child as possible;

> **Ethnography (noun)**
> • The scientific description of peoples and cultures with their customs, habits, and mutual differences.

This method not only related to the use of practice but also the decision to mimic their bodily behaviours, with the aim to learn how they engage with their environment and how their social awareness is developing; in alignment with their diagnosis of autism. This process of understanding the method of participant observation also helped me understand why I have found this role challenging:

> At the same time, the practice of ethnography also assumes the importance of maintaining enough intellectual distance to ensure that researchers are able to undertake a critical analysis of the events in which they are participating. This mean that they should be willing, and able, to take a step back from the relationships that form with the people they encounter in the field for long enough to identify and reflect upon some of the taken-for-granted rules and expectations of the social world they are studying. (Hume & Mulcock, 2004: xi)

This insight is particularly important when considering the environment for my practice was within the education sector; a Special Educational Needs school specifically for children holding a diagnosis of autism. This presented expectations that I was required to adhere to, yet at times become the focus of contentious research topics; such as the use of touch. The dual role of a practitioner-researcher comes into play again here when considering the need to obtain a close and trusting relationship whilst maintaining critical analysis for the research project to be successful.

> The ethnographer must be able to see with the eyes of the outsider as well as the eye of the insider, although both views are, of course, only ever partial. Good participant observation requires a self-conscious balance between intimacy with, and distance from, the individuals we are seeking to better understand. By definition, participant observers deliberately place themselves in a series of very awkward social spaces, some of which are more difficult to inhabit than others. (Hume & Mulcock, 2004: xi)

The time given to fully consider the epistemology of my practice, and the methods I use to construct this, has allowed for a more operative understanding of how I can convey and disseminate the findings of this PhD. This decision was assisted by my research into the application of participant observation and how closely linked it is with ethnographic research[12]; and in line with my research being with autistic children in the culture of the UK Education System, with the aim to understand and adapt existing practices used within this environment.

> These understandings are based on glimpse and slices of the culture in action. Any given practice that is studied is significant because it is an instance of a cultural practice that happened in a particular time and place. This practice cannot be generalised to other practices. (Denzin, 1997: 8)

Therefore, it was clear that I need to consider the ethnographic method and practice not to tell us about all autistic children in education, but about those particular children I personally interacted with. Further to this I concluded that the final method I considered was how, and why, I felt the need to document the interactions using video recordings. As mentioned earlier, the PaR method would have required the submission of a performative or artistic practice, yet I knew early in the process there were alternative reasons for the video documentation. The aim was not to create an edited film that would be presented aesthetically,

[12] It is worth noting here that the ethnographic approach is distinct from auto-ethnography as I do not personally hold a diagnosis of autism.

but was a suitable tool to assist my memory, ability recall these very specific interactions, and as a resource when writing of this thesis. Nevertheless, I did not know how to describe this formally, which became an obstacle I needed to overcome in two different ways. The first has been explored by outlining the decision to align with Practice-Based research as the method of choice, but the documentation still needed to be acknowledged. The intention in the early stages of the PhD process was to embed the video documentation with intention, in the latter stages of the PhD, so I gave this more thought. The shift came when I was introduced to the idea of a mnemonic:

> **Mnemonic (noun)**
> • A system such as a pattern of letters, ideas, or associations which assists in remembering something.
>
> **Mnemonic (adjective)**
> • Aiding or designed to aid the memory.
> • Relating to the power of memory.

I could see that my video footage could be considered a method of memory retention to assist the writing, as well as to reflect on the development of my project from the viewpoint of the practical research. It is also useful in that I could take still images of the video footage if needs be to evidence the practical research visually for dissemination purposes, including conferences, research posters, and the likes. The application of technology to enhance the ethnographic research setting resonates with an example given by Helen Kara in her 2015 text: *Creative Research Methods in the Social Sciences A Practical Guide*. Here she states 'Many ethnographers have embraced the possibilities offered by technology, both for use within conventional ethnographic studies and to shift the boundaries of ethnography itself' (Kara, 2015: 32). She then offers insight to the use of digital photography and video recordings to assist a rower to recount his experience of being embedded in a regatta for 10 days and nights. Kara mentioned the need for documentation, as a mnemonic, to mitigate the risk of not having fully understood or comprehended the events at the time, and to be able to revisit the footage at a later stage to support his research.

To go further, Kara also comments on the changing world of traditional research to highlight the need and appropriateness of new ways of embedding many different approaches to ensure the best outcome. She comments of the idea that '[t[he categories of 'arts-based', 'mixed methods', 'using technology' and

‘transformative’ are not mutually exclusive’ (Kara, 2015: 9). This is clearly the case with my own PhD. I could, potentially, fall into any one of those categories she uses as examples if the core premise was extrapolated out into a specific and exclusive methodological approach.

To conclude, in light of Kara’s insights, the main methodological decisions have been to shift from the idea of Practice-as-Research in favour of Practice-Based research for its alternative view on the submission of practice. This enabled the avoidance of such sensitive interactions to be view for their aesthetics and rather see the video documentation being considered a mnemonic assisting in memory retention (as supported by Kara’s example) reflection on practice textually and in line with thoughts from Denzin’s text, and as a reflexive practitioner-researcher. Additionally, this then enables the documentation to be seen as an integral part of the iterative approach, and to become more truly integrated into the analysis (included in Chapter Six). The approach is referenced to throughout earlier section of the thesis with it being understood that the iterative approach enables the practical research to support the theoretical knowledge, and vice versa, an important process as later highlighted by Melissa Trimingham and Nicola Shaughnessy’s work (Trimingham & Shaughnessy, 2016: 296), and in Jim Mansell & Julie Beadle-Brown’s 2004 paper discussing Person-Centered Planning.

Equally, the review of practice has enabled the method of participant observation to be embedded into the PhD process, in line with ethnographic research methods, taking influence from my original DoS, Martha Blassnigg, and her anthropology studies. During the process of this review of methods, the interdisciplinary nature of the project has proven difficult in terms of outlining clear methods relevant to one discipline or topic of research. To respond to this, you will note that the structure of this thesis allows the reader to comprehend each element individually, whilst naturally making connections to support the thesis narrative, leaving the practice itself to be discusses more formally in Chapter Six. This allows for the theoretical information to be absorbed in order to present the framework in which to understand the practice from. This structural decision is a direct response to the need for the methods to influence the written submission as well as the research decisions along with PhD process.

Part One: Computer Technology in Education, Neurodiversity and Autism

The first two chapters offer the reader a more comprehensive understanding of the integration of Information Communication Technology (ICT) in education since the late 1980s, along with the diagnosis of autism. *Chapter One*: *The History of Computer Technology in the UK Education System,* highlights historical developments in educational technologies and the pressures on - and from - industry. The integration process addressed considers the lack of involvement of end users and that government policy and funding decision makers implemented a top down approach. ICT's use in mainstream, inclusive, and finally SEN[13] schools grounds the discussion surrounding technology's validation through teaching and including technological interventions for autistic children.

Chapter Two: Autism & Neurodiversity[14] then supports an understanding of autism in the wider context of thesis, by offering a historical review of Leo Kanner and Hans Asperger's research (in the late 19th Century). The UK diagnostic process is explored through Lorna Wing and Judith Gould's work (1978) whose research was paramount in understanding autism as a spectrum whilst developing *The Triad of Impairments,* which outlines Social Communication, Social Interaction and Social Imagination/Theory of Mind. Misdiagnosis and diagnoses similar to autism are presented and collectively help also situate the education sector in the wider thesis argument by reflecting on adaptations and the role of technology in this setting. Lastly the chapter considers semantic and cultural impacts on autism by utilising the work of Amit Pinchevshi and John Peters (2016), to address societal and new media impacts on autism, and Ian Hacking's terms *making up people* and *dynamic nominalism* (1986).

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[13] The *SEND code of practice: 0 to 25 years* states: 'Special educational needs (SEN) xiii. A child or young person has SEN if they have a learning difficulty or disability which calls for special educational provision to be made for him or her' (2015: 15)

[14] *Neurodiversity* was introduced by Judy Singer, an autistic Australian sociologist (1998) and was adopted by the autistic community 'the concept of neurodiversity provides a more balances perspective. Instead of regarding traditionally pathologized population as disabled or disordered, the emphasis in neurodiversity is placed on *difference*' (Armstrong, 2010: 5).

Chapter One: Computer Technology in Education

Introduction

The first chapter of the thesis contextualises the overall research project by addressing the influx of technology in the UK school system over the past 30 years. This chapter draws on research reflecting on the impact that technological advances, in recent years, have had on the increased use of computer technology in UK schools. Despite this thesis being primarily focused on the education system through Specialist Educational Need provisions (which adheres to the placement of the diagnosis of autism in this discussion) the choice has been made to begin this chapter by reflecting on the use of computer technology within mainstream UK schools. By placing this at the beginning of the thesis, Chapter One works to contextualise the thesis argument in collaboration with the second chapter; which outlines autism in the wider context of neuro-diverse diagnoses. The history of technology in the UK education system will be presented generally in the first instance, as this mimics the integration process, then moves to discuss mainstream schools using inclusive practices (that helped integrate pupils with Special Educational Needs) ending with Specialist Schools, and autistic children specifically, being presented in the latter further chapters.

The integration of Information Communication Technology (ICT) will be preceded by a brief historical overview of advances in computers since the 1990s. In doing so the work of Sir Tim Berners-Lee is included in connection to the World Wide Web and in connection to the way computer technology was applied in education. The shifts seen, in terms of the number of computers accessible to school children, will be outlined to give the reader a clearer indication of the growth of ICT and to begin to understand its varied uses. Following this, the teaching profession itself will be introduced and discussed in connection to the changes that ICT had on the curriculum. This section of the chapter critiques the introduction of new computer technologies into the school curricula due to the assumptions made about the benefits of ICT conflicting with the needs and opinions of the teaching staff, due to little change to their

workload. This information is offered to further contextualise the environment in which pupils were learning.

Throughout research into the introduction of ICT within the education system the clearest starting point seems to be the introduction of the desktop computers into the education system, beginning with higher education provisions but soon making its way into secondary and primary schools as early as the 1980s. Their use increased dramatically throughout this decade, and in the 1990s the cost of computers had fallen, making them more accessible and in turn encouraging the development of features such as CD ROMS and PowerPoint; a technological development shaping the interactions by students, as well as being tailored for different teaching styles.

This introductory research highlights the ways in which the teachers needs conflicted with governments rationale and process for ICT integration as well as their predicted, categorically positive, effects. The chapter unpacks how the assumed benefits ultimately contrasted to the needs and opinions of teaching staff at the time. To highlight the difficulties noted during the introduction of computers, the concept of the *digital divide* will be framed to evidence another obstacle for the integration of computers within the school environment. 'Along the same lines, using information technology (IT) in education settings - from childcare to the classroom to the lecture hall and beyond - may have benefits but also carries serious risk and side effects' (Spitzer, 2014: 81). Yet the push for teacher training programmes, as well as increasing access to ICT for adults, was prioritised, and becomes information offering the reader context of the societal shifts that followed.

When introducing the term *digital divide* the disparity in access to ICT is mentioned alongside the difference in access to computers in the home. The belief that ICT was imperative to a child's development persuaded parents, and in turn home computers became commonplace. The lack of understanding around the isolative effect this could have was underappreciated by policy makers and designers, and as a result commercial drivers laid the path for computers to be engaged with more so for entertainment that education – though not a lasting theme of the chapter.

The effect these governmental decisions had on the teaching profession will be address more specifically when looking at how the teaching profession

was being reimaged in light of ICT inclusion. By again addressing the original intentions and expectations for ICT, this chapter highlights the impact on the profession and how this effected the way in which ICT was successfully, or not, integrated and embedded into pedagogic techniques. The cursory introduction of ICT is outlined to acknowledge the effect this had on the teaching profession in the early years, which will be explored in more detail through subsequent chapters. The argument presented will offer insight into how the introductory phase still has a negative effect today, and how a lack of rigorous research in the initial phase has led to vast assumptions and expectations that were short lived.

With this research underpinning the difficulties presented by overexposure to computer technologies, this first chapter seeks to introduce the placement of technologies for those with Special Educational and our daily engagement with ICT as a core theme. To conclude the chapter links are made to the information established through the upcoming second chapter, which will complement the information presented here by outlining a historical overview of autism specifically. Here the diagnosis (evidencing difficulties in social understanding across three areas of social skill) will be presented to evaluate how the use of conventional, solo use, technology is situated in the wider context of the thesis.

Chapter One considers an extensive overview of the use of computer technologies present since the 1980s. By doing so this offers insight as to why we have seen a dramatic increase in the reliance on ICT in education sector, as well as our daily lives. These themes underpin the discussion regarding the validation of technologies through government policies and funding, teaching styles, as well as commercial drivers, and the unintended consequences of solo engagement with conventional technologies, made addressed in the research questions, in the context of autism.

Historical Overview of Computer Technology in Education

To begin this historical overview of the introduction of Information Communication Technology (ICT) in the UK education system it is important to consider the society factors that share their history, and influence the way in which UK Government was considering this as a vital skill for the younger generation. During the 1990's it was clear that the use of computers in the classroom was taken very seriously, and the introduction of these devices in the national

curriculum soon followed. Therefore, we begin by understanding that early 1990s there was significant progress made on the World Wide Web[15] , developed by Sir Tim Berners-Lee; which was fully accessible to the public by 1992. Within this time frame, the Internet[16] was being developed (with Sir Tim Berners-Lee's influence often being recognised in historical literature). The idea of creating a network of computers was long standing by the 1990's yet became more achievable following the establishment of the World Wide Web. The year preceding its publication saw all restrictions taken off of the Internet to allow access for commercial users and individuals. The UK holds a strong position, worldwide, for the influx of computers in the education system, with Sir Tim Berners-Lee, and both his parents, being British computer scientists working with computers since their infancy. With the World Wide Web created as a platform for storing, finding and sharing information there was a clear sense of its future use in the education system. By 1995 the World Wide Web was of particular interest after it was established that businesses, schools and individuals had access to a system that would allow them to create and maintain their own web pages.

With both of these dramatic developments, in the World Wide Web and The Internet, the impact on the connectability between users, as well as the increased access to information, computer technology is placed in the school system and formally established in the UK. Additionally, 'the impact of the internet and World Wide Web on society [was] profound. Social changes have occurred in business, health, science, education, politics, and in customer behaviour' (Rogers, 2001: 97). As their importance was becoming more established, the cost of manufacturing computers significantly fell which led to more rigorous developments in graphics and multimedia tools and as their use became more desirable across society, and schools were increasingly investing in computers. The initial ratio in schools was speculated to align with one computer between a

[15] In a paper titled *World-Wide Web,* written by Tim Bernes-Lee and Robert Cailliau in 1992, they stated: 'The World-Wide Web (W3) project allows access to the universe of online information using time simple user interface operations. It operates without regard to where information is, how it is stored, ow what system is used to manage it' (Bernes-Lee & Cailliau, 1992: 69)

[16] 'The Internet today is a widespread information infrastructure, the initial prototype of what is often called the National (or Global or Galactic) Information Infrastructure. Its history is complex and involves many aspects - technological, organizational, and community. And its influence reaches not only to the technical fields of computer communications but throughout society as we move toward increasing use of online tools to accomplish electronic commerce, information acquisition, and community operations' (Leiner, et al, 2009: 23).

class of children - standing at 30 pupils on average - yet increased to ratios as little as one computer per 10 pupils by the end of the 1990s. It is during this time that UK schools were offered funding to allow for computer suites to be installed, often as part of their library facilities due to their presumed positive impact and views around them being able to store information.

However, even at this early stage there were questions as to how the computer could be integrated into the pedagogic techniques already being utilised. It was quickly acknowledged that there was a disparity in how different teachers used the devices, and it was overwhelmingly accepted that it they were a form of assistance, for the teaching profession, rather than an innovative shift.

> In the same way that the invention of material which could be used to produce small, lightweight, high-quality headphones led to the development of the Sony Walkman, the development of computers led us to think about the ways in which their power could be used in the educational environment. (Ager, 2003: 2)

It was quickly acknowledged that if the computers were not to become just part of the furniture, they needed to be engaged with, as 'it cannot be used to entertain a passive audience; the computer demands active engagement if it is not to become a redundant electronic gadget' (Bash, 1995: 17). Initially a link to The Sciences was pursued and there was, seemingly, a clear opportunity for computers to become a resource in these subjects, which heightened their status throughout the curriculum dramatically.

> It was not a case of teachers saying 'What we really need to enhance children's teaching and learning is a piece of equipment that will do this', it was politicians wanting to be seen to be enhancing educational facilities who provided funding for computers that went into schools. (Ager, 2003: 2)

There was also a clear indication that one of the initial aims and uses for the computer was for it to modernise the typewriter. The process for written work was shifting from hand written, even in primary schools, and the word processing functions on the computer were being developed rapidly to meet demand. Yet, of course, with this shift came difficulties in regulating the teaching and marking of such work;

> Similarly, where we might have expected the examining boards to be aware of the impact of computers on coursework development (as one major impact is to blur the line between plagiarism and research, making the myth that we can police individual original endeavour almost impossible to sustain), there is little observable change beyond the occasional banning of spelling checkers or an insistence on handwritten copy, which will increasingly penalise children as they

> evolve and hone their text-processing skills. A child with word-processing skills is penalised by being forced back into pen technology (with all its editing and redrafting problems) under external assessment conditions. (Happell, 1995: 105)

Nonetheless, this concern is regularly seen in education today, with all UK exam conditions, from primary school to higher education, being reliant on pen technology despite years of encouraging the use of computers for written assignments. In some cases, it is clear that concerns, as well as improvements and innovative uses, from the 1990s, are still present in our engagement with ICT in the education sector. 'Although funding was provided for much development work, and a great deal was done, the fact that it was done the wrong way around is perhaps the reason why it took so long to integrate ICT work into all schools' (Ager, 2013: 2). Therefore, it is important to acknowledge that during the period between 1997-2007, there were substantial developments for computers that included the use of video, downloadable programmes, email, the ability to publish, voice recognition, as well as software such as Microsoft Office's Word, Excel and PowerPoint which all changed the way in which students and teachers prepared and presented their work. As a result, the ratio has risen to five pupils to any one device, and by 2010 it is well understood that it is 1:1, due to this increased demand and desirability, industry responded.

Even with this commercial growth, and the positive effect this has had on the various uses for the computers, the increased demand in turn forced manufacturing costs down and created more affordable investment for the education sector. Yet there is little research to suggest computers had any noticeable effect on learning or teaching styles, a key concern motivator for this research, specifically in line with the education of autistic children. Throughout Larry Cuban's 2001 publication, *Oversold and Underused,* this issue is presented through case studies from California's Silicon Valley - which by contrast is now seen as a hub of global technological innovations, and the home to the likes of Facebook, Google and Apple. His research suggested, in most cases, the computers were still not being fully integrated into the classroom environment in primary and secondary schools yet were more often used to support the planning responsibilities of both teachers and pupils alike. This example, and Cuban's research, is important to be considered in the chronology of ICT introduction (despite this thesis focusing on primary school aged children with autism) as it

clearly offers insight into the placement of conventional, solo use, technologies in education and shows that higher education is the setting in which they were originally deemed most relevant.

> We can also say that few fundamental changes in the dominant mode of teacher-centred instruction have occurred [...]. If anything, what we observed and were told by students suggested strongly that occasional to serious use of computers in their classes had marginal or no impact on routine teaching practices. In other words, most teachers had adapted an innovation to fit their customary practices, not to revolutionised them. (Cuban, 2002: 96-97)

Throughout the majority of his writing he focuses primarily on examples drawn from experiences in higher education provisions. When reflecting on the importance of this research it is apparent that in higher education, there was difficulty integrating ICT, let alone in the education of autistic children. Despite this study being conducted over 16 years ago, Cuban's descriptions ring true for today's University setting where lecturers use the computers profusely in the preparation of the lectures, but still reliant on more traditional teaching methods while in the presence of their pupils[17]. Likewise, the University students themselves are reliant on their computers to prepare for lectures and to present their work but excluding this there is not true integration evidenced. A following chapter, within *Oversold and Underused* (2001), the focus is on the influx of technologies in Stanford University, also in California's Silicon Valley. Cuban concluded, again, that teaching practices remained largely unchanged during the years that saw the 'greatest penetration of new technologies' (Cuban, 2002: 129). The techniques that were still heavily relied upon were first and foremost, lecturing, which still accounted for more than half (to two thirds) of the teaching practices used for undergraduate education. A somewhat newer technique was that of seminars, introduced at the turn of the last century, yet they were quickly seen as indispensable, especially for postgraduate study and the latter years of undergraduate courses.

> These traditional forms of teaching seem to have been relatively untouched by the enormous investment in technologies that the university has made since the 1960s. That individual professors in various departments and schools turned to the case-study method, project-based approaches, problem based learning, and

[17] Manfred Spitzer, introduced in Chapter Five, highlights the benefits related to memory retention when face-to-face learning, hand written work and pen technology, and how a lack of handwritten work hindered reading skills. It also includes evidence for the decreased attention span on pupil when attempting to multitask, or when computers are accessible in the classroom setting.

> other innovative approaches, using computer simulations and applications, goes without saying. (Cuban, 2002: 129)

In the UK, it was becoming clear that the use of computers, by teachers, was still not consistent in the early 2000s and reflected what Cuban describes throughout his time researching provisions in the USA in the mid 1990s. Computers, in various environments, were causing as many issues as they aimed to have resolved, and one key factors was for the teacher's themselves. When reviewing Cuban's text, Bruce Myint stated that '[a]fter all, it has been 20 years since the education community was warned of the dangers of the *rhetoric of* technology, under-critical and over-inflated claims that technology will revolutionize the field' (Myint, 2003: 209). With this in mind it fell on the teachers to ensure the success of ICT by engaging with the continuous technological developments the computers[18] brought. It seemed that there was not a clear direction on what software was appropriate; for example, many were disengaging with computers altogether, and the fear of the computers becoming redundant was again acknowledged. This was a core concern alongside the realisation that, for those teachers needing to increase their ICT skills, conversations surrounding how (and what) software would enhance children's learning seemed somewhat alien especially when these teachers did not have the luxury of resources or time.

> It is unsurprising that a major initiative costing £230million pounds failed to achieve all that it might have done when it took little account of the lessons of successful CPD over the past twenty years. Most significant among these would be that the training should be immediately relevant to teachers, that they should have some ownership over it and that it should be perceived as important by senior management as integral part of the school's development plan. (Ager, 2003: 2-3)

Following a period of specific ICT teacher training, in the early 2000s, and to compensate for the disparity seen across the primary school systems in the UK, a more consistent approach to the use of ICT in teaching techniques became apparent. This was supported by funding for both software and hardware, developed network infrastructure, as well as the creation of a government department set-up to conduct research into the developmental needs for ICT skills within the education sector. The introduction of computers had been done so swiftly but without real consideration for the negative side effects such a

[18] In both the Hardware and Software.

changeable device could have on the teacher's ability to fully, and confidently, integrate this into their everyday school environment[19]. This is particularly clear when considering that '[a] decreased workload and higher quality in teaching were expected when ICT came along but no changes are visible' (Brodin, 2010: 102). With more knowledge and experience of computers came more creative innovations for the engagement with computers, by teachers, and the more radical fear that computers were making teachers redundant had come and gone.

> Our concerns as educators when we inquire into the future, then, should not simply be one of preparing ourselves for an inevitable future and attempting to 'future-proof' our systems. Instead we should see the relationship between the future and education as a reciprocal dialogue of anticipation, adaptation and creation. We may need to adapt to change on a short timescale, but other the longer-term education can also be a motor for radical transformation of social values, practices and ideas. [...] We can reclaim the right for schools to act as resources for their communities to imagine and build the future that they want rather than simply training them for the future they have been given. To do so, we need to remember that the future is not set in stone, that technology is not some magical force driving us down one inevitable path, and that education is also a force to be reckoned with when it comes to shaping progressive futures. (Facer, 2011: 10)

This historical information highlights the initial restructuring process needed for the introduction of computers into the education sector, yet the environment needing the most financial investment was within primary schools. Research clearly suggests that this area would require the longest time to integrate computer technology, and that this had only been possible after the financial investment of £230million on training programmes, by government, which in the first instance still did not seem to create the intended outcome (due to training being poorly conducted). Yet, in the face of varied challenges in the first two decades, it appears that throughout the early 2000's the integration of computers had been deemed a success by UK government. After all, the work of Cuban, Ager and now Facer, exposes the drive for ICT's involvement in the education sector was not a direct result of teachers need, but instead was directly from government decision makers and commercial influencers. It is also clear that with government support, in the UK, schools had already become invested in the computer technology by the early 2000s, therefore industry was able to develop

[19] A consideration still applicable within this thesis.

packages specifically designed to be sold in the education system[20] (as well as develop hardware and manufacturing to reduce cost) deeming them more accessible.

Commercial Influencers and the *Digital Divide*

In the light of manufacturing costs reducing, by the early 2000s, it is key to briefly note that home access to ICT is a problem still often seen in today's engagement with computer technology for children within the UK. In the early 2000s this was being researched avidly and publications stated a clear disparity between home and school access - often referred to as the *digital divide*[21] - which has been known to cause a lack of continuity, and on occasion tension between teaching staff and the parents of their pupils. In 2003, Richard Ager wrote:

> A situation now exists where some children will have access to a computer and facilities that are of a higher standard than those available in school, and will have a higher level of technical skill. We must make use of these skills, and not treat everyone as operating at the same level. Conversely, there may be children who clearly do not have access to computer facilities at home, so these skills will need to be develop solely in school. (Ager, 2003: 8)

The tensions were not only present when reflecting on the inequality seen, it was also present within the home environment itself as many parents invested in computers to allow their children to have at home what they already had access to in the school system. Throughout government it was believed that this would allow them to progress more within education and support their homework. Prior to this, children would have been given tasks that were reliant on searching information through text books or by communicating with their family for information; and would have been hand written before submission. Yet this was no longer the case, and 'where radio and, in its early interaction, television would

[20] One such example being the BBC Micro. 'The BBC Micro can be seen as a symbol of this change within the United Kingdom. This was a machine, prompted into existence by a moral panic, funded by the government, contracted for manufacture to a technology firm, branded and provided PR support by the BBC and sold to a closed market (secondary education) before being purchased by middle-class families and used by individuals to play and program games, then following the generation of another moral panic, being acclaimed as a historical pillar of the contemporary UK games and software industry' (Wade, 2016: 42-43).

[21] The term is most commonly used within economics, and Daniel Piazolo uses it in 2001: "The new economy is sometimes seen as the herald for a truly borderless world, where everyone can profit from the blessings of the internet regardless of his or her geographical location. However, since the internet requires substantial prerequisites concerning technical infrastructure and human capital, some worry that the developing countries will be left behind." (Piazolo, 2001: 29)

mainly be situated within one, often shared, room' (Wade, 2016: 58), these computers were often being placed in the child's bedroom. This meant that, even at this early stage of the personal, home, computers, there were isolating factors evidenced. The use of the computer for educational purposes was also limited and the computers were fast becoming a form of entertainment.

Alongside this revolution, the early 2000s saw interactive whiteboards becoming commonplace in primary schools across the UK, meaning the overhead projector[22] element was less used and blackboards[23] became redundant - another push towards the digital integration within the education system. Likewise, the first tablet devices were also being introduced (yet were still immature at this stage) and children were less reliant, even then, on the use of mouse and keyboard, through the engagement with tablet devices that allowed for a stylus to be used on the screen as a replacement for both.

Noted at the time was increased funding for public access to computers in environments such as local libraries, which were still being relied upon for written content and research projects; it was clear that this was a response to the divide in access was becoming noticeable across society. 'Consequently, the term *digital divide* refers to unequal access to information technology' (Tarman, 2003: 3), and could be deemed problematic when trying to create equal opportunities for childhood development across the UK. However, while this problem was just being noticed and discussed by the likes of Richard Ager, there was not much time dedicated to investigating the effect this would have or how we could manage this with new technologies still being developed and introduced to UK schools.

The teaching profession reimagined

After introducing and discussing these developments in home access to ICT in his book *Information Communications Technology in Primary Schools* (2003), Ager again makes it clear that during the early 2000s there was still an external push for the integration of computer technologies and that it was not the teaching

[22] The projectors meant here are Overhead projectors which required the teaching staff to write, or print, their information onto transparent sheets of acetate before their image was project, using mirror technology, onto a wall or other surface.
[23] In the case of black boards the information would be written onto them in real time by the teacher, using chalk.

community that were driving these new developments or introductions of alternative technological devices. He references Michio Kaku who, in 1998 stated that 'we were nearing the stage of ubiquitous computing' (Kaku, 1998 in Ager, 2003: 13) within a decade. Whilst writing in 2003, Ager challenges this statement to acknowledge the need for a greater shift in the way ICT is seen by teaching staff to allow that to happen within five years;

> It requires a wholesale belief by all teachers in all schools that the use of ICT is beneficial and that it will enhance teaching and learning and raise standards. Without that, however much money is provided for computers, software and training, a few committed and interested schools will forge their way to the very cutting edge of ICT use in schools, while the large majority of schools will remain in the backwater. Vast culture changes life this do not take place quickly. (Ager, 2003: 13)

It is apparent by these statements that Ager was beginning to reflect on a real concern regarding not only the monetary investment, by government, but also the effect this had on the teaching profession and the culture of our education system. He also uses this text to offer insight into the ways in which engaging with technology does show the ability to 'do wonderful things for our children's education, and the amount of resourcing that has been provided from government specifically for ICT has been enormous' (Ager, 2003: 13-14). Yet, this book makes clear in many ways that the commitment of the teaching profession not always met by the design industries, the continued investment (financially) from government, or by the trust that all children have the same access to such devices in the home environment.

> Schools have a continued source of funding for ICT hardware year on year, and a powerful and stable broadband infrastructure is being develop to connect all schools, giving them not only extremely fast access to the Internet but also the ability to download video clips and engage in video conferencing. Curriculum Online is providing schools with £100 million each year for the next three years specifically for digital content and £230 million was spent on a programme of CPD, giving every teacher in the country the opportunity to learn how to use ICT to enhance teaching and learning in their own phase and/or specialist area. Yet the latest indication is that only 15 percent of schools seem to be making effective use of ICT to raise standards in a coherent, whole-school, strategic way. (Ager, 2003: 13-14)

It is also worth noting that the investment in training by UK government came alongside 'plans to establish a network of 6000 "UK Online Centres" focused on "disadvantaged communities" in rural and inner-city areas of England. [...] This ICT Learning Centre programme [ran] parallel to a £100 million Department for

Education & Employment initiative to establish 85 City Learning Centres, based in inner-city schools' (Selwyn, 2002: 7). In Selwyn's paper, *'E-Stablishing' an Inclusive Society? Technology, Social Exclusion and UK Government Policy Making'* (2002), clarifying that this initiative came hand in hand with policies to reduce social exclusion and to meet employability quotas for the next generation by exposure to computer technology with 'justifications used throughout the surrounding governmental rhetoric concerning "up-skilling" the workforce and increasing international competitiveness' (Selwyn, 2002: 15).

So, by 2003 the rise of computer technology in the education system was very apparent, alongside increased developments more generally, which had all been supported by substantial funding from government. Yet, despite these efforts there was still a very noticeable *digital divide* in the UK, with as little as 15 percent of schools being considered to have full integration. This information had secured the earlier thoughts on the *digital divide*; which is also a term used to describe the disparity between those with full integration of computer technology, often both at home and at school, and those who had limited access either at school and/or at home, or in neither environment[24].

With regard to the ever-widening problem with the disparity of ICT integration, world-wide, comments in this chapter are limited to the progression of the use of computer technology within the education sector in the UK. Furthermore, due to the inconsistency of integration across schools in the early 2000s, many questions were raised regarding the use of such devices and their use in daily activities that previously had not require such technologies. 'The availability of so many powerful choices raised some questions: how much is too much? What issues must be discussed/resolved prior to committing the necessary resources?' (DiBello, 2005: 239). This is a core concern of the thesis and under pins future comments on the educational of autistic children, and the

[24] It is important to note that this thesis is using the term *digital divide* to address the to emphasise the divide in education within the UK, despite the term can being used when concerned with the *digital divide* between the economies of different countries;

> The existing economic divide between the industrialised and the developing countries is, of course, partly the reason for the digital divide between the high-income countries and the rest of the world. Lack of computers, unstable electricity infrastructure, shortage of telephones and capacity of telephone lines aggravate the introduction of the necessary information technology for the digital economy. Furthermore, the fees for new software and internet services are prohibitive for many users in developing countries. (Piazolo, 2001: 32)

need for embodiment to be included in this discussion. Literature reflecting on the *digital divide*, and way teachers' investment in computers throughout their engagements with pupils often discuss *commitment* as a theme. With this in mind it is key to note that with the development of computer technology being vast and ever growing, a problem with the longevity of the hardware and software is noted which raised concerns for the schools, as it was clear that 'an investment in technology is going to have to be long-term' (DiBello, 2005: 240), in order to commit to the regular developments seen.

Once again with this comes the need for members of the teaching profession to be well versed in the world of ICT, which, in the early 2000s, DiBello shows to still not commonplace. This offered clearer justification for those teachers that didn't feel able to commit to fully integrate ICT in their teaching. Clearly there were also concerns as to whether the teaching staff felt confident independently learning how to use certain software, and even those that were confident in doing so still 'expressed genuine concern as to whether or not they could rely on the technology they planned to use' (DiBello, 2005: 240). Simultaneously others commented on the additional workload the use of ICT incurred, due to the technology being unreliable or after having to go through extra procedures in order to redo, save and the retrieve the work they had already completed. Throughout this time period there were efforts made for computer technology to be more seamless and the development of faster broadband meant there was numerous updates for the software the schools had invested in; this had a direct adverse effect resulting in enhanced confusion and frustration among many.

> [...] If meeting the need for updated resources is not possible, serious consideration should be given to the possibility of postponing the addition of any new technology. Are you ultimately doing a disservice to a student by providing training and experience with a piece of equipment that is no longer used in the workplace? (DiBello, 2005: 241)

Therefore, in the early 2000s it was clear that independent and continuous training for teachers was being relied upon to assist the disparity between integration of computer technology. With the need to commit to the use, inclusion, and adaptations of ICT this was something that newly qualified teachers often found it more manageable than those who had been in the profession for a number of years. 'With familiarity, anxieties and fears tend to decrease, and

confidence increases. The amount of confidence a teacher possesses in using computers [...] may greatly influence his or her effective implementation of technology methods in the classroom' (Christensen, 2002: 411). These newer teachers may well have experienced computer technology as a student themselves so would more readily see the benefits, and its use was more naturally embedded throughout their teacher training, which lessened the more daunting elements of the integration process. 'Training appears to foster meaningful use by teachers in the classroom, which in turn, fosters student Computer Enjoyment and later a perception of importance of computers' (Christensen, 2002: 431).

This access to increasing amounts of training, and the result of increased exposure, had a positive effect as by the late 2000s it was common to have computers in the home, which in some ways meant that this generation was growing up without knowing a time before computer technology[25]. The benefit of a generation growing up with access to ICT was also apparent when considering the impact in the classroom as well as their teaching process; causing the reduced need to introduce a child to keyboard and mouse skills, therefore moving more into their use to generate and access information. When reflecting on the barriers previously noted in Khalid Abdullah Bingimlas' 2009 study (which discusses meta-analysis of literature evidencing barriers in education and cited recommended solutions for the teaching profession), his concluding statement, regarding the barriers faced is interesting to note:

> In general, several studies identified a range of the following or similar factors as widespread barriers: lack of computers, lack of quality software, lack of time, technical problems, teachers' attitudes towards computers, poor funding, lack of teacher confidence, resistance to change, poor administrative support, lack of computer skill, poor fit with the curriculum, lack of incentives, scheduling difficulties, poor training opportunities, and lack of skills in how to integrate ICT in education. (Bingimlas, 2009: 241)

This extensive list was written in 2009, at a time when, as previously mentioned, it was understood that the integration of computer technology was becoming easier and more widespread due to more home computers being used by primary school children. The integration had taken a lot longer than government had wished for when funding their £230 million training initiative, and £100 million

[25] The generation that cannot remember a time before computers is known as Generation X.

investment to establish 85 city Learning Centres, 6 years earlier. Despite this it was becoming clearer that '[o]n a practical level, for example, access to a PC does not guarantee a connection to the internet, any more than access to the internet is a guarantee of effectively accessing every available website and on-line resource' (Selwyn, 2002: 10), something that was a concern for the teaching profession; yet goes beyond the theme and argument of this thesis.

ICT in Special Educational Needs provisions

When referring specifically to literature that cite the ICT development designed for children with Special Educational Needs, it seems as through the early 2000s was the revolutionary period for the placement of ICT in schools. At this time, the professionals working with the SEN community were embracing an inclusive working environment in which children with learning and/or physical disabilities were being enrolled in mainstream schooling.

> Shortly after the start of the second half of the 20th century, the idea of integration emerged in opposition to the segregationist school system, which separates the regular and special education systems. A new paradigm of integration education for children with special needs emerged, based on new philosophical foundations and ethical values. It facilitated integration of children with special needs into a regular classroom environment, facilitating their engagement based on appropriate conditions and relationships of mutual acceptance and respect (Opara, 2007, 2009). [...] The integration of a few decades ago has further developed into *inclusion*, based on postmodern philosophy, ethics and values such as human rights, absence of discrimination, equal opportunities and justice. (Istenic Starcic & Bagon, 2014: 204)

So, although the thesis is primarily concerned with provisions that are specifically designed for those with Special Educational Needs, it is clear that the literature connecting Special Educational Needs and the use of computer technology is intrinsically connected with inclusive access within mainstream schooling. 'The inclusive perspective searches for a school for all and for each one and demands an individualised and customised educational response to the specific learning needs of each child' (Ribeiro & Moreira, 2010: 55). The shift to inclusive schooling practices is also discussed in Bonnie Evan's *The Metamorphosis of Autism* (2017). In his review of the text David Wright states:

> This transformation, or dare one say invention, of the newer form of autism was, according to the author, in part generated by the postwar social policy of deinstitutionalization itself. Before 1960, psychological treatises did not have to address severe cases of childhood "mental deficiency" (since they were relegated to low-status and isolated residential facilities), whereas with the movement to

> community care, the field of psychology was forced to take a greater interest in the diverse range of children with “special needs” filling state classrooms and whom educational authorities were legally obliged to teach. (Wright, 2019: 141)

To understand this shift more fully systematic reviews were accessed, in particular Andereja Istenic Starcic and Spela Bagon’s publication titled; *ICT-supported learning for inclusion on people with special needs: Review of seven educational technology journals, 1970-2011* (2014). This text presented a variety of studies from researchers concerning different disabilities as well as age groups, geographical locations, provisions and gender. The overriding conclusion from this text is that the use of computers for the inclusion of those with Special Educational Needs in mainstream provisions is vital and successful.

Istenic Starcic and Bagon’s paper (2014) systematically reviewed 118 papers, published across seven journals between 1970 and 2011, and states in the first line of the abstract that ‘research and development of information and communication technology (ICT)-supported learning for people with disabilities have not received adequate attention. It is also difficult to access research findings and developments in this field’ (Istenic Starcic & Bagon, 2014: 2012). With this is mind it is interesting to consider that, without reading each individual paper at length to verify this, it would be safe to say that the overriding majority of the papers *promote* the use of computer technology and deem this as exclusively positive step across all disabilities and all age groups. When reflecting on the idea of a *school for all* reported by Ribeiro & Moreira (2010) the thesis considers the overriding positive reporting of ICT for children with Special Educational Needs to be a direct result of promoting inclusive schooling, and to give teachers and parents hope that this tool will support their child’s access to mainstream education and curriculum.

It is clear from this publication that the computer technologies have been used in creative and adaptable ways to make this possible, and that again, much onus was placed on the teaching staff to make this happen. Yet - as mentioned previously - the increased workload for the teaching profession was not accounted for in the decision to increase access to ICT, especially when considering the increased pressures associated with the need for more

individualised work environments for all pupils[26]. The move to inclusive schools was again from governmental decisions first and foremost, like the integration of computer technology. Governments approach to this was again to increase funding and training to make inclusive school environments possible, as well as a reliance on the employment of additional staff to work with the children identified as having Special Educational Needs.

The only statement within Istenic Starcic & Bagon's paper that shares the concerns presented in the latter stages of this thesis, regarding the negative and unintended consequences of computer technologies for those with a diagnosis evidencing social difficulties, is; 'While ICT has the potential to promote inclusion and support differentiated instruction, the technology itself could also present the main obstacle to inclusion' (Istenic Starcic & Bagon, 2014: 203). This statement is not substantiated in the review, which is a limitation of the paper. In fact, it is not referred to again at all and it has not been connected to any specific publication, despite being a contradictory statement that clearly juxtaposes the other arguments from the collective publications[27]. One of the concluding statements of the review was that 'especially for students with disabilities, ICT provides accessibility and equal engagement and facilitates overcoming of potential isolation by connecting them to social environments and enabling their participation in education and wider society' (Istenic Starcic & Bagon, 2014: 224), a statement that is, in general, agreed with despite being too generic for a heterogeneity of disabilities, ages, genders and regions they discuss.

Conclusion

By approaching this chapter with a chronological overview of historical information surrounding the integration of ICT in education, since the 1990s, the aim is to offer the reader a clear context in which to approach and understand the following chapters of this thesis. The information introducing the influence that technological advances has had, on the governmental decision makers, offers insight into the problematic starting point within education and the pressure this

[26] This topic will be addressed in greater detail throughout in interventions across the two chapters presented in Part Two of the thesis.
[27] Overall, the paper was insightful more for the overview of literature on the topic of computer technology's role in the inclusive schooling movement, and in turn highlighted the cursory approach to the topic, without critique.

put on the teaching profession. This was in connection to two main causes, firstly the lack of involvement from teachers when decisions around ICT in education were being considered, and secondly the commitment needed to understand and implement ICT rapidly despite confusion surrounding the choice of software, the regular updates and the ways of managing the disparity of access, between school and home environments, and the effect this had on the *digital divide* being seen across the UK.

The likes of Richard Ager and Larry Cuban go further in outlining where the lack of inclusion, in terms of the teaching profession's need for ICT in their approach to pedagogy, resulted in integration being problematic. In light of this, the use of ICT in schools challenged the teaching profession due to the newly implemented learning tools that many teachers had not be trained in. Hence, additional and independently accessed training was necessary to address these technological changes effectively, in order for teachers to feel confident in the new devices they faced. Their direct contact with pupils meant that both trust and confidence, in the process, was key for its integration to be successful. The teaching professions commitment to ICT has also been integral to the growth of its use, and this was a problem that reduced as the younger generation of teachers were more comfortable with ICT as it naturally played a part in their life and their teacher training.

Through the latter stages of the chapter it is made clear, through the discussion considering Special Educational Needs, that approaches to the use of ICT in inclusive educational provision was becoming popularised in the early 2000s. In the early phases of ICT integration, it is evidence that those with Special Educational Needs were increasingly enrolled in mainstream schooling, with additional support supplied, to promote inclusivity over segregation. This is where the chapter concludes and offers a context in which to read the following discussion surrounding interventions used in SEN provisions for autistic children.

In light of this information the second chapter of this thesis now aims to align two important research approaches succinctly. Its first priority is to give the reader a more in-depth knowledge about the history of autism and look at the diagnostic framework from which one would gain a diagnosis. The approach to this chapter was also informed by giving the reader a clear context in which to approach the latter chapters of the thesis, and to begin to situate the argument in

the education of autistic individuals. The second objective is also to give premise to the complexity that autism brings to the argument. Not only through the spectrum that is autism, and trying to distinguish the difficulties this presented both the autistic community, but also the researchers interested in supporting them and how the language and culture are both impacted by autism but also have impact on it. Utilising the work of Amit Pinchevshi and John Peters (2016), along with Ian Hacking (1986) which will assist in addressing societal and new media impacts on autism. Thereafter, When considering the side effects of ICT more broadly the decision has been made to address this in more detail throughout Chapter Four, where interventions specifically designed for use with autistic children, in education, will be outlined extensively.

Chapter Two: Autism & Neurodiversity

Introduction

The second chapter of this thesis will outline the specific position of autism in the wider context of this PhD research project which largely aims to promote a comprehensive understanding of the education of an autistic child. Throughout this thesis the terminology used will be **autism**, when referring to the diagnosis, and **autistic children/adults or autistic individuals** when referring to those holding a diagnosis[28]. If reference is made to individual examples or first-hand experience of working with autistic children, this will be reflections on interactions with participates from the practical research elements (unless otherwise stated). At times the information presented will draw on the prologue and the methodological processes of practical research and participant observation in practice as well as theoretical research gained through a Masters of Research Dance as well as a Post-Graduate Certificate in Autism (Children), to support the discussion and embed autism in the research. To describe the classification under which autism sits the term **Neurodiversity[29]** will be applied, as '[u]nfortunately, however, those on the spectrum tend to be viewed negatively as weird, sick, disabled, disordered, abnormal, and laden with deficits. (Smagorinsky, 2016: 4). Therefore, the decision has been made as Neurodiversity describes those with a diagnosis, such as autism, in terms of differences rather than as disabled or disordered people.

This chapter of the thesis aims to demonstrate a body of research into autism which has informed the development of the knowledge over seven years. Here information is brought together from various theoretical sources, rather than first-hand experience[30]. Yet, the research direction was shaped by the iterative

[28] Where appropriate the terminology of others will be changed to those listed here.
[29] 'Neurodiversity as a concept is only about [18] years old. It originated as a movement among individuals labelled with autism spectrum disorders (ASDs) who wanted to be seen as different, not disabled' (Armstrong, 2010: 7-8). In contrast to *Neurodiversity* the term *Neurotypical* will be used to describe any individual who does not hold a diagnosis of autism.
[30] The experience of working with autistic children has guided the information included yet is not discusses specifically until later in the thesis.

approach established, with the practical research being supported by theoretical knowledge, and vice versa, which underpins the importance of the practice itself.

Chapter One outlined the history of computer technology in education and to mirror, this a historical overview of research resulting in the specification of autism as a diagnosis is included to begin this second chapter. In doing so the diagnostic outcomes of autism and how this may be evidenced for a child holding this diagnosis is included. This overview will discuss findings throughout the early 1900's, where there is evidential research by psychiatrists and psychologists resulting in an increased recognition of *neuropsychiatric disorders*, specifically those evident throughout childhood; the 1940s being specifically important. Autism's recognition in the medical field was pioneered by the work of Leo Kanner and Hans Asperger, who conducted their studies between 1943 and 1945. The majority of literature refers to Kanner's work for our present understandings of the characteristics of autism and subsequent diagnosis.

The historical context helps to expand current understandings surrounding autism, which has informed the placement of this research at the beginning of this thesis to support the thesis argument. An explanation of the diagnostic process of autism will be demonstrated by reviewing current literature from childhood studies and literature designed for teaching staff and health professionals, surveying literature that focuses on Neurodiversity, where possible. Not only will this chapter contextualise autism in the wider context of Neurodiversity, but also the placement of the diagnosis within the UK education system. Then Part Two will connect to current understandings of autism and its place within the UK education system, by situating autism in this specific research project and will underpin the discussion of practice presented in Part Three of thesis (which reflects on personal experience with autistic children during the practical research).

Furthermore, whilst contextualising autism in the wider field of Neurodiversity, the diagnostic process will help evidence the prevalence of misdiagnosis and dual-diagnosis, as well as other Neurodiversity that show similarities to autism. This chapter will aim to introduce the investigation into interventions specific to the diagnosis, which will be more formally presented through Part Two. The combination of research presented in the first two chapters acts as a thorough, and formal, introduction to the thesis more broadly.

Whilst giving focus to the history of autism this chapter will present information connected to the development of autism's diagnostic framework, and its implementation. Throughout Chapter Two the three areas evidenced as being underdeveloped, developmentally, for a diagnosis to be obtained, will be introduced in detail using the formal process; the *Triad of Impairments* (Wing & Gould 1979). This information will offer a base line as well as help to highlight the potential differences and difficulties faced by those with autism, and allow the uses of interventions and teaching methods to be understood more comprehensively[31]. Throughout the final stages of the chapter an introduction into the schooling for autistic children will be introduced[32].

Historical Overview of Autism

The description of autism is seen to differ depending on the publication and the discipline of the author, and between countries yet, the *Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition* (2013) (DSM-5) categorises it as a Neurodevelopmental Disorder. The *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-4)* (1994), however, listed autism as a Pervasive Developmental Disorder. In the World Health Organisation's *International Classification of Diseases* (ICD-10) autism is within the *Specific Disorders of Psychological Development* category. Despite this, more recently the term Neurodiversity has been used to account for the variety of neurological diagnoses, not exclusively autism, as a way to change the negative connotations associated with words such as *disorders, impairments,* etc. Consequently, the decision was made to use the term Neurodiversity over the three descriptors above, as it is becoming common within childhood development literature.

> The actual coining of the term has been attributed to Judy Singer – a self-described parent of an "aspie" (person with Asperger's syndrome) who wrote a book chapter in 1999 title "Why Can't You Be Normal for Once in Your Life?" Singer wrote, "For me, the key significance of the 'Autistic Spectrum' lies in its call for and anticipation of political of Neurological Diversity, or what I want to call Neurodiversity.' The 'Neurologically Different' represent a new addition to the familiar political categories of class/gender/race and will augment the insights of the social model of disability. (Armstrong, 2010: 7)

[31] Information presented through chapters Three and Four.
[32] Information acknowledging specific adaptation to the curriculum and teaching techniques employed to support autistic individuals in the UK is offered alongside reflections on inclusive mainstream provisions - like those mentioned in Chapter One.

The historic overview allows the current diagnostic frameworks and specific interventions to be appropriately interpreted. The history of autism has been formally traced back to the 1940's, an era where research into childhood diagnoses was increasingly evidenced and seen as the catalyst for studies connected to our current understanding of autism. Yet, the earlier half of the nineteenth century was influential in its developments. Pioneering British psychiatrists, Henry Maudsley, is noted for his research into psychosis and beginning research into childhood conditions; which contradicted the romantic ideals about children held throughout society at this time. Maudsley stated that 'children with very strange behaviour could all be classified as suffering from childhood psychosis' (Maudsley, 1867 in Wood, Littleton, & Sheehy, 2007: 184), a term that was becoming increasingly recognised.

The progress of research into childhood conditions throughout the following 60 years of psychiatrists' research, which provided much needed information to underpin the current understanding of autism and helped to define similar diagnoses. An influential study was conducted by Sante De Sanctis, an Italian psychiatrist and psychologist, in 1906, which concentrated on the regression of language evidenced by young children. His research transformed the understanding by suggesting a correspondence between the regression of language and of social skills. He was also recognised for the term 'dementia precocissima catatonia', which he used to describe the early onset of dementia in children (again focused on regression of skills).

Sante De Sanctis' research preceded two research studies formally recognised as resulted in autism being evidenced as a diagnosis, in the 1940s. The first was a research study in 1943, by Leo Kanner, an American psychiatrist and a physician who had helped form the Foundation of Childhood Psychiatry in the United States of America. Kanner's work eventually enabled connections to be made throughout case studies dating between the 1860's - 1930's, and his research is highlighted for its ability to illustrate a clear thread through a complex disorder, to form what we now know as autism.

The term autism is known to have been inspired by the Greek word *autos*, meaning *self*. Despite Kanner's work outlining characteristic for the diagnosis it would seem that the term was first applied by Eugen Bleuler, a Swiss psychiatrist. He used the term *Autismus* 'to characterize many of the social

withdrawal symptoms exhibited by schizophrenics' (Lombardo, et al., 2007) and it was only later connected to what we now know to as *autism* specifically. 'For Bleuler, *Autismus* meant self-enclosure against all kinds of reality, not only social reality, as the later definition would have it (Pinchevski & Peters, 2016: 2510). Within Kanner's initial study he published the specific and definitive characteristics he had seen throughout his research with children who presented autism; withdrawal, obsessive nature, rote memory, heightened specific intellect, lack of communicative intent, over sensitivity and heightened relationships to objects. He stressed that each outcome was individual and unique to that child alone, yet it was 'after Kanner published his first paper on "early infantile autism" many believed that autism was an emotional, not a physical disorder and that the way the parents had brought up their child has cause all the problems*'* (Wing, 2002: 22); a statement that was later rejected by the autism community.

Alongside Kanner's research in America, the second of the two studies was conducted by Hans Asperger, a paediatrician from Vienna, in 1944. His work was distinct from Kanner's due to researching adolescents instead of children. This study evidenced heightened signs of naivety and inappropriate social interaction skills in young adults - which is information that would not have been identifiable purely through Kanner's work (as his research participants were children only). The majority of the participants in Asperger's study had poor motor skills yet were of borderline intellect, unlike Kanner participants, and in many cases evidenced heightened intellect (Howlin, Baron-Cohen & Hadwin 1999). In both studies, the results specified that the impairments[33] seen were evidenced through various outcomes within autistic individuals and that no two individuals diagnosed autistic will have the same difficulties or abilities (Kanner 1943).

It was originally thought that their studies described the same condition, resulting in Asperger's work lacking recognition. Yet, due to his research participants being adolescents, resulting in his identification of heightened signs of naivety and inappropriate social interaction skills, Asperger's research was appreciated for adding new insights. Nonetheless, Asperger's research still lacked recognition and was not translated from German, to English, until 1980

[33] The use of language here is to replicate and give awareness to the way in which the diagnosis was understood at the time. Throughout my own reflections and experiences, I will align with the field of Neurodiversity where terms such as *differences* or *difficulties* is favoured over impairments.

(the year of his death). Despite this it has been suggested that other professionals, even Kanner himself, were aware of Asperger's work (Pinchevski & Peters, 2016: 2511). At the time, the two researchers' work was often seen as overlapping, yet they generated two separate diagnoses; Kanner's resulting in what we know today as Autism (or Classic Autism) and Asperger's work known as Asperger's Syndrome.

> One of the positive effects of the interest in Asperger's syndrome is that we now know that autism can occur at all levels of intellectual ability, including very superior levels. On the negative side, this makes us sometimes forget that about half the cases diagnosed with an autism spectrum disorder suffer also from a marked degree of intellectual disability. (Frith, 2014: 744)

In the UK, both Kanner and Asperger were recognised equally through Lorna Wing and Dr Judith Gould's research, which began in 1979. By combining information about Leo Kanner's and Hans Asperger's studies, Lorna Wing - a psychiatrist and physician - become interested in researching Developmental Disorders after having an autistic child (Boucher 2009). Wing worked alongside Gould (a chartered consultant clinical psychologist) to redeveloped a study on children with Special Educational Needs by focusing primarily on autism. These two women formed a term that was used to underpin diagnosis, and recognition, of autism: Triad of Impairments (Wing & Gould, 1979). It is interesting to note here that this new wave of autism research is considered within Bonnie Evan's 2017 text titled *The Metamorphosis of Autism.* When reviewing the book David Wright explains that:

> From the 1960s […] the autism that had previously been grounded in classical psychoanalytic individual case studies was being replaced by one based in neuroscience, genetics, and epidemiological surveys. Now autism was all about the lack of engagement with social surroundings and interpersonal cues, thus providing an interesting avenue to pursue psychological theories of empathy. (Wright, 2019: 141)

With this in mind, Wing and Gould's *Triad of Impairments* is used to describe the three main areas of difficulty; Social Communication, Social Interaction, and Social Imagination/Theory of Mind (Wing & Gould, 1979). 'In 1979, Wing and Gould published a report of a large-scale study of special needs children living in the district of Camberwell' (Boucher, 2009: 28) and observed a number of children with key characteristics of autism highlighted through the work of Kanner, however, they also saw various characteristics more closely represented

by Asperger's study. In 1996, Wing began to use the term *spectrum* to describe the breadth, combination and diverse characteristics presented - which was also included in the title of her book *The Autistic Spectrum: A Guide for Parents and Professionals* (1996). *Spectrum* not only describes the broadness of autism but also its tendencies, as 'Wing and Gould emphasised the heterogeneity of the individuals themselves' (Boucher, 2009: 29), which led to term that soon being used in the name of the diagnosis. It was through the research of Wing and Gould that some of the physical differences of autism were acknowledged and became insightful in evidencing some of the more obsessive and restrictive patterns of behaviour.

Categorisation of Autism

In the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-4)* (1994) autism was listed as a *Pervasive Developmental Disorder*. Within this classification there were five individual and separate diagnoses with unique characteristics; three of these being the collective of what was titled *Autistic Spectrum Disorders*- which was described as the separate conditions of Classic Autism, which was derived from Kanner's study, *Asperger's Syndrome* from the work of Hans Asperger, and *Pervasive Developmental Disorder Not Otherwise Specified* (PDD-NOS), to include a combination of characteristics from the first two diagnoses. The two additional disorders classed as Pervasive Developmental Disorders are; *Rett Syndrom*e and *Childhood* Disintegrative Disorder (CDD), which will both be introduced in more detail through a latter section of this chapter (in the subsection which focuses on misdiagnosis and/or dual-diagnosis as well diagnoses that share characteristics with autism).

Classic Autism described those with difficulties in Social Interaction, Social Communication, and Social Imagination. For a child to gain this diagnosis they must have difficulties that are 'gross and sustained' (A.P.A., 1994: 66), with communication difficulties being defined as prolonged and underdeveloped. Many autistic children have limited verbal communication, although when speech does occur, it shows various abnormalities including persistent Echolalia (mechanical repetition of sounds of words). '[...] Echolalia may be immediate, or of delayed type- the child repeats a word that has been said some time previously over and over again' (Turk, Graham, & Verhulst, 2007: 141). It was

also noticed that individuals often have trouble with the complexities of language; commonly jokes, complex questions, expressions, and sayings.

> For many autistic individuals, the semantic meanings of words are less interesting than their phonetic qualities and acoustic patterns. Autistic children often enjoy repeating words and phrases even if they don't comprehend the meaning (echolalia); and prosodic 'deficits' are a characterisation of the condition. Autistic individuals often respond to language musically, developing particular kinds of intonations, enjoying rhythms, repetitions and alliteration. Many enjoy 'nonsense verse' while one of the skills noted in autism is for rote learning of disconnected word strings. (Shaughnessy, 2013: 328)

Alongside differences in language acquisition and application by autistic individuals, the DSM-4 suggested this may be associated or a consequence of learning difficulties and 'abnormalities in the development of cognitive skills' (A.P.A., 1994: 65) usually resulting in autistic individuals being below average intellectually- that is an IQ below 70.

This lower than average IQ is a district character of Classic Autism, distinct from Asperger's Syndrome (which makes clear that those with this diagnosis often have typical or above average intellect). Another distinct attribute of Classic Autism was described as 'the presence of often severely incapacitating ritualistic tendencies including a highly restrictive, stereotyped, and repetitive behavioural repertoire' (Turk, Graham, & Verhulst, 2007: 140). In many cases these types of behaviours are noticed by parents at an early age, and can assist in gaining a diagnosis. The last recognisable trait is also noticed through the infantile years, preceding school, which is the lack of imaginative play, 'stereotyped and repetitive motor mannerisms or a persistent preoccupation with parts of objects' (A.P.A. 1994: 67), and often a narrow range of interests. Again, this can be fairly obvious to parents and carers yet can also be subtle, so may not be evidenced until entering school; where comparisons between other children's development may lead to a difficulty or difference being noted.

Asperger's Syndrome, the eponym of Hans Asperger, is characterised by having milder social and behavioural difficulties than those with Classic Autism. 'The disorder has some features in common with autism, with two noticeable exceptions: there is no serious delay in language development and most children with [Asperger's Syndrome] are of average or higher intelligence' (Barker, 2004: 96). It was also considered that those with Asperger's Syndrome would have significantly less challenges with language acquisition, although frequently

evidence difficulties with 'idioms, puns, nuances, double entendre, inference, metaphors, allusions, and sarcasm' (Notbohm, 2005: xxiv). There may also be a noticeable decrease in the behaviours typical for Classic Autism with little-to-no repetitive motor mannerisms, such as hand flapping, as well as a limited preoccupation with objects.

> The definition for Asperger's Syndrome also specifies that there should be no delay in cognitive development. This means that the child or adolescent must be within or above the average range in terms of intellectual ability to meet the diagnostic criteria for Asperger's Syndrome. (Roth, 2010: 41)

Those with average, or higher, intellectual ability commonly strive in subjects needing logic, memory, and creativity. 'The outlook for those with [Asperger's Syndrome] is generally better than it is for autistic subjects. Many complete secondary school, and some go on to further educations' (Barker, 2004: 101); in comparison, those with Classic Autism can require a high quantity of care throughout adult life. In relation to the aforementioned, it is suggested that one in 200 diagnosed with Asperger's Syndrome are exceptionally skilled in a specific area, known as an Autistic Savant. It is also suggested in the DSM-4 (1994) that those with 'Asperger's [Syndrome] appear to have a somewhat later onset that [Classic Autism], or at least to be recognised somewhat later' (A.P.A, 1994: 76).

Although those with Asperger's Syndrome are seen to have a heightened intellectual ability and higher levels of IQs, 'they still have marked empathy difficulties and eccentricities with impaired understanding of social conventions' (Turk, Graham, & Verhulst, 2007: 146). It is often the case that a diagnosis of Asperger's Syndrome is mistaken for mild autism, which is not necessarily correct; those with a diagnosis of Asperger's Syndrome have differing disabling and enabling characteristics than those with a diagnosis of Classic Autism[34].

[34] In the 4th edition of the DSM (1994) Asperger's Syndrome was listed as being separate to the diagnosis of Autistic Disorder (or Classic Autism) under the category of Pervasive Developmental Disorders. Yet, in the 5th Edition (2013) there is no distinction, so far as to change consolidate Classic Autism, Asperger's Syndrome and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS) into one diagnosis: *Autism Spectrum Disorder.* In the preface of the text they state:

> 'Consolidation of autistic disorder, Asperger's disorder, and pervasive developmental disorder into autism spectrum disorder. Symptoms of these disorders represent a single continuum of mild to severe impairments in the two domains of social communication and restrictive repetitive behaviours/interests rather than being distinct disorders. This change is designed to improve the sensitivity and specificity of the criteria for the diagnosis of autism spectrum disorder and to identify more focused treatment targets for the specific impairments identified' 2013: xiii).

> The fact that there are now formal diagnostic criteria for both autism and Asperger's Syndrome might seem to indicate that there are precise ways of distinguishing them. But this is not always the case. Sometimes an individual's symptoms meet both the criteria for Asperger's Syndrome and those of another pervasive developmental disorder, i.e. autism or PDD- NOS. (Roth, 2010: 41)

Due to this, Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS) was described (in the DSM-4) as a diagnosis of inclusion, 'this category should be used when there is a severe and pervasive impairment in the development of reciprocal Social Interaction or verbal and nonverbal communication skills' (A.P.A., 1994: 77). It was commonly assigned to those without the specifics of either of the two conditions above, and tended to be used to include those who evidenced milder symptoms of Classic Autism without the language skills and heightened intellect of Asperger's Syndrome.

Each of the three diagnoses categorised in the DSM-4 were considered a 'neurobiological disorder' (Kranowitz, 2005: 31) believed to be present from birth and a result of an imbalance within the brain itself, yet the cause is still unknown.

> In recent decades there has been much debate over the ontological status of autism and other neurological 'disorders', diagnosed by behavioural indicators, and theorised primarily within the field of cognitive neuroscience and psychological paradigms. The triad of dominant theories includes theory of mind deficit, executive dysfunction, and weak central coherence theory, as well as behavioural diagnosis and behavioural psychological intervention paradigms; all position autism as a neurological disorder, a pathological deviance from expected functional stages of development (Milton, 2012: 883)

Despite all of these avenues a connection to genetics has been complicated by cases of identical twins who are not both autistic and although many of these areas have increasingly gain research funding none have been conclusive, no specific gene has been identified, and 'no single cause has been definitely shown to produce the disorder' (Greenspan & Weider, 2006: 4).

Despite this the proposed connections to genetics has been complicated by cases of identical twins who are not both autistic. On the subject Simon Baron-Cohen has also written about increased levels of testosterone in pregnancy being a contributor and connecting to the gender bias seen[35]. Both are topics that increasingly gain research funding, but none have been conclusive in identifying

[35] The level of boys diagnosed as autistic outweigh the number of girls, and this is a topic discussed in the latter stages on this chapter in more detail.

a specific gene, and 'no single cause has been definitely shown to produce the disorder' (Greenspan & Weider, 2006: 4).

Despite the three separate descriptions of autism offered in the DSM-4, the most recent, fifth edition, the Diagnostic and Statistical Manual of Mental Disorders autism is addressed vastly differently. The collection of what was titled Autistic Spectrum Disorders were no longer seen and instead the publication no longer described autism as a Pervasive Developmental Disorder, but instead assigned it to a new category of Neurodevelopmental Disorders. Within this restructure the diagnosis of Asperger's Syndrome was controversially removed.

Those previously diagnosed with Asperger's Syndrome held different characteristics from those with Classic Autism which led to those with the diagnosis of Asperger's feeling as though the term *autism* does represent them in society. The concerns raised connected to the previous understanding that Asperger's Syndrome is often associated with heightened intellectual competency, yet the removal of this diagnosis in the DSM-5 sees the lack of categories resulting in assumptions that they are on, what was previously referred to as, the other end of the spectrum. This view point saw those with classic autism being very different from those with a diagnosis of Asperger's Syndrome regarding underdeveloped verbal communication and the likelihood of lifelong care. Yet, to avoid presenting an opinion on the changes made in DSM-5 (2013) this thesis applies the term *autism* or *autistic* throughout the thesis.

This concept also relates again to Michael Oliver's work, especially when he considers the role of medical stances on disability:

> [T]his is what has come to be called the medical model of disability, which has had, and continues to have, a profound impact on the self-identity of many disabled people. (Campbell & Oliver, 1996: 36)

This statement again clearly explains why the removal of a diagnosis, such as Asperger's is not considered, through the medical model, to be controversial, but also sheds light on the importance of embedding those with a diagnosis of autism into research. In line with this it is also important to reflect on the fact that every individual with autism is just that, and individual. In an attempt, here to discuss the heterogeneity of autism the Wing and Gould's *Triad of Impairments* with me used to structure the subsequent sections of; Social Communication, Social

Interaction and Social Imagination/ *Theory of Mind*[36], which are presented in more detail below for its assistance in diagnosis. There are many areas of development that cannot be defined by any one of the triad and, in some cases, they connect to all three. It is also possible for the person diagnosed not to struggled with *any* of the examples used below, yet they are included to assist the reader's understanding of the possibilities. 'In other words, we shouldn't immediately assume that an autistic person cannot do something – rather there might be a myriad of reasons why they don't' (Cage, 2014: 761), as well as a myriad of things they can and will do. This thesis aims explores the complexities of autism, as Jon Brock explains:

> Autism is complicated and messy. Almost every aspect of cognition can be affected, but the pattern of strengths and difficulties varies hugely across the autistic population. Even so-called 'core' symptoms manifest differently in different individuals and at different stages of development. There are no clear boundaries. (Brock, 2014: 753)

This concept is explored further through this chapter, which aims to use the *Triad of Impairments* to structure the presentation of research surrounding social communication, social imagination and *Theory of Mind*, and finally social interaction. So, despite there being no clear boundaries (to use Brock, 2014) this format will allow for some to be created for the purpose of this thesis.

Social Communication

This first section, of three, will focus on *Social Communication* and in doing so aims to progress to a discussion of outcomes evidenced by those with a diagnosis of autism, where verbal and nonverbal communication skills are underdeveloped. Also discussed is the adverse effect this may have over a prolonged period of time, and how this impacts on the comprehension of autistic individuals and understanding of verbal Social Interactions. This section will then include a more comprehensive discussion of the second and third difficulties highlighted through the *Triad of Impairments*: Social Interaction, and Social Imagination. Literature often uses terms such as prolonged and underdeveloped to describe the placement of communication in the *Triad of Impairments*, to

[36] The *Theory of Mind*, as a term, is frequently used interchangeably with Social Imagination with both referring to the ability to understand someone else's mental state and emotions, as well as their own, whilst also having the ability to differentiate from others and predict the actions of others (Baron-Cohen 1995, Baron-Cohen, Leslie & Frith 1985).

reflect that many children develop very little verbal communication. This difficulty can often be noticed from the early development of the child from 18 months of age, where typically developing children are acquiring language.

If speech is developed then there are often various difficulties related to verbal repetitions of words and sounds; known as Echolalia. Turk, Graham, & Verhulst (2007) note that if speech is not developed fully in the infantile years then it is often consistent with challenges also seen non-verbal elements of communication. This is inevitably co-occurring with the additional difficulties of Social Interaction and Social Imagination (Cumin, Leach, & Stevenson 2000, Boucher 2009), a connection made in more detail through the latter section of this chapter. For someone diagnosed autistic, it may be increasingly difficult to understand the complexities of conversations, often resulting in misunderstanding and/or distress.

Even those who develop language often have some area of delay in their use of language in childhood, which commonly results in limited vocabulary. The autistic individuals who do gain language it is key to note their understanding of the subtleties of communication is also considered a spectrum, in the same way the diagnosis is.

> Typically developing children learn the nature of communication as early as 6 to 9 months of age when they begin to develop interactive routines with mom or dad. These interactions may or may not involve babbling, but they certainly precede the development of spoken words. Instead, they involve an *approach* (or orienting response) via looking at their parents, physically getting closer, pointing to them, or some similar action; a *behaviour* that draws attention to some event or item (such as the movement of an object, a sudden noise, etc.); and a *consequence* by which the parents reinforce the behaviour via laughing, smiling, repeating the vocalizations or gestures, or providing a tangible outcome. Thus, even though no words are spoken, a communicative episode can be identified. (Bondy & Frost, 2001: 728 - 729)

The skills described clearly rely on movement and mimicry, which offered further recognition for their involvement in the practice informing this thesis. These are often applied until the age of two (where children then begin to understand other people's actions) assist the child to understand more complex nonverbal gestures used alongside language (Greenspan, 2002); another justification for the practical research approach developed. From three years of age they begin to verbalise feelings and emotions and at four years the child will have the ability to comprehend truth, lies and the motivation of both, due to a developed *Theory of*

Mind. This term describes the ability to understand someone else's emotions, whilst having the ability to differentiate from others and predict their actions in various situations, yet some 'autistic children find even the immediate social environment unpredictable and incomprehensible' (Baron-Cohen, Leslie & Frith 1985: 38). For typically developing children the *Theory of Mind* assists the development of verbal communication by the age of four. For autistic children, on the other hand, it is thought that *Theory of Mind* might not develop to a complex level, especially for those with a lower than average IQ.

> The impairment in communication is also marked and sustained and affects both verbal and nonverbal skills. There may be a delay in, or total lack of, the development of spoken language. In individuals who do speak, there may be a marked impairment in the ability to initiate or sustain a conversation with others or a stereotyped and repetitive use of language or idiosyncratic language. (A.P.A, 1994: 66)

Research in the shows further challenges connected to the nonverbal aspects of communication, and how this might negatively impact on their confidence to fully understand verbal conversation; even when this element of communicative skill is at a seemingly typical level. If facial expressions and gestures are not intuitively recognised it can effect the individual's ability to read the emotions of the person they are communicating with. This is especially important when thinking about the many coping mechanisms people rely on (when referring to their language) to conceal emotions that may be very apparent when interpreting their facial expressions. It is this lack of the unconscious ease, when attempting to connect the verbal and nonverbal elements of communication which is a consequence of under developed non-verbal communicative skills.

In comparison, those without a diagnosis effecting their language acquisition better understand emotions and are more likely to recognise this through nonverbal cues. Another complexity in this situation is the ability for the nonverbal cues to override what is visually seen. This is often more apparent when considering the subtleties of the physical output of emotions such as worry, nervousness, and apprehension; which are often collectively referred to as Emotion Blindness (Boucher, 2009: 156) or Mindblindness (Howlin, Baron-Cohen, & Hadwin 1999).

This research is often connected to developments in appropriate imitation and mimicry, as 'typically developing children spontaneously mimic each other as

a form of communication' (Nadel, 2002), when compared to autistic individuals. Verbal repetition of words and sounds are commonly used by autistic individuals. This, referred to as Echolalia, is considered vastly different from the 'spontaneous mimicry of meaningless actions [which] appears to be lacking in [autistic children]' (Hamilton, 2010: 105). When Echolalia is apparent it can used be immediately after a word or sound is experienced by the individual or have a delayed effect hearing the child repeat something they have heard at an earlier time (Boucher, 2009: 340).

The use of Echolalia is often categorised in two different ways; appropriate and non-appropriate, with some children using 'language appropriately but in a narrow, stereotyped, repetitive way' (Greenspan & Weider, 2006: 302). When considering the appropriate use, the repeated phrase may be applied in a socially accepted place within a conversation, but may carry with it an accent or mechanically sounding voice that may not be the natural speaking voice for that individual. This, therefore, is noticeable within the conversations often causing an additional stress for the individual using the Echolalic phrase. Regarding stress, 'Bogdashina argues that echolalia increases with sensory overload and decreases when the processing demands or pressure to vocalise lessens, giving way to more spontaneous speech' (Bogdashina, 2004, in Keay-Bright & Howarth, 2012: 138). Yet, non-appropriate uses of Echolalia may see the individual repeat a word, or phrase, without any apparent audience and outside of a socially recognised verbal communication, and can cause the listener to question their intention (Greenspan & Weider 2006). The reliance on Echolalia in both its forms can also be connected to an outcome of the struggles in acquiring and comprehending the complexities of the English language.

It is common for autistic individuals to have trouble with the complexities of language including jokes, questions, expressions, and sayings. It is also noted that these difficulties may be attached to an additional learning disability (A.P.A., 1994: 65). The diagnosis can evidence a vast intellectual region and for those with a dual diagnosis (if both effect their language acquisition) which may cause limited development of language, with a low level of verbal comprehension[37] (Jones & Guldberg, 2014). In such cases Echolalia may be apparent, or the

[37] Both of these topics will be discussed more specifically in the latter section of this chapter.

individual may develop coping mechanisms through physical gestures and noises to compensate for the words they have not been able to effectively understand and use (Clements & Zarkowska 2000).

However, for those who are of average or above average intellect there is often no detrimental delay in language acquisition (Barker, 2004: 96) and therefore are less challenged by verbal communication. Yet, is often misunderstood as having no communication difficulties, but as mentioned previously the difficulties may lie in the complexities of language, such as metaphors, sarcasm, idioms, puns, etc. (Notbohm, 2005: xxiv). The English language, in particular, is fraught with complexities and habitual phrasing that makes the speaker's intended meaning difficult to understand. The use of rhetorical questions can also become problematic may cause social tension, if such questions are repeatedly unanswered, or if jokes are misunderstood.

When considering the difficulties for those with, and without, language acquisition it is inevitable that both present challenges, socially, for the child holding the diagnosis. Nonetheless it cannot be argued which is more, or less, detrimental. It would be easy to consider those with language to have a better chance at living a more social life, but the acquired understanding may bring with social barriers, due to the listener not understanding or giving consideration to the diagnosis they hold - often resulting in the listener having a false sense of the speaker's conversational comprehension (Jones & Guldberg, 2014). This can increase and provoke an additional layer of difficulty that may not reside in the verbal communication itself, but in the social and cognitive developments that come hand in hand with language acquisition.

Yet, despite the level of language acquisition it is clear that an underdeveloped *Theory of Mind* can cause the additional challenge of perceiving the other's mental processes, at the same time as being aware of one's own (Jones & Guldberg, 2014, Greenspan & Wieder 2006). This consideration is also discussed in studies that focus on the connection between limited understanding of facial expression, gestures, and nonverbal elements of conversation. Therefore, it was necessary to describe some of the key issues that come with this, as well as those challenges that effect those at both extremes of the communication difficulties associated with a diagnosis of autism; verbal and nonverbal.

Social Imagination and the Theory of Mind

This section now brings focus to Social Imagination/ Theory of Mind. The Theory of Mind is connected to autism in many formats, and is clearly connected to one's ability to imagine the situation of another (as mentioned above):

> In a seminal paper, Premack and Woodruff (1978) defined theory of mind as the ability to impute mental states to oneself and to others. The ability to make inferences about what other people believe to be the case in a given situation allows one to predict what they will do. This is clearly a crucial component of social skills. (Baron-Cohen 1995; Premack & Woodruff, 1978)

To reflect on such developments, reference is made to literature from the field of childhood development and effect of development of Social Imagination on social skill development. In doing so this section introduces self-referential abilities and empathy as key themes (which influential through the practical research discussed in Chapter Six). As mentioned through the section above, evidencing details about Social Communication and autism more broadly, the overall social skill development of individuals is embedded on the infantile years. It is clear then that the overriding presence of mimicry at this time of, between child and their primary caregiver and/or peers, is vital through this developmental process[38].

The phrase *lack of imagination* is often associate with the Triad of Impairments, and other diagnostic frameworks, due to the idea that limited pretend play and imaginative problem solving through the early years is directly correlated to a lack of imagination. It is also common in the years before age five that parents, carers or educational professional are able to definitively highlight differences in their child's development compared to their peers. 'Many of the skills children need in their development as social beings, for example turn-taking, decision making, language skills, monitoring and reciprocity, evolve naturally through play' (Keay-Bright, 2008: 3). Yet, further to this difficulties with Social Imagination present challenges when imaginatively appropriating or interpreting the actions of another. 'Individuals [...] display a markedly restricted range of interest and are often preoccupied with one narrow interest' (A.P.A, 1994: 67). This process is also regularly linked with the other two elements contributing to the *Triad of Impairments* characterised through a diagnosis of

[38] And this is the reason that mimicry became such an important theme in the practical research elements of the PhD and why this, as a topic, is given emphasis throughout the latter chapters.

autism and can be an alternative rationale linking difficulties in communication with a lack of pretend play with peers.

If autistic individuals have limited abilities to interpret or imagine the other in interactions, alongside the need to conceive their own humanness, how does one communicate successfully? This is where the difficulties in Social Imagination become most apparent. In addition, the 'lack of creative and imaginative behaviour is seen as resulting from the preoccupation with a restricted set of repetitive behaviours' (Boucher, 2009: 34). Yet, it must be said that this way of thinking is somewhat outdated, and as this thesis progresses it can be seen that there is a place to support and encourage such characteristics among the autistic population, rather than assume this is certain. Dr Ilona Roth, Senior lecturer in Psychology with research focusing on neurodiverse styles of cognition in autism, goes some way to address such concerns by opposing some of the long-held views of the likes of Simon Baron-Cohen and Utah Frith, and presenting the consideration:

> Paradoxically, a small minority of children on the autism spectrum show exceptional talents in fields typically associated with creativity, including visual arts and music. The fact that these gifts are frequently attributed to exceptional memory and attention to detail conveniently sidesteps any challenge they otherwise pose for the diagnostic criterion of imagination-related difficulties. I argue for a more complex and nuanced account of creativity which better accommodates this work. (Roth, 2019: 71)

Therefore, it could also be said that the objects and interests may be increasing the inability to engage with their interests, of which some may well be creative or imaginative, yet there will be others for whom this will be the cause for the behavioural differences. This is another example of how the details of this diagnosis is complex, interlinked and co-occurring.

Consequently, information considering the need for social human interaction throughout the neuro-typical childhood development seen within the infantile years cannot be refuted, and is key throughout the developing thesis argument. It is important to reflect on such knowledge as well as highlighting how imperative the process is in the development of empathetic experiences and social learning through play.

> Play also, especially from the point of view of "meaning" can be considered as leading from activity to representation, in so far as it evolved from its initial stage of sensory-motor activity to its second stage of symbolic imaginative play. (Piaget, 1951: 2).

Further investigations and analysis of such information also led to a more rigorous understanding of empathy, specifically in connection to the diagnosis of autism which will be addressed more in Chapter Six; where empathy and mimicry are address in individual subsections. This connection is particularly important when referring to research suggesting 'self-referential cognition and empathy are inextricably linked' (Lombardo, et al., 2007: 9). Within the field of autism empathy is often considered to be lacking or underdeveloped - in those who have a diagnosis; yet researchers such as Simon Baron-Cohen are beginning to consider this too broad a statement for a diagnosis described as a spectrum. Through the comprehension of human interaction, perception, imitation, self-referential abilities, and elements of *Theory of Mind*[39], one can produce complex empathic responses to others. 'There are a large variety of social processes from observational learning and copying to mentalising and reflective discussion' (Frith & Frith 2012: 306). With the introduction of a differences in any one of those areas, we can consider the implication this would have on their empathic abilities.

The concept of self-referential ability is interesting, in its connection to the understanding of empathy from a self-referential viewpoint, in combination with childhood imitation as a developmental tool. During the discussion, of both empathy and self-referential ability, mirror neurons are often introduced; '[m]irror neurons are brain cells that are activated not only in the individual performing an action, but also in the brain of the observer witnessing the action and are thought to be the neural mechanism underpinning our ability to perceive emotions, intentions and gestures' (Shaughnessy, 2012: 35). Self-referential ability, alongside that of *Theory of Mind*, are combined to underpin the current understanding of the cognitive neuroscience surrounding studies on empathy, the importance of gestural understanding and imitation (in the development of language) is introduced, connecting it to information regarding Social Communication, above. Evan Thompson, when writing on Empathy and Consciousness (2011), makes the following statement:

> This development, as Rizzolatti and Arbib envision it, comprises two main steps, corresponding to two gaps that have to be bridged on the path from action recognition to speech – first, the gap between recognising actions made by

[39] Simon Baron-Cohen is known for using the term *mind reading* in place of *Theory of Mind* , and *mind blindness* for those with limited abilities in this area.

> others and sending and receiving messages with communicative intent; and second, the gap between gestural communication and speech. (Thompson, 2001, 10)

It is understood, through Thomson's text, that by using kinaesthetic and proprioceptive awareness to understand one's own bodies, and the bodies an individual interacts with, it is possible to develop a complex level of empathy, which is reliant on the combined skills developed in communication and imagination. This again supports the need to embed bodily practices into the discussion of autism, as this thesis goes on to do. Evan's text offers further justification by reflection on the importance of embodied experiences by connecting one's somatic experiences with their cognitive developments:

> Thus, the affective mind isn't in the head, but in the whole body; and affective states are emergent in the reciprocal, co-determination sense: they arise from neural and somatic activity that itself is conditioned by the ongoing embodied awareness and action of the whole animal or person. (Thompson, 2001: 4)

This is an understanding that goes further to support the influence from Somatic Movement Practices in the practical research and the decisions made through facilitation, but his statement also connected to research into the importance of the ability to self-reference. In this case it is a conversation particularly important when working with those who have underdeveloped social skills, in line with an individual's diagnosis, when developing empathy:

> For now, we speculatively conclude that these findings might point to the idea that [autistic individuals] need to be more self-focused and have more metacognitive ability to accurately reflect on themselves in order to mentalise with others. If this is true, it would support the idea that simulation is a strategy that [autistic individuals] could benefit from and may be helpful in informing novel treatments for more able high-functioning individuals on the autism spectrum. (Lombardo, et al. 2007)

Through this thorough understanding of the association between mimicry and complex empathetic understanding it was clear that these two elements were more than just aligning in the research supporting this project, they were intrinsically connected. Therefore, they are specifically addressed alongside touch in the sixth chapter of this thesis, as all three are essential throughout the infantile years (and are utilised as tools through the practical research Chapter Six reports). Prior to the more detailed inclusion of touch in practice it is important to note that sensory sensitivity is seen as being prevalent across those diagnosed with autism. In some cases, touch can be uncomfortable and avoided,

but, in some cases, deep pressure is more appealing. In her book *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behaviour* (2005) Temple Grandin, with co-author Catherine Johnson, discuss her relationship with touch, as an autistic individual, and how it helped her to relate to others as well as to animals.

> A lot of autistic children can't stand touch. I was like that when I was a little kid. I wanted to feel the nice social feeling of being held, but it was just too overwhelming. It was like a tidal wave of sensation drowning me. […] At first the waves feel good, and the sensation is soothing and relaxing. But as the waves get stronger and more powerful you feel like you're starting to drown and panic. […] That's why I would get under the sofa cushions, because I could control those. I could let that good feeling wash over me, and if it got too intense I could stop. (Grandin & Johnson, 2005: 117-118)

As a result of this understanding, Grandin created her own *hug machine* that would allow for the positive feelings of deep touch, but in a controlled environment. She soon realised this could help her but also had a place in understanding the care for livestock. She states; 'I think the explanation may have to do with oxytocin. Oxytocin also goes up with physical contact, and I think what might have happened is that every time the pig briefly squeezed himself against the soft foam he probably raised his oxytocin a little more until finally his oxytocin levels were high enough to compensate for the missing opioids and he settled down' (Grandin & Johnson, 2005: 117). This insight is important for many reasons, but here it is key to dispel some of the assumptions that all touch is avoided by autistic individuals.

Social Interaction

This section will introduce the third aspects of Wing and Gould's *Triad of Impairments*, and the association between the difficulties of Social Interaction and Social Imagination are considered as equal, therefore this section addresses how social impacts manifest. In doing so specific difficulties experienced by autistic individuals, when interacting with others, are acknowledged. When understanding that Social Interaction as communication between two or more individuals, the topic of communication (both verbally and non-verbally) will again be referenced in this section. This will also illustrate the need to understand how social norms influence specific settings and the aptitude to adapt behaviour to match those interactions in order to have comfortable interactions within groups of more than

two people. Lastly, with the introduction of Social Imagination/ Theory of Mind preceding this section, the will the placement of imaginative problem solving, mimicry, and empathy within Social Interaction, is again addressed. 'Arguably the most important and valuable aspect of social cognition is to do with learning about other agents not just as types, but as individuals' (Frith & Frith 2012: 295). Therefore, a consideration for the social implications connected to these topics will be evident in various ways, dependent of the individual diagnosed. To address this there will be a discussion regarding some of the possible consequences, with examples offered to clarify information.

Firstly, with regard to the differences connected to communication it is vital to acknowledge that Social Interaction may, in turn, cause frustration for the autistic individual experiencing it. 'This impairment is part of the core feature of childhood autism, namely a profound disorder in understanding and coping with the social environment, regardless of IQ' (Baron-Cohen, Leslie & Frith 1985, 37-38). This may result in frustration and anxiety if their side of the conversation is misunderstood or if the autistic individual does not fully understand the person may be conversing with. This often causes negative reactions if they have a challenge interpreting jokes and if the person they are talking to is heavily reliant on humour through their side of the conversation, for example.

> However, it is also understood that children do not develop at the same rate, many experience additional complexities that make them feel more anxious at certain times than others, and the inability to predict and control the world around them makes for a generally confusing and alarming experience. (Keay-Bright & Howarth, 2012: 129)

This difficulty can have an adverse effect in social situations as the person they are conversing with may interpret this as rudeness which is a negative social reaction to someone who may be struggling with structure of the conversation, rather than the topic or content. Therefore, it is also difficult for neuro-typical individuals to understand the struggle with coherence that is the battle ground experienced daily by autistic individuals (Caldwell, 2013), often resulting in tension and social anxiety, sometimes on both sides. Another consequence of such social anxieties, particularly for children, is the involvement of an adult in conversations, as frequently, the parents or carers of autistic children are quick to answer or converse on their behalf. This is understood to have negative repercussions for the child, and may result the inability to express themselves

independently; resulting in the child becoming over reliant on others to speak on their behalf. This can mean limit their experience of social communication as an individual or may enforce a limited vocabulary from childhood, into adulthood, and therefore become dependent on others for a prolonged period of time.

> Another common attentional problem in autism is the failure of autistic children to establish and maintain joint attention, i.e., the ability to attend to the same stimuli as another person. That leads to failure to share experiences. This, in turn, results in the failure to comprehend the meaning of the interaction and hinder social and cultural development. (Bogdashina, 2014b)

Therefore, it is apparent that Social Interaction is synonymous with the verbal and nonverbal elements of communication but it develops differently for individuals diagnosed, in a number of other ways. Firstly, it is important to acknowledge that in more recent descriptions of autism there is more information presented to consider isolation:

> Play also matters for children with autism, because playing is the norm in early childhood, and a lack of play skills can aggravate children's social isolation and underline their difference from other children. (Boucher 1999 in Dautenhahn, 2017: 692).

This can also be associated with the individuals restricted and/or repetitive patterns of behaviour coupled with a tendency for highly focused interests or activities which may not correspond with the interest of family members or peers. It is important to stress that any examples given are used to help highlight the extremities of autism, so it is not to say that all those holding a diagnosis are unable to adapt or develop effective relationships or pursue regular Social Interaction[40]. 'It is important to spell out that autistic individuals can learn these things, and that they learn all the time. Most people find that their ability to cope with Social Interactions improves as they get older. This is equally true of [autistic individuals]' (Frith 2012: 13).

With this in mind, it is also profoundly noticeable that those who do evidence difficulties in Social Interaction will show signs of this effecting many aspects of their life, if it safe to say that all elements of the *Triad of Impairments*

[40] Throughout *The Power of Neurodiversity*, Thomas Armstrong creates chapters on a number of different diagnoses of which autism is one. The third chapter is dedicated to autism and is titled *The Positive side of Being Autistic* (2010: 53-74) and uses this chapter to explain the many positives that come with difference: 'However, we need to do a better job of examining the strengths and abilities of those along with autistic spectrum and realise that these strengths represent legitimate ways of being in the world' (Armstrong, 2010: 61).

coexist within an individual. Those who do develop the ability to adapt socially, particularly those who are able to communicate verbally with confidence, will find that relationships built will enable development in other aspect effected by their autism diagnosis. ‘Imitation of peers serves to increase and refine peer interactions during early childhood and remains a strong elicitor of social interest throughout childhood’ (Ingersoll 2008, 108). Throughout the education system those with higher developed Social Interaction skills and the ability to fit comfortably in a group setting often access more variety in their ability to learn through and with others, this in turn has a profoundly positive effect on their social ability in adulthood.

Mimicry and social interaction are integral to one another, as discussed through the section addressing Social Imagination, and mimicry is learnt through human interaction during the infantile years. It is through this developmental stage that all children have experiences assisting their ability to learn about the *self* and the *other*, which are key skills to underpin Social Interaction, and is inherently a transaction of processes with those interacting. Therefore, there is a reliance on self-referential ability and the ability to predict the other's emotional stage, sense of humour as well as nonverbal elements of conversations such as facial expressions. All of these features, combined, make Social Interaction fundamentally difficult for those with a diagnosis, on varying levels.

Additional Diagnoses

The increasing prevalence in autism has increased the research interest (in recent years) as well as becoming a focus for the UK media and government. In fact, this supposed increase adds to the concerns of a potential misdiagnosis but also aligns to the diagnostic process being used to diagnose those with much subtler symptoms or at a younger age. ‘The percentage of children and teens ages 6 to 17 diagnosed with an autism spectrum disorder (ASD) increased to 2%’ (Neale, 2013), which results in approximately one in every 50 children currently having a diagnosis.

Consequently, research into early diagnosis and Early Intervention has become more widely recognised for its positive effects on the development of children diagnosed. During a presentation at The University of Plymouth on the 19th June 2013 by Jan Georgeson, titled Support and Aspiration in the early

years: the implications of the SEN Green Paper, changes to governmental processes within the Special Educational Needs Sector were discussed. It became apparent that changes to the two-year-old health visitor checks would see the inclusion of an Early Identification process to help diagnose children at a younger age. These changes are supposed to increase the priority for Early Intervention[41] ensuring children are in appropriate school environments from their first years of education and allowing effective interventions to be implemented sooner to support the child's development.

As mentioned previously, the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-4) lists five diagnoses all considered to be Pervasive Developmental Disorders (PDD). Classic Autism, Asperger's Syndrome and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS) have been introduced in this thesis already, yet alongside these are two additional conditions; Rett Syndrome and Childhood Disintegrative Disorder. These fall under the same diagnostic classification, due to sharing significant similarities to autism.

Like autism, Rett Syndrome is understood to be connected to be present from birth, yet, apparent normal development may be evidenced in the first two years of life. This syndrome does show a delay in typical infant developmental stages as well as elements of regression of previously acquired physical skills when reaching a toddler stage, which is particularly noticeable through fine and gross motor skills. The main difference between this diagnosis and one of autism is that this has a higher likelihood of effecting the child physically - both skeletal and muscular. The greatest similarity to autism, is the impaired verbal communication, which often effects expressive and receptive language but in many cases, is due to the physical action of talking which differs from autism.

In the case of Childhood Disintegrative Disorder (CDD), also known as Heller's Syndrome, there are additional evidences of social and communicative difficulties, which are comparable to those seen by individuals with a diagnosis of autism. 'However, both these disorders are degenerative conditions, with a later onset and different course and outcome when compared with […] autism' (Boucher, 2009: 12). Like autism, one characteristics is significant difficulties in

[41] Early Intervention will be discussed in more detail throughout Chapter Two.

communication and also some signs of repetitive and restrictive patterns of behaviour by autistic individuals. The main difference between the two diagnoses is that those with CDD often have more physical limitations concerning their bowel and bladder control. This diagnosis is extremely similar in its classification to autism, and is usually suggested is a child's difficulties cannot be better understood through one of the other diagnoses.

Misdiagnosis, Dual-Diagnosis & Early Diagnosis

Furthermore, there are number of additional childhood diagnoses that share characteristics with autism, causing confusion and misdiagnosis. For this section, it was decided to give a brief insight into an additional four diagnoses seen as an additional diagnosis for those holding a dual-diagnosis - alongside autism; Attention Deficit Hyperactivity Disorder (ADHD), Sensory Processing Disorder, Nonverbal Learning Disorder, and Selective Mutism.

Attention-Deficit/Hyperactivity Disorder (ADHD) is a term used inclusively, allowing it to be used to represent more than of set of characteristics for a diagnosis. To reflect this, the DSM 5 (2013) has listed five different ways of categorising ADHD, with the first two[42] having up to a further nine subcategories. To talk broadly, outcomes for ADHD include a heightened difficulty regarding attention which effects their development and functioning. This sees itself presented in many ways, including difficulty behaviours in many social situation, such as schools, supermarkets, doctors, etc. In childhood there may also be signs of difficulty focusing or holding their attention for prolonged periods of times and/ or controlling their impulses. Although discussed in connection to other neurological diagnoses the neurological basis of ADHD is hypothesised, and often inferred, despite still being included under Neurodevelopmental Disorders in the DSM 5 (2013).

As there are often elements of sensory hyper/hypo-sensitivity presented by those with a diagnosis of autism, it is important to give more details on Sensory Processing Disorder (SPD) as an individual diagnosis, despite there still being some dispute over the validity of this as a diagnosis, and it not having been included in the most recent DSM-5. SPD is considered to effect individual

[42] Here the important difference, from the previous edition of the DSM to the current version, is the two categories being divided into 'inattention' and 'hyperactivity and impulsivity' (2013).

children in differing degrees and to be present from birth. ‘Sensory Processing Disorder (SPD) is the inability to use information received through the senses in order to function smoothly in daily life’ (Kranowitz, 2005: 9). The outcomes of this diagnosis are most commonly understood through an oversensitivity or lack of sensitivity to the way which they process sensory input within, or around them. This can result in having poor hygiene and a lack of understanding what their own body is telling them. On the other hand, they may show difficulty processing the world around them, for example not comprehending the knock-on effects of certain actions. They may have difficulty with textures including clothing, food, and footwear; all of which may result in the child being unable to function typically.

Nonverbal Learning Disorder is again known to create an increased difficulty in interpreting, and understanding, the non-verbalised aspects of communication. It is not, as sometimes misunderstood in society a diagnosis in which the person diagnosed is nonverbal themselves, as those with a diagnosis are ‘characterised by normal language ability including good verbal memory and a tendency to verbosity’ (Boucher, 2009: 25). It is common that the person may not be able to interpret or understand the differences in facial expressions, body language, and gestures. This difficulty in interpretation is commonly seen through autistic individuals and is seen throughout those who may have a seemingly good ability to verbally communicate; Nonverbal Learning Disorder may result in confusions and frustrations by the social aspects associated with the challenges presented.

The last diagnosis mentioned regarding alignments between their diagnostic framework and categorisation, is one that represents difficulties in the verbal elements of communication and is called Selective Mutism (SM). This disorder sees the child lacking in verbalised communication and, as a result, exhibits an inability to verbalise their wants and needs due to anxiety or lack of self-esteem; it is listed under the category of Anxiety Disorders in the DSM-5 (2013: 195-197). These symptoms are presented by children who have acquired verbal communication but exhibit Selective Mutism when they feel apprehensive about a situation, or self-conscious about their speech. This can often also be seen through those with a diagnosis on the autistic spectrum and is connected with anxiety. This may cause children to struggle to appropriate verbal

communication, especially in a situation where they have previously difficulties in verbal exchanges.

Due to the similar yet various characteristics associated with autism, the most misdiagnoses are due to the overlap with the following conditions: Rett Syndrome, Childhood Disintegrative Disorder (CDD), Attention Deficit Hyperactivity Disorder (AD/HD), Sensory Processing Disorder (SPD), Nonverbal Learning Disorder (NLD), and Selective Mutism (SM)[43]. All of these disorders have individual outcomes effecting the child's progression, development, and communication. These disorders, along with autism, can be co-occurring comorbid diagnoses within a child; many children show signs of one other diagnosis as 'all subgroups [...] overlapped each other to a great extent' (Wing, 1997: 15).

The evidential similarities between diagnoses are apparent as all of the diagnoses are considered to have individual outcomes and are 'not what doctors call a unitary [diagnosis]' (Brookes, 2005: 14), as they often have no physical signs associated with them which often makes a number of social situations increasingly hard for the child and their families. It is common that the child is misunderstood or may struggle to gain a diagnosed at all and left being considered a difficult child.

> People rarely discuss the cost of false positive diagnosis, and there is a real cost. If you talk to some parents who have had that happen to them, where for example a language impairment has been misdiagnosed as autism, they're actually very cross and very upset. (Sutton, 2014: 763)

This is emotional response is not only seen when misdiagnosis happens, but can also be very common amongst those who gain no diagnosis at all. In many cases it is increasing hard for females to be recognised as autistic due to the socially accepted gender bias which cases many to lack support and it is, therefore, common that females go into adulthood undiagnosed.

Gender Bias

Across much literature connected to autism there is reference to gender and the visible gender bias towards boys being diagnosed more often than girls. Although

[43] All of those listed in this section have been included along with a brief description of the diagnosis in the Appendix 2.

this is a continuous issue in the field, this thesis does not focus on the gender of the participants within PhD process, and therefore has been included as a topic to reference its place in the research field.

> [Autism is] more common in males than females by a ratio of approximately 4:1, a ratio that has not changed significantly from the time of Kanner (Fombonne, 1999). However, this is a whole-spectrum average, which masks the fact that males outnumber females by about 6:1 at the high ability end of the spectrum, but by less than 4:1 at the low ability end of the spectrum. (Boucher, 2009: 73)

It is also clearly acknowledged that the work of Simon Baron-Cohen (2009) has gone some way to embed this theory into the world of autism by means of his seminal text *Autism: The Empathizing–Systemizing (E-S) Theory*. Throughout this text, he states that this theory 'is also extended to the extreme male brain theory as a way of understanding the biased sex ratio in autism' (2009: 68). It is this theory that has been used time and time again in order to discuss and understand the gender bias but also as a means to explaining the interests and behaviours of many autistic individuals being repetitive and often very structured. Baron-Cohen's theory is still used in more contemporary texts such as *The Power of Neurodiversity* (Armstrong, 2010):

> Women, he argues, are *empathizers*. Compared with males, they are better at establishing intimate relationships, cooperating, reading the moods of other people, and understanding emotions, both their own and those of others. Men, on the other hand, are *systemizers*. A system is anything that takes input and delivers outputs. It could be technical, like a computer; natural, like the weather; abstract, like the field of mathematics; organisable, like a DVD collection; or motoric, like a tennis shot. (Armstrong, 2010: 58)

Although this theory was popularised by the work of Baron-Cohen its rationale can also be connected to the work of Hans Asperger, as he stated 'In general abstraction is congenial to male thought processes, while female thought processes draw more strongly on feelings and instincts' (Frith, 1991: 85). The quote used earlier unpacks (Boucher, 2009) the differing ratios based on those with Asperger's Syndrome or that of Classic Autism, but this does not seem to be obviously reiterated or considered throughout most literature addressing this subject. Many rely on the theory that autism is an *extreme case of the male brain*, which Baron-Cohen deems a *systemizer* brain, which might explain why it is more frequent in boys (Pinchevski & Peters, 2016: 2517). Yet this theory does evoked criticism for the impact this has on autistic females who are undiagnosed,

fight to gain a diagnosis, or who have been formally misdiagnosed[44].

Societal Impact on Autism

As mentioned above there is a link between the societal understanding of autism and the way in which children may be accessing a diagnosis, especially for autistic females. Despite this, there are few papers exploring both the societal impacts on autism and a particular focus on how ICT is address throughout this conversation. One such paper achieving this is written by Amit Pinchevshi, senior lecturer in the Communication and Journalism, and John Durham Peter, Professor of Communication Studies, which was briefly introduced in the conclusion of the first chapter. Their research is cemented in the field of communication so highlights the societal impacts of language (connecting autism with ICT specifically). This paper proved insightful when connecting the concerns surrounding the language associated with autism and these interests in autism and computer technology as a collective topic. Written in 2016 the paper, *Autism and new media: Disability between technology and society*, offered context to the impact that developments in ICT had on the language used to understand autism from as early as the 1980's - a time coinciding with the development of The Internet as shown in Chapter One. It grounds its argument with the following statement:

> Our concern in this essay is not the etiology or ontology of autism but rather its cultural echo as a set discourses that comment on recent changes in the technological infrastructure of communication and the proliferating use of digital platforms for relational purposes. In this regard, a running comparison with schizophrenia will be instructive, an illness with which it shares a long diagnostic history. If schizophrenia can be characterized as an excessive intrusion of the social, with its intrusive voices and broadcast thoughts, autism can be characterized as an extreme withdrawal from the social in favour of a persistently impersonal, and often narrowly technical, world. Autism and schizophrenia may well be described as the paired mental disabilities of the communication age. (Pinchevshi & Peters, 2016: 2509)

It is by drawing on the diagnosis of schizophrenia that Pinchevshi and Peters also construct the section of their paper titled *Historical media formation: autism and*

[44] One female autistic self-advocate, Samantha Craft, has begun to open up the conversation surrounding females with autism and in doing so has created *Females with Asperger's Non-Official Checklist* (2010). Throughout this list she creates 11 categories including: Deep Thinkers; Innocent; Escape and Friendship; Comorbid Attributes; Social Interaction; Finds Refuge when Alone; Sensitive; Sense of Self; Confusion; Words and Patterns; and Executive Functioning. The full list can be seen in the Appendix 3.

schizophrenia (2016), in which they explore the origins of both diagnoses. What is apparent from their text that the overlap does stem largely from the language used about the two diagnoses[45], yet it recognises that whilst writing their pivotal papers of *Classic Autism* and *Asperger's Syndrome* 'both Kanner and Asperger were careful to distinguish this new syndrome from schizophrenia. Autism remained constant throughout development almost like a personality feature whereas schizophrenia could flare up suddenly' (Pinchevshi & Peters, 2016: 2511).

Connecting Technology and Autism: Language and Society

In the process of concluding this chapter it is also important make formal connections between the themes of Chapter One, which focused on the use of ICT in the UK education system. It was clear that the many ways computer technology was seen across society played a significant role in how vital it was considered throughout the education system. The work of Pinchevshi and Peter (2016) began to shed light on the way in which computer technology and autism share histories, therefore have informed the thesis and its ability to connect the subject matter of the first two chapters presented. Their research comments on 'the history of modern mental pathology is in part the history of lived experience of technical media' (Pinchevshi & Peters, 2016: 2508), and introduces the prevalence of media metaphors to understand the characteristics of both diagnoses and that 'presents complex methodological and analytical problems' (Pinchevshi & Peters, 2016: 2509).

This text is also used to support the content of Chapter Four, so here their work is merely introduced to offer insight into the importance of understanding that autism and computer technology, addressed in this thesis, by showing they

[45] 'The Swiss psychiatrist Eugen Bleuler, who gave schizophrenia its official name in 1908, also coined the term *Autismus* (as well as the term "ambivalence"). In fin- de-siècle psychiatry and psychoanalysis, autism first referred to sexual self-absorption. Havelock Ellis used the term "autoerotism" in 1898 to describe the condition in which there is no external object of pleasure besides one's own body, which Freud took up as "Autoerotismus." Bleuler, who was less committed to sexuality as an explanatory category, used "Autismus" instead, launching the term on its long journey in 1910. From the Greek "autos" or self, *Autismus* named the symptom of turning radically away from the external world and its substitution by inner fantasy totally indecipherable to outsiders: "schizophrenics who have no more contact with the outside world, live in a world of their own ... they have cut themselves off as much as possible from any contact with the external world" (Bleuler quoted in Parnas et al., 2002: 131). For Bleuler, *Autismus* meant self-enclosure against all kinds of reality, not only social reality, as the later definition would have it' (Pinchevshi & Peters, 2016: 2510)

are not just linked through the outputs (in terms of the technological enhancements in interventions and the schooling of autistic children), they acknowledge it is also through the semantics surrounding autism and, therefore, the way it is understood, as well as how it can be exploited, by society. The two authors explain how new technological advances have transformed the way in which we communicate in general:

> Whereas decades of thought about mass media posited face-to-face conversation as the communicative ideal, autism presents an alternate mode of texting, typing, and mediated talk stripped of both verbal and non-verbal complexities. New media have introduced new affordances for people with disability commonly referred to as a "pervasive communication disorder".' (Pinchevshi & Peters, 2016: 2508)

When Pinchevshi and Peters presented *Historical media formation: autism and schizophrenia* (as a subheading in their 2016 paper) the conversation around the history of autism was presented, leading to details regarding autistic savant and in turn explaining that: 'media metaphors bring together the storage and processing functions in underscoring the restricted and repetitive manner in which the "autistic savant' is said to interact' (Pinchevshi & Peters, 2016: 2513). This example is used to outline how the language used to describe autism often re-appropriates phrases connected to computer function; e.g. *they are wired differently.* When reflecting on social norms surrounding peoples view of disability and diagnoses such as autism it is shown to have a clear effect of the individuals (as mentioned earlier regarding the changing of definitions). The work of Michael Oliver and his text *The Politics of Disablement* (1990) became an importance source of information. As a reader in disability studies he has discussed this topic in many ways, but in his 1990 publication he makes clear that:

> The hegemony that defines disability in capitalist society is constituted by the organic ideology in individualism, the arbitrary ideologies of medicalization underpinning medical intervention and personal tragedy theory underpinning much social policy. Incorporated also are ideologies related to concepts of normality, able-bodiedness and able-mindedness. (Oliver, 1990: 44)

Pinchevshi and Peter's go on to connect to this discussion, showing the impact this has on a diagnosis and one of the concluding sections states:

> If autism is an atypical neural wiring –as opposed to the neurotypical configuration – is a minority, not disability, with more in common with race and sex than with psychopathology. This view adds a new twist to the social constructions-versus-hard science debate, as it draws profitably on both sides of

> the equation, making a case for the “complex embodiment”. (Pinchevshi & Peters, 2016: 2517).

They also give reference to Ian Hacking’s *Making up People* (1986) for its exploration of the complexities connected with the societal impacts on diagnoses and utilises comparisons between autism and other conditions such as Obesity and Personality Disorders. In Pinchevshi & Peters’ paper they use Hacking to support their statement that; ‘Arguably, in no other medical domain is social construction so evident as in psychiatry, an observational science whose necessary reliance on both behavioural criteria and self-reports make patient and doctor into collaborators’ (Pinchevshi & Peters, 2016: 2509), yet is too often not the case, if we refer to Oliver’s thinking.

Ian Hacking’s text does not focus on links to metaphors from new media, like Pinchevshi and Peters does, but looks at societal impacts more broadly. Throughout Hacking’s text, he calls on many complex examples to explore his notion of *dynamic nominalism*, which he uses to explain that a diagnostic framework cannot merely be seen as just a way to categorise or describe.

> We may be observing a particular medico-forensic-political language of individual and social control. Likewise, the sheer proliferation of labels in the domain during the nineteenth century may have endanger vastly more kinds of people than the world had even known before. (Hacking, 1986: 164)

Hacking’s work is widely considered as exposing how is instrumental in understanding the process of labelling and categorizing people and in turn aids his theory that this process results in society *making up people*. Pinchevshi and Peters use Hackings work to discuss this idea of socially construction:

> But Hacking does not dismiss organic causes of mental illness either. We follow him and Bruno Latour (1993) in recognizing social construction without dismissing biological facticity, and seek to acknowledge the lived, embodied experience of people with disabilities (Siebers, 2008). Only by maintaining this complex position can we resist both the biologization of contingent cultural assumptions *and* the idea that mental illness is completely cultural. While the former risks ontologising metaphors, the latter risks denying the lived misery of mental disease. In this respect, autism is both a construct and a real medical condition. (Pinchevshi & Peters, 206: 2509)

It could be considered that the stereotypes surrounding autism have a damaging effect on how autism is experienced by individuals. Firstly, it has been touched on above that the gender bias towards males often leaves females, and their families, feeling lost whilst fighting for a diagnosis of autism to be considered (as

one example). On the flip side, the heightened awareness surrounding autism has resulted in a 'reliance on both behavioural criteria and self-reports [that] make patient and doctor into collaborators' (Pinchevshi & Peters, 206: 2509).

Conclusion

This chapter aims to have offer the reader a clearer understanding of where autism sits within the broader thesis argument, along with consideration for the historical and societal context. The chapter provided a clearer indication of the diagnosis by addressing its history through both Leo Kanner and Hans Asperger's influential work, before presented the problem faced when those with a diagnosis are exposed to conventional, solo use, technologies; addressed throughout future chapters. Throughout the chapter the reliance on research searching for the *cause* of autism was avoided and instead focused on the evidenced characteristics of someone already holding a diagnosis.

As made apparent here, the diagnosis of autism is complex and ever changing with new research emerging, and that diagnostic guides (such as the DSM-4 and DSM-5) have the ability to shift and shape societal and academic motives. Despite this, it is increasingly noted that influence from autistic self-advocates has a positive impact by using first-hand experience to shape the way autism is discusses and approached, particularly in the case of autistic females. Therefore, the choice was made to align with the ethos of Neurodiversity throughout the thesis, with language altered (where possible) to respond to the negative connotations associated with archaic descriptors such as *disorder, disabled* and the likes. With this in mind, the thesis is still applying the term *Triad of Impairments* due to this being a readily used throughout the diagnostic process. This will support the experience of working with autistic children, as participants in the research, presented through the latter stages of the thesis.

By working systematically and chronologically the key concerns surrounding autism being established through a historical overview, offered as the first subsection. In such, the work of Kanner and Asperger was reflected on primarily whilst being supported by the more contemporary work of Gould and Wing. The DSM-4 and DSM-5 were provided to give contextualising literature as a way to guide the reader through the complexities associated with a diagnosis of autism and to understand how the diagnosis is understood by professionals using

this manual. In light of this, as mentioned above, the use of the *Triad of Impairments* offered structure to the sub sections of Social Communication, Social Imagination/ *Theory of Mind*, and Social Interaction, respectively, and their placement in the diagnostic framework.

The main argument being that these three elements are interwoven in this triad, exist as co-occurring and in direct correlation to one another. The helped in the process of writing this chapter, yet it became apparent that they are difficult to discuss separately; giving a clear insight into the complexity that is autism, how it exists for individuals, and how conflicting information can be. It also offered a clearer perspective on how the spectrum element of autism is often overlooked and the lack of recognition for the heterogeneity of autism results in the many sweeping statements and generalisations which lead to stereotypes embedded in society; which Chapter Four addresses by commenting on educational technology.

Consequently, it felt imperative to avoid this by consciously including sections on Additional Diagnoses that often sit alongside autism, are considered to have overlapping diagnostic processes or features, or that may be supported through similar methods and interventions. This theme continued into the section referencing Misdiagnosis, Dual-Diagnosis & Early Diagnosis. As a subsection, this felt broad but by beginning to offer this information the aim was merely to open up the conversation about the reality that is multiple or misdiagnosis and how this effect the children and those around them. This continued through the sections discussion the heightened prevalence of autism seen in recent years and how this may be a direct result of misdiagnosis, diagnosis at an earlier age and dual-diagnoses. To support this consideration, seven specific diagnoses were highlighted due to the overlapping features with autism, and their connections through diagnostic overviews.

Lastly, it felt it important to reflect on the benefits of early diagnosis along with the problems that many people have faced gaining a diagnosis at all. The previous subheadings then led into the final three sections included, albeit briefly. The Gender Bias, Societal Impact on Autism, and Connecting Technology and Autism: Language and Society, have been, offered in order to consider autism broadly and to allow the remaining information in this thesis to be considered with this information in mind. The minimal information regarding the gender bias

hopes to highlight the position within this discussion whilst making it clear that gender, it self, is not a key concern within this thesis. When introducing the work of Pinchevshi and Peters to reflect on societal influencers, by also introducing the work of Ian Hacking and his 1986 paper *Making Up People.* Pinchevshi and Peters' work also begins to make clear research that allows for the further arguments of this thesis to be recognised in literature connecting two main themes: autism and computer technology.

The conclusion of this chapter has been constructed not only to reflect on the diagnosis this thesis is reliant upon, but also gives the reader a chance to considered the breadth and complexity of autism before moving on to address the education system, interventions, technological advances and lastly a new approach that could and should be considered to offer alternative solutions and premise adaptation. With the first chapter of the thesis highlighting the complexity of ICT in education, and this second chapter repeats this process when addressing autism. Collectively these two chapters in Part One brought together the discussion of the education sector, in Part Two; which proves to be the equally as complex.

Part Two: Interventions

Part Two progresses the thesis argument from Chapter One's historical overview of ICT in education and Chapter Two's discussion of autism's placement in the boarded thesis. Here Chapter Two outlined diagnostic methods and features of autism, premising the complexity surrounding the diagnosis and societal implications. The two chapters introduction of therapeutic, educational, and technological used in the education of such children, now see in Part Two. The interventions, presented across two chapters, support individualised methods delivered on a one-to-one basis; reflecting on the practical research aims.

Chapter Three: Traditional Interventions in the Education of Autistic Children presents interventions and therapies experienced, or witnessed, being used, in the PhD's participating school, including: *Treatment and Education of Autistic and related Communication handicapped Children* (TEACCH), *Picture Exchange Communication System* (PECS) and *Intensive Interaction*. This precedes an introduction of Occupational Therapy, Speech and Language Therapy, and Play Therapy. *Chapter Four: Technological interventions in the education of autistic children* then introduces the use of ICT specifically in the education of autistic children by discussing interventions reliant on computer technology (designed for conventional, solo users). This is before acknowledging the different categories such technologies fall into based on their intended use.

Following this a detailed introduction of technological interventions as a platform for working with autistic children is critiqued for its failure to recognise the complexities of autism. This is presented by commenting on systematic reviews whilst connecting industry and commercial demands, the saturated market of technologies, Apps and interventions for the autistic *customer*. Collectively, Part Two, considers diverse techniques used in the education of autistic children. The traditional interventions are evidently reliant on human interaction despite the over stretched profession lacking resources, resulting in technologies used as an alternative. This binary view is responded to as the thesis argues, by reflecting on the practice, for a hybrid, triad, approach where the human interaction, technological interaction and the autistic child are responsive to one another, creating a dynamic and holistic approach.

Chapter Three: Traditional Interventions in the Education of Autistic Children

Introduction

Due to the complexity surrounding the diagnosis of autism presented through Chapter Two, it is clear that children diagnosed face challenges that may be further exposed when entering the school environment. The framework of the *Triad of Impairments* highlights difficulties in social skill development across all three elements. It is likely that all children experience difficulty transitioning into the new environment, of the school, but for autistic individuals this may exhaust their abilities and present new obstacles. To overcome these, and to support the child to access the curriculum, the education system has been reliant on a variety of interventions supporting the development of children with Special Educational Needs.

Throughout the education of autistic children, it is commonplace for their individual needs to be assessed in order for specific interventions to be applied to help developments and their ability to access the taught material. Although explicitly introducing and address interventions used with autistic children, the interventions discussed in this third chapter may also be applied in the education of those children with similar or multiple diagnoses (such as those included in Chapter Two). With interventions being commonplace in the education of those with Special Educational Needs it was only sensible to offer the reader specific margins regarding the educational and therapeutic interventions discussed here. Therefore, all those included in this thesis adhere to two criteria: they have been experienced first-hand throughout the research process and/or have been used with the participants of the practical research, and they promote or rely on one-to-one facilitation. This third chapter has an additional agenda in that it only addresses interventions independent of technological influences or

advancements: described here-after as *traditional interventions*[46]. It must be made clear through the introduction of this chapter that, although the interventions have been experienced first-hand as part of the PhD project, the role of this third chapter is to unpack them theoretically. The practical research for this PhD project is specifically address in the sixth chapter of the thesis.

Therefore, it has also been deemed necessary to introduce the regular application of therapies (described here as therapeutic interventions) such as Occupational Therapy, Speech and Language Therapy, alongside Play Therapy, as all can be accessed through the education sector as well as privately or through the NHS. These therapies will be introduced to offer an outline of the benefits that come with understanding and exploring the numerous options available for families with a n autistic child and to make clear what this PhD project it sitting alongside in terms of interventions and tools to support of autistic children.

The focus throughout this whole thesis is primarily on the education within primary school facilities, with examples primarily within specialist school provisions. Here the three traditional interventions discussed have been specifically developed with the diagnosis of autism in mind, and do not prioritise the use of technological engagement. In this chapter, there is a distinction made between educational interventions, that can be created and applied by anyone in the school environment, and therapeutic interventions, for which specific training is needed in order to apply the technique. Information regarding the development of each intervention will be seen throughout this chapter, to situate these traditional interventions alongside a historical overview of their placement in the education of autistic children, where possible. This third chapter evidences the breadth of traditional interventions used with autistic children, which will be a discussion that supports the introduction of technological interventions existing in educational environments, as the main concern of Chapter Four. This chapter not only serves the purpose of creating an overview of current practices, but will also allow for personal practical research to be contextualised later - and to support the critical review of the use of ICT with autistic children, which is introduced

[46] The term *traditional interventions* has been coined as a way to distinguish these interventions from those presented in the fourth chapter, which are reliant on technological mediation in their application.

through Part Three of the thesis. It was deemed important to review and give context to these existing practices in order to fully introduce and outline the decisions made in the development and delivery of practical research with autistic participants.

Educational Interventions

To begin the overview of interventions used with autistic children it is key to outline that any recommended intervention is designed to be trialled on an individual basis, as all children benefit, or respond, differently to any one of the proposed processes. Such interventions may be suggested by a variety of professionals that potentially engage in the support of every autistic (child but are most commonly seen applied in the education sector). The professionals, outside of education, include GP's, Paediatricians, Educational Psychologists and Support Workers. Within the education system the role is not limited to the teaching staff, and key specialist staff include Special Educational Needs Co-Ordinators (SENCOs). The role of a SENCO was originally fulfilled by a member of the teaching staff, but in the past 15 years, it has been a full-time position that is obtained following a Masters Level qualification in Special Educational Needs. It is the SENCOs responsibility to work with the child, their parents or carers, with the aim to support the child's additional needs in a variety of ways. In doing so the SENCO may also refer the child to external support following an SEN Individual Education Plan (IEPs) (a process utilising adaptation and individualisation across many elements of the autistic child's education).

With guidance from the SENCO, and/or the teachers of that child, it is common for techniques trialled in school as well as in the home environment, by parents or carers, and may go alongside the parents own research into suitable interventions to support their child outside the school hours. In the UK, the most predominant protocols are educational and behavioural support, and therapeutic interventions, but there are options for pharmaceutical treatment and dietary alterations where appropriate. Despite these four categories being widely trialled and implemented there is still a lack of evidence to suggest that any can (or

should) lessen the difficulties evidenced within the *Triad of Impairments*[47], yet are all grounded in evidence suggesting they are beneficial for the overall well-being of the child. As mentioned in Chapter Two autism is in need of more research, yet it is commonly accepted that autism is lifelong and that any interventions are there to support the individual child's holistic development.

Considering holistic developments for the child there has also been a push towards Early Intervention, in the UK, which saw an increase in interventions relevant and appropriate for a much younger age group, often accessible from the infantile years; before the age of three. As a result, exercise, dance, play, and creative outputs are becoming more recognised and viable options for these children where developments may not have reached language acquisition, and are designed specifically for children preceding school. When reflecting on personal experience with autistic children it is encouraging to perceive research suggesting that the majority of therapies for autistic children include movement in order to be successful. This understanding is supported by a recent study reflecting on this theory, in addition to research focusing on play based interventions, which stated that movement is a key component; '[...] [autistic children] tend to gravitate towards games that stimulate the senses and provide a lot of movement' (Pedersen, 2013). Therefore, this chapter also aims to introduce Play Therapy and its application as an intervention used for children with, and without, holding a diagnosis of autism.

To outline specific educational interventions embedded in the curriculum (used with autistic children) the discussion will first reflect on the use of individualised learning tools such as *Treatment and Education of Autistic and related Communication Handicapped Children* (TEACCH) and *Picture Exchange Communication System* (PECS). Both of these have been experienced first-hand, are used with the participants of the research, promote one-to-one facilitation and, for the third chapter, are independent of technological influences or advancements. TEACCH and PECS are seen used in specialist school provisions across the UK to support individual learning styles exhibited by pupils. To support Part Three (which addresses the practical research of this PhD) an

[47] The lessening of difficulties referred to here is only mentioned in connection to sensitivities or behaviours that cause distress or harm to the child, or their family, and should not be mistaken for themes connected to a *cure.*

intervention called *Intensive Interaction,* developed by Melanie Nind and David Hewett, will also be included in this chapter. This approach is highlighted for its use of mimicry, one-to-one interactions and its viewpoint on the use of touch in interventions with autistic individuals - and other Special Educational Needs.

It is commonly accepted that 'appropriate education for [an autistic child] may require modification of standard environments, curricula, equipment and teaching methods and, again specialist staff training' (Boucher, 2009: 329). Any recommended interventions or therapies are trialled on an individual basis, by trained staff, as each child will benefit, or respond, differently to each, varied, process.

> The development of intelligence depends on the specifics of the genetic, physical, social, emotional, and contextual environment in which a child is situated. While there may be similar patterns of development, each child is unique. (Antle, 2013: 32)

Therefore, with adaptations, and training, it is feasible to look at the child holistically when working towards the framework for their curriculum, so their existing skills are prioritised, and they are offered support for the skills that require development. Throughout SEN provisions it is commonplace for pupils to have an Individual Education Plan (IEPs) designed to support the pupil to work towards specific targets and to plan their progression by understanding their individual needs, likes, dislikes (and through conversations between the parents and teaching staff).

> Individual education plans (IEPs) crossed the Atlantic n 1994 and became a requirement for pupils with special educational needs (SEN) in Britain via the framework of the 1994 Code of Practice (DfE 1994) (Tod, 1999: 184)

This process allows for adaptation and individualisation to be embedded in many elements of the autistic child's education, and the education of all children with Special Educational Needs. Yet, despite children having adaptations to their curriculum, this individualised learning does not always prioritise adaptations to the computer technology they engage with. When discussing the difficulties associated with apply individualised learning and person-centered planning[48] Jim Mansell and Julie Beadle-Brown stated that:

> We too think that helping people with intellectual disabilities requires sustained, committed engagement with them as individuals to fund out

[48] Along with Person-Centered Action.

> what it is they need and want, and to work with them at the often complex and difficult process of putting this in place. […] We agree that this is a process of discover and iteration as people grow and develop. (Mansell & Beadle-Brown, 2004: 33).

Often, without an individualised approach, social skills and engagement are being taught with the use of computer and tablet devices, or by an application or game downloaded onto, although this is often counterproductive[49]. Such methods are clearly designed, and employed, as a way to reduce the time and effort it takes to individualise and adapt every aspect of a child's day, meaning the IEPs are inherently limited.

> Subsequent developments sought to reduce the burden on special educational needs co-ordinators (SENCOs) by delegation of the task of target setting to class and subject teachers and increased use of ICT and 'off the shelf' targets in the hope of reducing the repetitious writing needed for IEP updating (Tod, Castle & Blamires, 1998, quoted in, 1994: 184)

Such information provides a clear indication of how the IEPs are repeated and attributed to a number of children with similar diagnoses, despite this inherently contradicting their very purpose. It is also important to note that the information provided about IEPs also begins to highlight the consequences of lack of resources (time and staff) in education and how this could lead to two interventions being implemented that may have contradictory processes and outcomes[50]. This raises questions about unintended consequence for an over reliance on technologies; a theme addressed in further chapters.

Early Intervention

As mentioned in the previous section, early diagnosis and Early Intervention is becoming more widely recognised for its positive effects on the development of children diagnosed. Early diagnosis is considered to be connected with the increased knowledge available about autism and its characteristics leading to more health care professionals and GPs being able to pick up on tell-tell signs.

[49] This example is used to introduce the problematic IEPs, technology in education will be discussed at length in Chapter Four.

[50] As an extreme, yet broad, example, a technological intervention may be offering a child assistance to read work aloud whilst that same child is being offered Speech and Language Therapy. Therefore, technological system may they be used as a short-term solution and be inherently undermining the time being take to assist the child's ability to read aloud as a process of long term and holistic development.

These signs may also be quicker to notice when it comes to siblings, when younger children show similar difficulties to their autistic sibling it is likely they will get a diagnosis at an earlier age (due to the parents being more aware of the diagnostic process). In the previous chapter a presentation by Jan Georgeson, in 2013, titled *Support and Aspiration in the early years: the implications of the SEN Green Paper*, is also mentioned. At this time (2013) she discussed the recent changes to governmental processes within the Special Educational Needs Sector which had an effect on the two-year-old health visitor checks which included an Early Identification process to help diagnose children at a younger age.

> More recently, several authors have suggested that the service delivery model for [Early Identification Behavioural and Development Intervention] treatment for toddlers with ASD needs to be different from the service delivery model for older children (Schertz et al., 2013; Wallace and Rogers, 2010). (Rollins, Campbell, Horrman & Self, 2016: 219).

It was clear, therefore, that early diagnosis could result in these children being in the appropriate schooling environment from their first years of education; Early Intervention. Yet, even more importantly, in many cases, this would result in support being offered before the child had reached school age. Boucher writes on the subject of Early Intervention in her text *The Autistic Spectrum Characteristics, Causes and Practical Issues* (2009):

> Of the many early intervention methods, none have been rigorously evaluated in large-scale studies, although numerous small-scale efficacy studies and personalised accounts have been reported. From these reports, it seems most likely that early interventions which are intensive, involve families, are either structured or give the child control, and that promote the generalisation of behavioural gains, are most likely to have positive and lasting outcomes. (Boucher, 2009: 305)

Additionally, this positive weighting towards Early Intervention means there is an increase in interventions relevant and appropriate for a much younger age group. Due to this there is recognition for techniques that focus on movement, including dance and play, along with a variety of creative outputs that are considered as being viable options for younger children. Early Intervention focuses on the ‘first three years of children’s lives to give them the essential social and emotional security they need for the rest of their lives’ (Allen, 2011: vii), and is key area of research when aiming to understand the autistic child’s needs before they enter into the education system.

> Best practice for toddler-aged [autistic children] involves parents being coached to incorporate specific behavioural and developmental strategies […] by utilising daily routines and activities. (Rollins, Campbell, Horrman & Self, 2016: 219).

In doing so parents are more able to ensure any interventions are naturally engaged with and are promoting holistic learning. The active involvement of the parents and carers of autistic children has varied positive impacts on the child's development and is therefore seen across a number of other interventions and therapies discussed in this chapter.

Individualisation

When planning this chapter, it was important to a reflect on interventions and teaching techniques, within education. Therefore, the guidelines created to categories the interventions discussed were as followed: they have been experienced first-hand throughout the research process and/or have been used with the participants of the practical research, promote or rely on one-to-one facilitation and (for this chapter) can be independent of technological influences or advancements. Consequently, these features are apparent in all interventions introduced, yet there are additional similarities regarding the collective interventions based on aims and applications. Age appropriate and adapted engagement with children to premise individualisation as an important consideration to acknowledge and is therefore a core consideration throughout the practical research I conducted.

As mentioned previously there may be numerous professionals who influence an intervention being suggested and subsequently implemented. Within education an intervention will most prominently be suggested by the child's teaching staff or the schools Special Educational Needs Co-Ordinator (SENCO) as both of whom are responsible for the child's Individual Educational Plan (IEP). This process can vary from provision to provision, child to child, but the involvement of a SENCO is seen in both mainstream and Special Educational Needs School (yet most common in the latter). Following trial on an intervention, it is advised that the child it is to be observed closely. This is achievable when the intervention is implemented in the school setting due to consistent engagement with the same staff, but many schools also attempt to ensure there is consistency within the home too by engaging parents more readily.

> The implementation of an effective curriculum for [autistic pupils], who display a diverse range of learning styles, makes it necessary for teachers and carers to think about a range of approaches that will be supportive and motivating and encourage children to take a more active role in managing their own actions. (Lord, 1997: 79)

The importance of individualised work and adaptations to the curriculum, for those with a diagnosis of autism in both specialist schools and mainstream schools, has been acknowledged and promoted through a number of different means. Throughout the text *Behavioural Concerns & Autistic Spectrum Disorders* by Clements & Zarkowska (2000), individualisation is prioritised throughout the majority of examples used, and it is always suggested as a way to help the developmental process and to reduce negative, or unsettled behaviour. Individualisation is again highlighted when thinking about the relevant curriculum approaches for autistic children which suggests, again, that interventions should be adapted to ensure that 'support [is] thoroughly planned and tailored to the unique needs of the child' (Hanbury, 2005: 51).

It is also key to understand that the professionals working to support autistic children, are confident in their ability to make adjustments to the child's curriculum, and to encompass areas of development that are not academic in nature; i.e., social skills or personal hygiene. When adapting the curriculum, especially for an autistic child, there is focus given to the development of skills needed to learn subject oriented information, and for this they may spend time working on problem solving, or decision making and cooperative development, as the 'education needs of [autistic children] are therefore "special" or "exceptional"' (Boucher 2009: 324). These skills are needed for subject based learning to take place but are also skills needed throughout many social aspects of life and genuinely important factors in the child's journey to adulthood. There is also importance given to including the child's home life by working closely with the parents, allowing for the varying skills needed for home and school life to be developed. 'Intervention may also be delivered indirectly through a third person or directly by a clinician. […] Indirect intervention if often perceived to be a more naturalistic approach where adults in the child's environment facilitate communication' (Law, Garrett, & Nye: 2003: 3). Therefore, a positive and engaging relationship between school and home is important for all children, but

is something particularly desired in the case of children who may struggle with change or transition and therefore function best with consistency.

> Decisions as to where [autistic child or young adult] should be educated must therefore be made on a case-by-case basis, often constrained by availability. Accessing appropriate education for their children is therefore frequently arduous and frustrating for parents. (Boucher 2009: 324)

Alongside this process many parents with autistic children also have to negotiate a variety of different environments that may not be adaptable for their child's needs, especially considering that autistic individuals may have notable communication and social difficulties. Parents can aid children who work best with consistency, by mimicking routines, rules or interventions in the home environment and by actively engaging with the events from child's school day. Other benefits come from 'Recognising the environment to make it less stressful to the individual (smaller groups, decreased noise level, providing a safe area to which the person can withdraw when she becomes anxious or overwhelmed) (Clements & Zarkowska, 2000: 56). These techniques will assist in the child's transition from school, to their time at the home, without discrepancies in expectation, discipline, etc.; which is another reason that adaptive and individualised working is beneficial.

> The unique characteristics of each person will require unique individual strategies, techniques and environmental adjustments to be implemented – what works for one individual may not only be painful but also harmful for the other. (Bogdashina, 2014b)

It is here, again, that the importance of understanding the role of individualisation in the schooling environment for autistic children is acknowledged further, as the areas for development differ. Therefore, not all children will have the same balance of curriculum subjects and life skill development. '[...] appropriate education for a child [on the autism spectrum] may require modification of standard environments, curricula, equipment and teaching methods and, again specialist staff training' (Boucher, 2009: 329) as well as their sensory needs being taken into consideration. 'Many autistic individuals seem to have sensory impairments in one or more of their senses [and] are bombarded with sensory stimuli. They are often unable to filter out information received through each of

the senses' (Bogdashina, 2014b) and it is important to consider how sensory difficulties are obstacles to their development in other areas[51].

With such adaptations, and the relevant training provided to support their facilitation, it is manageable to look at the child holistically when creating adaptations to the curriculum, which makes it possible to focus on existing skills and develop processes to aid the development of those the child struggles with.

> For a child in specialist provisions, these difficulties can be minimized as we learn more about the shape of their thinking and adapt the curriculum, activities and materials around them to suit their way of thinking. For a child in a mainstream classroom, the challenge is to alter the curriculum, whist is exclusively based on regular shapes for the conventional learner, and a practice, which is develop for the majority. (Hanbury, 2005: 73).

Not only does this assume their development is in line with their chronological age but it also relies on the child being able to conform to enough social norms when in a larger class setting, without an individualised work plan or one that does not allow for adaptations to support their social, imaginative and sensory needs (Hanbury, 2005).

Yet, despite this, this research project focuses on those educated within Special Educational Needs provisions, and it is therefore important to give focus to the need for individualised learning generally in the education of autistic children[52]. The first two interventions that support individual learning are seen within SEN provisions - T*reatment and Education of Autistic and related Communication handicapped Children* (TEACCH) and *Picture Exchange Communication System* (PECS) and these will be explained briefly as example of practices in education.

Working with TEACCH/PECS

Treatment and Education of Autistic and related Communication handicapped Children is a tool, which is known by the acronym TEACCH. It was developed in 1966 in the USA by Dr Eric Schopler, a psychologist, who worked at worked in the Chicago based Treatment and Research Centre for Childhood Schizophrenia.

[51] As an example, hypo or hyper sensitivity to auditory input may effect a child's ability to develop language, which will have a secondary effect on their ability to socially communicate.
[52] Through the thesis there will be reference to the difference between mainstream and SEN schooling styles yet this comparison is merely for taken to contextualise and not to be seen a critique connected to ICT specifically.

This intervention is commonly used throughout the UK because it is a simple method to enable schools to create individualised routines for their pupils. 'This method emphasizes the use of a structured environment using one-to-one teaching in classrooms that provide visual cues on how to complete a task' (Turkington & Anan, 2007: 38). It functions so well due to using images of the child's environment and/or specific tasks (often using photographs) that are fixed on a timeline with Velcro. This makes it easy for the child to remove tasks that have been completed as well as see them in the order they will take place, whilst also ensuring the are easily adaptable. It is used extensively within specialist provisions for those holding a diagnosis of autism as well in a variety of settings to support children from the infantile years to adulthood. It can also be implemented to support an autistic child, alongside other family members, within the home environment to encourage fluidity and consistency between home and school.

> In additional, TEACCH programmes of intervention and education are designed explicitly to include parents as co-therapists. This ensures that the goals of intervention and education are dictated by the family's needs; that the broader needs and feelings of individual family members and of the family as a whole are taken into account; and that the techniques used can be carried through from nursery, clinic, or classroom to the child's home. (Boucher, 2009: 313)

Jones and Jordan (2014) described TEACCH as an individualised programme that promotes independent learning in a structured framework aiming to minimise the social pressures in non-individualised settings or through group work. Having experienced this tool used within special education, it is considered a significant example of how individualised processes work within the education system, with focus given to the visual and not just the verbal.

Reliant on structure and by using visual aids to explain the individual events and/or tasks for the child's day, TEACCH works extremely well with children who struggle with transitioning or with unexpected changes to routines. The emphasis again placed on the individual:

> [T]he TEACCH principle that no size fits all is useful to bear in mind. Each [autistic child] has difference and changing educational/intervention needs. Each family has different needs, opinions, wishes for their child. (Boucher, 2009: 324)

Therefore, it is likely that the added benefit of this intervention is its adaptability as it can be changed and updated time and time again much like my own

practical research. It is important that the process is just dependent on the child's needs, therefore TEACCH can be used to represent routines; such as how to complete a puzzle, what is needed for a lesson, how to wash your hands or where to keep your belongings[53]. To support the child's learning it can be used to assist written skills, and a number of problem solving tasks. The use of imagery, often photographs, gives the child instructions and timescales which assists with those with underdeveloped verbal communication or those working towards independence.

Picture Exchange Communication System (PECS) is the second example when addressing how a school priorities interventions that support individualisation, and much like the TEACCH intervention, it is used across the UK. It was developed in America in 1985 by Andy Bondy, and Lori Frost on the grounds of them educating autistic school children. Bondy and Frost soon realised that speech was often heavily relied upon by the adults in this environment, despite this skill creating great difficulties for the children. Yet also understood that the '[t]herapists recognizing the limitations of speech imitation training programs or looking for alternative communication modalities to teach while speech is developing have tried various alternative or augmentative communication systems' (Bondy & Frost 2001:726). This is how PECS was developed as an intervention designed to help children to initiation of communication between staff and pupils.

In terms of function PECS is primarily used to support the child's ability to communicate with others. With various functions, each PECS board or pack will have been created to assist the specific child's existing abilities. One common format is a PECS board with a number of phrases at the top, for example "I want", "I need", "I see", then below will be a number of pictures to help them complete the sentence. In another example, a child may carry a key-ring with a number of cards attached with symbols, images or words; such as "toilet", "drink", "coat", "pen" (etc.) to help them function more smoothly in their day if communication is a barrier.

[53] Visual examples of what the TEACCH system looks like have been included in the Appendix 4.

In their text *Active Support: Enabling and Empowering People with Intellectual Disabilities* (2012) Jim Mansell and Julie Beadle –Brown discuss the use of techniques such as TEACCH and PECs they state that:

> They are also an important element of methods of argumentative and alternative communication for use with all people with impairments in communication. If staff frequently respond to preferences expressed by the person they are supporting, then the person will learn that there is a point to making choices and will make more of them. (Mansell & Beadle Brown, 2012: 64)

With both the examples having visual element that 'provides the individual with minimal "vocabulary" of pictures that can be used to indicate needs and wants' (Boucher, 2009: 302)[54], it can be seen as beneficial in the overall development of the child. This system was developed for use specifically with autistic children, and allows these children to become embedded in their own daily routine, 'as in other areas discussed above, maximising choice and control is s skill on the part of those providing support' (Mansell & Beadle-Brown, 2012: 64). It aids transitions and communication skills by allowing the, often minimal, vocabulary of a child to be supported through the inclusion of visual aids, supporting developments at their own level. It was also important for Bondy and Frost support the ability to foster independence in these children, as well as minimise the amount of complexity often a barrier for children learning to communicate.

> PECS relies on the principles of applied behaviour analysis so that distinct prompting, reinforcement, and error correction strategies are specified at each training phase in order to teach spontaneous, functional communication. Specifically, no verbal prompts are used (although responding to natural verbal cues is taught later in the sequence). (Bondy & Frost 2001: 727-728)

As this communication system is based on the individual child's abilities and is designed to work from these and created methods to strengthen their independence and will to communicate the system is used across the UK in many SEN school provisions. The individualised nature and one-to-one format also offer a positive example that fits into the categories listed at the beginning of this chapter.

Intensive Interaction

[54] Visual examples of PECs have also been included in the Appendix 4.

With reference to the need for individualised learning methods, highlighted in the sections above, a clear theme is individualised interventions. This leads into third intervention discussed; *Intensive Interaction*. The inclusion of this intervention as an example supports the discussion presented in Part Three, which addresses the practical research, as this intervention is specifically used as an example for its approach to the use of mimicry, as well as being individualised, and therefore complimented and inspired many of the decisions made when personally working with the autistic children participating throughout the practical research discussed in Chapter Six.

Melanie Nind and David Hewett developed *Intensive Interaction* in the 1980s, during their time working at Harperbury Hospital School in Middlesex, UK (Kellett & Nind, 2003). This practical approach was developed to encourage and enhance meaningful communication with those who have learning difficulties. It is aimed at, and appropriate for, a variety of people with diverse abilities and disabilities, but one of the common similarities for all those it is used with, is a delay in social and communicative skills which is, more often than not, coupled with additional learning, behavioural, and/ or sensory needs. With this in mind it is important to state that it is not limited to children, but can be used on various age groups. However, the earlier it is implemented, the more likely it will promote an improvement on the children's communication skills. The information presented in the first two pages of *A Practical Guide to Intensive Interaction* (Nind & Hewett, 2001), encourages people to embed this intervention more readily:

> Intensive Interaction has been written about and discussed as an approach to "communication" for children and young people with the most severe learning difficulties, who have not readily made relationships, established informal communication or who are unable easily to access the curriculum on offer. (Nind & Hewett, 2001: 96)

The approach sought inspiration from research into the importance of the parent-child interactions from new-born to adulthood, and what skills can be learnt within such a caregiver-interaction[55] (Kellett & Nind, 2003). *Intensive Interaction* is

[55] The first intervention I was interested in, during my BA Hons Dance Theatre, was *Floortime* (developed by Stanley Greenspan and Serena Wieder) due to giving importance to the caregiver-interaction and allowing this to be premised as a significant experience available to support the child. The holistic approach inspired the practical research with autistic children and the following quotes give examples of this:
'Treat all of the child's behaviour – even if it seems random – as purposeful' (Greenspan & Wieder, 2006: 60).

reliant on mimicry throughout, which is inspired by childhood development and research into the placement of mimicry between child and parent/caregiver, yet it is apparent that it is not attempting to replicate this relationship, and is therefore often applied on a one-to-one basis. In terms of the interactions experience a teacher, for example, will sit with a child and begin to observe them before engaging with their movements or verbal communication using mimicry. The aim being to share mutual interactions and to create an accepting environment for behaviours that may be individual to a child (for example if a child makes a rocking motion, repeatedly makes a verbal noise, or has a physical tic that is often unnoticed).

The principles *Intensive Interaction* use and enhance one's ability to find interactions that allow both parties to engage in communication that is not just reliant on the verbal, but gives acknowledgement to the subtleties of communicating non-verbally (Nind & Hewett, 2001). It develops this idea by suggesting that these subtleties are rich enough to become the main form of communication, without the need for any verbal engagement. It is therefore statements like this to allow me again to draw on the similarities to this intervention and my own practical research.

It allows the interactions, through play, to have a redeveloped place in the social world, for those individuals who are in need of further focus on communicative development. Through independent research, to support Chapter Four of this thesis, it is understood that the importance of play, and mother/parent relationships, has been written about by three other key authors specialising in autism, and *Intensive Interaction*, literature; Utah Frith, Simon Baron-Cohen and Phoebe Caldwell[56].

> When connecting this research with Intensive Interaction it is mentioned to give focus to the enjoyment held between two people who engage in playful experiences with each other. Here we are able to acknowledge the interactions between people that are purely for engagement, and enjoyment, when in the

'True communication occurs only when a child is part of a shared world' (68)
'Thus through touch, sound and movement, the child senses the emotions of the other person in order to fine-tune [his/her] own emotions as part of two-way emotional signaling' (152).
The *Floortime* model is also references through *The Power of Neurodiversity* (Armstrong, 2010): 'It is based on the idea that parents should pay attention to cues from their autistic children and set up naturally occurring scenarios of involvement where the child is encouraged to emotionally interact, solve problems, express needs, and in other ways move out into a meaningful engagement with the social world' (Armstrong, 2010: 66-67).

[56] Their thoughts will be presented in more detail through the latter stages of this chapter, during discussion of Play Therapy.

> presence of other humans in our day-to-day lives (Caldwell, 2006, Caldwell, 2013).

When considering communication, Nind & Hewett's text (2001) acknowledges the development of communication through the infantile years. The authors' address the idea that most communication evidenced by humans is for enjoyment rather than for a specific function, and discusses the benefits of this for social skill development for building relationships and understanding emotion. This information supports an awareness of human interaction and social skills, whilst evidencing why this intervention was developed for individuals who have little-to-no verbal communication skills in mind. 'Intensive Interaction has been written about and discussed as an approach to "communication" for children and young people with the most severe learning difficulties, who have not readily made relationships, established informal communication or who are unable easily to access the curriculum on offer' (Nind, 1999: 96).

It is also then key to acknowledge the work of those such as Adam Ockleford and how they use extremely similar approaches in the development of his *Sounds of Intent Framework.* The frame work itself is a freely downloadable tool used primarily within education, but also with adults, that looks at three main domains; proactive, reactive and interactive. Although he does so from the point of view of music[57] as a tool, he closely research communication and autism in his 2013 text *Music, Language and Autism.* The developed *Sounds of Intent Framework* is acknowledged here as another successful example of how an approach to autism from an understanding of communication and an individualised approach can generate the practical development and application of a tool to support educators to better understand an support the needs of their autistic pupils.

> From the beginning, the Sounds of Intent research team adopted a "bottom up" approach, working with a group of practitioners – music therapists, teachers and others – in an attempt to develop accurate descriptions and shared interpretations of the different types and levels of musical engagement that they observed among their pupils and students with SLD or PMLD. (Ockleford, 2015: 2).

[57] Which Ockleford describes as a 'close (though distinctly characterful) cousin in the domain of auditory communication' (2013, 27).

Therefore, by reflecting on the *Intensive Interaction* approach and briefly mentioning the way in which the *Sounds of Intend Framework*[58] came into fruition, it is clear that it is increasingly important to acknowledge the need for adaptation and individualised interventions for autistic children, especially for those with underdeveloped verbal communication, and when those of us designing new approaches are doing so with autistic children. Unlike the first two examples, (TEACCH and PECS) reliant on visual aids, *Intensive Interaction* relies on human interaction through applying the intervention on a one-to-one basis, which like my own work, supports the individual developmental needs of the child. In summary, the three interventions highlighted previously have given premise to the ways in which the individual needs can be managed and how the curriculum can be adapted to meet these needs, and often delivered in one-to-one settings. The three interventions, collectively, also give focus to the additional need for individualisation and adaptation to support children who present additional needs as a result of their autism, and how these should be made a priority in research project much like this PhD.

Therapeutic Interventions seen within education

As mentioned in the introduction of this chapter, the need to identify the variety of support accessible for an autistic child was deemed important for the thesis argument. Following on from Early Interventions and then the introduction of three educational interventions, individual in nature, it is necessary to introduce the regular application of therapeutic interventions (often present within education). It is important to state at the beginning of this section that these types of therapeutic intervention are distinct from the interventions above (educational interventions) due to the requirement that the follow are only applied by a trained therapist. Again, before being applied their use is decided on a case-by-case basis, and if they are not able to be provided within school system they are often available privately or through the NHS. These therapies will be introduced, briefly, through this next section, with the aim to outline an understanding of the vast options available for a child holding a diagnosis of autism.

[58] Which will be further introduced in Chapter Six.

The therapeutic approaches are offered to further the introduction of interventions, before those that are reliant on, or based around, the inclusion of computer technology as a platform for working with autistic children. Here the therapeutic techniques being introduced are Play Therapy, Occupational Therapy, and finally Speech and Language Therapy. These four therapeutic interventions have been chosen specifically as all have been identified as being used within the Special Educational Needs provisions that were engaged with as part of the practical research for this PhD project. This thesis does not, therefore, argue that these have been chosen due to being most commonly used in the education of autistic children, but are relied upon to given specific examples of therapeutic interventions generally[59].

Play Therapy

To transfer this knowledge to more present-day reflections from the training through the Postgraduate Certificate in Therapeutic Play Skill - accredited by Leeds Beckett University are offered. The decision to pursue this training was directly related to research during the PhD and offered a clearer rationale for the inclusion of play, alongside movement, in the practical sessions facilitated with autistic children as participants.

In *The Quarterly Journal of Experimental Psychology* (2012) Utah Frith writes about the connections seen between play activities and the development of comprehensive interaction in social settings, and the understanding needed for complex social development. She suggests that the lack of pretend play in childhood leads to social difficulties, which is significant in its connection to autism, as this is something embedded in the diagnostic process (Frith, 2012; Baron-Cohen, Leslie, Frith 1985). As mentioned in more detail through Chapter Two; the term *lack of imagination* is connected to the *Triad of Impairments* and *Social Imagination* specifically. It is often seen as a conclusion drawn from the evidential lack of pretend play and imaginative problem solving through the infantile years. Play is more prevalent in the infant years in which parents and/or

[59] The guidelines of being experienced first-hand throughout the research process, promoting or rely on one-to-one facilitation and (for this chapter) can be independent of technological influences or advancements, were applied when deciding which therapeutic interventions to discussion.

carers are able to identify differences in their child's development through comparisons made between them and peers, or family members.

Like many of the characteristics and diagnostic elements of autism there are many factors that are interlinked and can be seen to have a mutual effect of the behaviours are evidenced by any one child. Play itself can easily been seen to link Social Communication, Social Interaction, and Social Imagination/*Theory of Mind*; all three of the *Triad of Impairments* (Wing & Gould, 1979). The three elements of the *Triad of Impairments* being co-occurring offers a reason for the lack of pretend play with peers (and how this becomes a signifier, or cause for concern) resulting in the child beginning to process of diagnosis. Play itself (developmentally speaking) offers a child so many learning experiences and is regarded as a way for children to express themselves and process experiences on their journey to adolescence.

Play Therapy shares a historical timeframe with the diagnosis of autism as it was established in the 1930s through the work of psychiatrists and psychologists interested in childhood development. It is often argued that Sigmund Freud's work psycho-analytical with adults in the years 1910-1930, developed his awareness of play and how it can be implemented to allow adults to access and express their unconscious concerns, as well as being used as a tool, therapeutically, for individuals to reimagine past experiences. When reflecting on the influence of Sigmund Freud on Play Therapy, Susan M. Knell states that Freud's work enable the conclusion that 'play allows the child to escape reality and explore new possibilities in a safe context' (Knell, 2004: 8). Despite these comprehensive statements, he himself never worked with children directly, only adults. Further to Sigmund Freud's hypothesis, Hermine Hug-Hellmuth, an Austrian psychoanalyst, began to use play as a therapeutic tool yet her work was superseded by the likes of Melanie Klein, Anna Freud and Margaret Lowenfeld; collectively known for the written accounts of applying play as a therapeutic tool.

> Both Anna Freud (1928, 1946) and Melanie Klein (1932) did extensive work incorporating play into their analytic session, although their approaches were somewhat divergent. Anna Freud used play to get children interested in play [whereas] Melanie Klein (1932) felt that play was a direct substitute for verbalisations, or the equivalent of adults' "free association". She used play as a means of communication, the manner by which the child made his or her thoughts known. (Knell, 2004: 80)

Despite the differences in application, Klein, Freud and Lowenfeld all shared the view that play itself had the ability to offer a way for children to convey and communicate their interests and feelings, as well as process their experiences. The approach most similar to the way Play Therapy is practiced today is often considered to be Melanie Klein's. This is firstly evidenced through her reflections on how the child interacted with objects (namely toys) as a method to relate emotions usually connected to people in their lives. As the heightened relationship with objects is often seen by autistic individuals, this reflection is considered important to connect autism and Play Therapy. Thus, the inclusion and importance given to toys in a Play Therapy setting allows for the child to explore and process these relationships in a therapeutic environment. Another interesting link to Melanie Klein's approach is that she developed this through her work with younger children who often had little to no verbal communication. This resulted in her view that 'play was a direct substitute for verbalisations, or the equivalent of adults' "free association". She used play as a means of communication, the manner by which the child made his or her thoughts known' (Knell, 2004: 80) - an approach that is again transferrable to autistic individuals.

When considering the training of Play Therapists today, the work of Virginia Axline, a psychologist and pioneer of Play Therapy, is seen as influential. The development of her Eight Principles for Play Therapists (in the 1940's) sees her outline the skills needed to work therapeutically. These principles were a product of her two seminal texts: *Play Therapy* (1947) and *Dibs: In Search of Self* (1964). In *Play Therapy* (1947) she writes:

1. The therapist must develop a warm, friendly relationship with the child, in which good rapport is established as soon as possible.
2. The therapist accepts the child exactly as he is.
3. The therapist establishes a feeling of permissiveness in the relationship so that the child feels free to express his feelings
4. The therapist is alert to recognise the feelings the child is expressing and reflects those feelings back to him in such a manner that he gains insight into his behaviour.
5. The therapist maintains a deep respect for the child's ability to solve his own problems if given the opportunity to do so. The responsibility to make choices and to institute change is the child's.
6. The therapist does not attempt to direct the child's actions or conversation in any manner. The child leads; the therapist follows.
7. The therapist does not hurry the therapy along. It is a gradual process and is recognised as such by the therapist.

8. The therapist establishes only those limitations that are necessary to anchor the therapy to the world of reality and to make the child aware of his responsibility in the relationship.
(Axline, 1947: 69-70)

The above offers trainees and insight in how to approach the child, how to premise holistic development and how to create boundaries for the child to create a safe and accepting environment. It is also a place for expression of emotions to be explored in a safe space, to support this 'play materials allow for nurturing, expressive, realistic, symbolic, and aggressive play' (Ray, 2017: 191). The application of the Eight Principles allows for the individualised nature that is seen through all other educational and therapeutic interventions presented in this chapter. It is done so through non-judgemental approaches to the child to offer acceptance to support the individual needs and developments. By utilising play as a means to communicate, often non-verbally, it is an effective way to engage with an autistic child and is also a process that would support any relationships they may have with objects (and toys) to be acknowledge and worked with through a positive setting.

> The child-centered play therapist does not attempt to establish objectives for the child to accomplish but is concerned about objectives as they relate to facilitating the development of a therapeutic relationship with the child. The focus is the child. (Landreth, 2012: 176)

Therefore, throughout Play Therapy it is established that the adult's role in the setting is to reduce the hierarchy that often comes from their relationships with teachers and parents. This approach encourages a process of equality that is more suited to the title of a facilitator[60], or in this case a therapist.

Occupational Therapy

Within many school provisions the types of therapeutic interventions vary from child to child, but are also dependant on what is available in the specific school. The financial commitment of having an Occupational Therapist within a school also effects the availability of other therapeutic interventions. In many cases an Occupational Therapist will be prioritised over a Play Therapist due to their ability to work more broadly when assisting the child's needs. Occupational Therapy

[60] As mentioned in the introduction of this thesis, the term facilitator has been adopted to assist in my role - as adult in the interactions - in being understood as by its non-hierarchical position.

(OT) is a therapeutic intervention that assists in particular activities that improve both physical and cognitive abilities. In the case of autistic children this is not seen as an attempt to *alleviate* their diagnosis of autism, it is more readily a means of supporting various difficulties often associated with the outcomes of the diagnosis, that the autistic child may experience uniquely. In the case of Occupational Therapy this will include interventions to support physical, emotional and social needs also promotes psychological developments too, through the individualised application of techniques.

> The occupational therapist (OT) has specific training in a wide variety of areas. Some of these include: human development, psychology, sociology, anatomy, neurology, physiology and kinesiology (the study of movement). [...] Occupational therapist are specifically trained to use age-appropriate activities to work on the development of skills used in daily life. This means that an OT working with children is able to choose play activities and games that are at the child's specific developmental level so that success can be accomplished. (Koscinski, 2016: 16-17)

Therefore, play is used across two of the therapeutic interventions discussed in this chapter, and due to play being offered within Occupational Therapy it again clarifies why this therapeutic intervention may be prioritised over Play Therapy. Many occupational therapists are seen to improve the child's ability to function more independently and successful to ensure their physical and cognitive difficulties does not hinder their holistic development.

> According to self-determination theory, human beings have three innate fundamental needs that, if met, enable them to grow, develop and flourish. These three needs - competence, relatedness and autonomy - are universal, and there is no reason to believe that [autistic individuals] do not have them. (Bushell, Gasson, Vann, 2018: 9)

Throughout this thesis, and from experiences working with autistic children, individualised and adaptable methods have seen to provide interactions with children through interventions tailored to their individual needs and that support holistic development. The use of mimicry, throughout the Practical research, is alongside playful interactions and, like Occupational Therapists and Play Therapists, recognise that; 'The occupation of a child is to play. Children learn through the completion of activities that they perform on a daily basis' (Koscinski, 2016: 17). Both interventions rely on the child's interests to lead the direction of the interactions, and through this the adult in the setting is there to support their holistic learning in a variety of ways; an approach used in the practice for PhD.

Speech and Language Therapy

Like all the other interventions described throughout this chapter Speech and Language Therapy, which 'is often viewed as a group of prescribed and precise activities' (Enderby & Emerson, 1996: 1657) is adaptable and individualised in all cases. For autistic children Speech and Language Therapy can be used to assist in the physical abilities to produce language as well as the social difficulties that may result in anxieties when trying to communicate socially.

> Intervention may take place in many different environments, for example, the home, school, clinic and will vary in duration and intensity dependent on the resources available, perceived needs of the child and policies of individual speech and language therapy services. (Law, Garrett & Nye: 2003: 3)

As mentioned in the previous chapter, one of the *Triad of Impairments* directly relates to communication, therefore Speech and Language Therapy is often a logical intervention for autistic children. This is a commonly used therapeutic intervention within the UK school system and is often done so in a one-to-one setting but has also been known to be delivered in groups. Much like the other interventions discussed above, there is a high proportion of individualisation associated with Speech and Language Therapy, and it is important to say that this is seen with autistic children but also with children who are accessing Speech and Language Therapy for another reason[61].

> Speech-language therapists can help [autistic individuals] to improve their general ability to communicate and interact with others effectively. [...] Therapists may teach nonverbal ways of communicating (which as sign language) and may improve social skills that involve communicating with others to initiate language development in young children with the disorders. They may also help people to better use words and sentences and to improve rate and rhythm of speech and conversation. (Turkington & Anan, 2007: 39)

In this way, it is key to note that the therapist themselves will be able to make decisions that suit the child best, but it is also common for the class room teacher, SENCO or parent to have referred the child so their objectives will also be taken into account when designing the therapeutic interventions. The other adults may also take a role in the intervention as there may be a requirement for

[61] 'Speech and language delay/disorder is a common developmental difficulty in childhood. It may present either as a secondary difficulty (where it can be accounted for by a primary condition such as: autism, hearing impairment, general developmental difficulties, behavioural or emotional difficulties or neurological impairment), or it may be considered primary when it cannot be accounted for by any other condition (Stark 1981, Plante 1998)' (Law, Garrett & Nye: 2003: 2)

more intensive intervention that surpasses the resources (of time and staff) for the child to access *direct*[62] therapy for the ideal amount of time, and due to this the other adults may engage the child in *indirect intervention.*

> Traditionally this approach is used to create an optimum communicative environment for the child by promoting positive parent-child interactions. Indirect approaches are increasingly being employed within a range of settings, where speech and language therapists train professionals and carers who work with the children and provide programmes or advice on how to maximise the child's communicative environment and enhance communicative attempts. (Law, Garrett, & Nye: 2003: 3)

When indirect approaches are employed it offers the child a more holistic environment in which the adults in their school and home life will be able to support them through a consistent approach. Also, important in the success of Speech and Language Therapy is its ability to be absorbed into other relationships and tasks, as well as used alongside over therapies or interventions. In some cases, Speech and Language Therapy is combined with music as 'many clinicians have utilized music for development in various areas [with autistic children] such as: fine and gross motor coordination, attention span, social and interpersonal skills, concept of self, and verbal and nonverbal communication (Whipple, 2004)' (Lim, 2010: 3). Although Music Therapy has not been discussed at length here[63] there is a formal link between the two in the case of a specific speech and language training called:

> Developmental Speech and Language Training through Music (DSLM) [which] is designed to utilise musical as well as related materials to enhance and facilitate speech and language development in children with developmental speech and language delays. (Thaut, 2005: 173)

When discussing this link in terms of application and the use of DSLM, Hayoung Lim (2010) discusses in his paper *Effect of "Developmental Speech and Language Training Through Music" of Speech Production in Children with Autism Spectrum* Disorders states that:

> Similarities between music and speech/language suggest a link between the two domains in terms of their evolution and development as well, because both music and language development in children are heavily influenced by their capacity for pattern perception and production […] Therefore, it is possible to postulate that a

[62] 'Direct intervention focuses on the treatment of the child either individually or within a group of children depending on the age and needs of the children requiring therapy and the facilities available' (Law, Garrett & Nye: 2003: 3).
[63] Due to the guideline created seeing only interventions and therapies that have been experienced first-hand included in the thesis.

> closer link between music and language, in particular the common mechanism of pattern perception and production between the two domains might exist in the development of [autistic children]. (Lim, 2010: 6)

Consequently, the use of Speech and Language Therapy, with autistic children, is offered in an individualised programme often conjunction with other interventions. This aims to promote holistic development by premising communication as a means of access to the other, and by focusing on the child's development as a whole. By combining direct and indirect interventions this therapeutic intervention also offers support for the adults work and living with autistic children, in order for them to best support that child in and out of the school environment.

Conclusion

This chapter unpacked the different traditional interventions used within education, and specifies those interventions seen across primary school and specialist school provisions for the Special Educational Needs children. The breadth of interventions has been reduced to focus on traditional interventions specifically developed and/or applied with the diagnosis of autism in mind. Within this chapter an introductory selection outlines that these are interventions not reliant on technological engagement, as a restriction on the interventions discussed in this chapter[64]. All those included were seen used within educational provision and/or have been used with the participants of the practical research, promote or rely on one-to-one facilitation and can be independent of technological influences or advancements.

By beginning with background information, a historical overview of their placement in the education of autistic children is offered through this chapter. The overview of individuality throughout the implementation of interventions for autistic children was discusses as an important factor in considering how each child may benefit, or how the interventions may be implemented in education and the home environment. This chapter also considered the different professionals involved in the implementation of interventions, and the differences seen between educational interventions and therapeutic interventions; whereby no one other

[64] 'There are many other treatment alternatives for autism available (one Web site, Research Autism, lists more than seven hundred)' (Armstrong, 2010: 66).

than a trained therapist is qualified to apply the therapeutic interventions. With education being the most common setting in which an intervention is implemented, the specialist role of a Special Educational Needs Co-Ordinator (SENCO) is often relied upon when deciding whether an intervention should be trialled with a child.

Considering autism specifically, more awareness of the diagnosis has resulted in an increase in Early Intervention methods offering age appropriate interventions for children under the age of three. This is one area in which exercise, dance, and creative outputs are relied upon as viable options for children without a need for verbal communication. These types of interventions are applicable for children of any age, and are giving this project the recognition needed to support the benefits of movement sessions, with autistic children. It is also key to note that traditionally Early Intervention is seen as interventions used before the child begins school, therefore the active involvement of parents and carers is key to the success of Early Interventions.

When discussing educational techniques, it was decided to begin with two specific individualised learning tools; *Treatment and Education of Autistic and related Communication handicapped Children* (TEACCH) and *Picture Exchange Communication System* (PECS). This was chosen as a point to discuss as these have been experienced first-hand, promote one-to-one facilitation and can are independent of technological influences or advancements (the guidelines created to aid the choice of interventions discussed). Both TEACCH and PECS support individual learning styles and clearly offer the child a space to learn on their own level in a supportive environment. With these interventions, the child is offered consistency and for this reason they are often used for children who struggle with changes to routines or transitions. Like all of the interventions discussed, these techniques are embedded in the child's day alongside relationships with their teaching staff. The human interaction ensures that this technique is implemented successfully and works to offer each child the desired support. It also offers a framework approach that favours adaptation to allow the child to strive.

These principles are also seen in the third intervention of the chapter discusses, *Intensive Interaction*, as an approach included for its use of mimicry, one-to-one interactions and its acceptance of touch, especially when being used with autistic children. This particular approach has also begun to open up the

discussion surrounding the importance of the relationship between primary carer giver and the child, whilst aiding holistic development, and premising adaptation within the intervention. When discussing the important influences from childhood development, the lack of (or significant reduction in), touch used throughout in the education system is called into questions by David Hewett. In doing so he advocates for its use due to its ability to aid development and engagement, within embodied experiences and through movement.

These considerations are when supported by research focusing on the play based intervention, Play Therapy, which stated that movement is a key component, with great benefits for autistic children; '[...] children on the autistic spectrum disorders (ASD) tend to gravitate towards games that stimulate the senses and provide a lot of movement' (Pedersen, 2013). Therefore, this chapter also introduced Play Therapy in more detail and its application as an intervention used for those holding a diagnosis of autism.

This chapter introduced the regular application of therapies, and therapeutic interventions, such as Occupational Therapy, and Speech and Language Therapy alongside the aforementioned Play Therapy, as all can be accessed through the education sector, privately or through the NHS. Therefore, these therapies were introduced, briefly, with the aim to offer an outline of the benefits that come with understanding and exploring the numerous options available for families with an autistic child and to make clear what my own work it sitting alongside in terms of interventions and tools to support the holistic development of autistic children.

Occupational Therapy shares characteristics with Play Therapy in terms of its application in education. Both take influence from the natural ways in which children communicate and express themselves. Therefore, play and mimicry are often both seen in Occupational Therapy sessions with autistic children. Koscinski, 2016, makes it clear that play is vital to children's learning and growth and that through the infantile years this is how they develop knowledge. Much like the practical research of this PhD both Play Therapy and Occupational Therapy rely on the child's interests to lead the direction of the interactions, and through this the therapist working with such children is there to support their holistic learning.

Lastly Speech and Language Therapy echoed the theories and approaches introduced by all other interventions and therapies, whilst also showing how it can be applied individualised and aligned to the child's needs. Like the other therapeutic interventions, Speech and Language Therapy is often used with autistic children, but not exclusively, and in doing so focuses on many aspects of communication, not just the physically ability. The intervention also relies on direct and indirect application and well as promotes the ability to combine this with other techniques to encourage natural and holistic development for the autistic child.

The introduction and discussion of the seven approaches in this chapter gave an overview of current practices use within the education of autistic children. It offers insight from personal experience without addressing this specifically and allows the reader to have a great context of where and how this research made impact on the education sector in the UK. This overview has been written theoretically to afford context over practical exploration, but the process of writing it has acknowledged similarities between the interventions and personal practice. This chapter also opens the discussion of how these interventions - not reliant on technological engagement - may only be responding to a portion of the child's needs, and holistic developments are premised through those intervention that support individualisation and adaptation[65]. The following chapter will now offer insight of interventions on the other end of the spectrum, those that are over reliant on technological engagement, and at a times risk replacing the human interaction that these traditional interventions advocate for.

[65] The sixth chapter will show the possibilities of both individualisation and adaptation by presenting the practical research associated with this thesis.

Chapter Four: Technological interventions in the education of autistic children

Introduction

The primary function of the previous chapter was to outline the wider context of educational and therapeutic interventions that were not reliant upon computer technology for their function. This fourth chapter will now specifically focus on the use of computer technology in education to underpin further chapters of this thesis. The final aim of Part Two is to use this fourth chapter to assess and define Technological Interventions, which supports the overview in in Part Three which reflects on the use of ICT in the education and the reduction in human interaction. Naturally, this chapter will draw on the contextualising information concerned with decisions to embed computer technology in the education system, introduced through research conducted and presented as part of Chapter One. This is subsequently expanded upon in this fourth chapter by focusing on interventions reliant on technological engagement specifically with autistic children, yet these techniques are not exclusive to autistic children and can be seen used with wider SEN needs as well.

For the purpose of this section it is important to point out that the use of the term computer technology, and/or ICT will always be applied when referring those introduced into the education system from the 1980's onwards. This timescale (of the past 30 years) has been chosen outline the dramatic increase in the reliance on ICT in everyday lives, including the education sector, namely Information Communication Technologies. The computer technologies discussed will also be those specifically, within the parameters of this discussion, used to interventions introduced within education. Therefore, this chapter will form the basis of the discussion around how computer technology has been validated through teaching styles, and our daily lives, as well as the development of specific technology based interventions for those with a diagnosis of autism. The conversation acknowledges how technology aims to be embedded within the

already complex and changeable framework of education, let alone autism. In some cases, the information offers specific contrast to interventions reliant on human interaction and/or therapeutic techniques, which were presented in the previous chapter.

To do so this chapter will offer a commentary on systematic reviews which have been conducted specifically to understand the breadth of interventions that are dependent on, or based around, the inclusion of computer technology as a platform to work with children. The preliminary research into interventions specifically for those with a diagnosis of autism (presented in Chapter Three) will be reflected upon to help contextualise the overall setting in which these newer, technology based, interventions have been introduced and to outline the unintended the consequences may have when used alongside, or instead of, traditional methods.

By creating clear guidelines surrounding the interventions discussed will allow for this chapter's review to avoid detailed accounts of the use of chalk-boards, white-boards and interactive white-boards as technologies, or audio-visual technologies used to supply pupils with learning resources that were applied in their traditional format; i.e. as photography and/or film, or information that is simply presented digitally using software such as *PowerPoint*. This section will specifically look at those interventions, that are in the form of, or include elements of, computer devices, tablet devices or are software/applications accessed on such pieces of computer technology, accessible in education and more recently the home following the introduction of affordable smartphones and tablet devices. To assist in clarifying the types of technologies reflected upon and challenged throughout this thesis, Lani Florian and John Hegarty's *ICT and Special Educational Needs - A tool for inclusion* (2006) will be relied upon.

For the purpose of this thesis the terminology of ICT is prioritised when describing the technological interventions more broadly. The alternative, or additional, terms that are used in similar literature are Computer-Assisted Learning (CAL) or Computer-Assisted Therapy (CAT), and Technology Enhanced Learning (TEL) yet ICT will replace these where appropriate, to ensure consistency. The research field of Human-Computer Interaction may also be referenced in the discussion use to introduce the thesis argument where adaptation is seen as beneficial in childhood interactions with computer

technologies for holistic development. This approach, outlined fully in Chapter Five, offers an alternative view to be implemented before the child faces the many difficulties that come in adulthood, for autistic individuals, due to the many unintended consequences to the overexposure of ICT.

Technology in Education: Categories offered by Lani Florian

When creating my own review of literature reflecting on the use of technological intervention in the education of autistic children, frustration was caused by a lack of clarity. It was noticed that not only was the complexity of autism often being misrepresented but so was the complexity of technological interventions. As briefly mentioned in the introduction of this chapter, the idea of reflecting on the use of technology in the education sector could easily have seen this thesis discussing chalk-boards, white-boards and interactive white-boards as technologies as examples. There are again broader research topics addressing technologies that discuss audio-visual technologies used to supply pupils with learning resources that are not adapted to be used with those with Special Educational Needs. These are inclusive of photography and/or film, and information that is presented on software such as *PowerPoint*, as in these cases the only technological difference to the way information is presented, rather than a form of intervention. To differentiate from such research topics (that generalise all technologies) choice made was to provide some distinctions between the categories of technology seen in the education of autistic children.

To guide the reader through these complexities, and as a response to the commentary on systematic reviews which follows, this first section draws on the categories of technology by their use in schools as a way to offer a specific understanding of how to consider the discussion, and to technologies that are not being reflected upon through the thesis argument[66]. In her chapter *ICT and Special Educational Needs - A tool for inclusion* (Florian & Hegarty, eds, 2006), Lani Florian, Professor in Special Education, reflects on research by John Woodward and Herbert Rieth to discuss technology in the education of children with special educational needs. This first chapter, authored by Florian alone was

[66] The use of Lani Florian's text has proven influential in that it does not focuses purely on the technology (it terms of either hardware of software) but eliminates this limitation in favour for how the technology is applied and engagement with. For her the use is more important that its technical ability or innovation.

titled *Uses of technology that support pupils with special educational needs* (Florian, 2006: 7-20), and presents the following categories a suggested distinction for the role of different technologies: 'Used to Tutor', 'Used to Explore', 'Applied as Tool', 'Used to Communicate', 'Used for Assessment Purposes', and 'Used as a Management Tool' (Florian, 2006: 11-18).

These categories offer many different ways of approaching and defining the application of technology and how it has been introduced into the education of those with Special Educational Needs, which is therefore breaking the norm in this field. Consequently, this chapter offers structure and purpose aligning with the overall argument presented in this thesis, whilst attempting to stand out against the over generalised critiqued below. Within the 'Used to Tutor' category Florian reflects on Computer-Assisted Instruction (CAI) programs that were designed and used with a range of children, not just those with Special Educational Needs.

> Most early CAI programs were based on a behavioural theory of learning. Typically, learners worked individually at the computer on tasks that tended to emphasise drill and practice, or the reinforcement of previously taught skills. Many programs may have been delivered via a computer software but, in terms of their design content, they were no different than conventional materials for drill and practice. (Florian, 2006: 11)

Many types of technology in education are applied as a short-term solution in order to assist the child to access the material being taught in class. This method is just that, it relies on a certain level of intellectual ability and very convention teaching methods to assist the child in a slightly different format. This approach of learning, in an SEN environment, has a positive reputation despite little innovation when it comes to its design application for specific diagnoses[67]. The same systems, designed or those with and without Special Educational Needs, lack the adaptability and flexibility that is often needed when working with the heterogeneity that is Special Educational Needs, let alone a diagnosis like autism that is considered a spectrum due to the variety of needs and abilities seen[68]. An example of this category of technological intervention may be software that reads text aloud for a child who has learning disabilities or a visual impairment. This is a

[67] This topic is a key concern of Chapter Five and to support this the work of Manfred Spitzer (2012) and Alissa Antle (2013) will be introduced.
[68] Both conclusions are made after presenting research on the overly positive reporting of the benefits of ICT for people with various diagnoses, introduced later in this chapter.

basic function that could be applied through human interactions yet often the resources, in terms of staff members and their time, are limited so this technological invention serves a great function of support children by means of a short-term solution allowing the child to access the curriculum.

Florian reflects on these concerns in a similar way and goes on to reference Woodward and Rieth's (1997) paper *A Historical Review of technology research in special education.* She writes that Woodward and Rieth 'concluded that, on its own, CAI was insufficient for teaching pupils with SEN' (Florian, 2004: 11). This also supports her earlier distinctions that these systems work best when used to reinforce existing knowledge and do not seem to be design for those students who may have less academic ability. This begs the question as to how much these types of systems are in place to assist in the teachers by offering the additional, one-to-one support for individuals if the program itself has its limitations. Such information provokes questions regarding whether a system, also reliant on traditional drill and practice methods, may be more damaging than good in a setting where individualised learning is favoured over consistent methods for all.

As a topic continued in the latter stages of this chapter, the overly positive reporting of the benefits of technological involvement in the education of those with Special Educational Needs seems to rely on the idea that such interventions in education aid inclusivity. After spending time reflecting on papers that do consistently praise the inclusive opportunities it is concerning that this was not painting the true picture of how isolating and excluding such devices can be. This is a theme also introduced at the end of Florian's section outlining technology 'Used to tutor' (2004):

> An important issue in the use of tutor programs with pupils with SE in the extent to which they are used to include or exclude learners from participating in group activities. A balance needs to be struck between the benefit of working individually at one's own pace and the isolation that some learners experience when such an emphasis precludes participation in group activities. Consideration needs to be given to how the program *facilitates* participation. (Florian, 2004: 12)

The effect this has on individuals, who are over exposed to technology as children, when they become adults have been widely researched by the likes of Manfred Spitzer and Alissa Antle (whose work draw on themes of influences by industry, the use of iPad and computers and the lack of embodied interactions). It

is also worth noting that Florian's chapter, and the text in which it was published, was written in 2004, and since then the technological developments, over 14 years, have had a dramatic impact on the amount of *screen-time*[69] a child is now experiencing, so any concerns then about isolation can easily be seen as ever more relevant in today's society.

This leads to the next of Florian's categories around the uses of technology in the education of children with Special Educational Needs, technologies 'Used to Communicate' (2004):

> These include electronic language boards, voice synthesizers and voice recognition software. Many of the symbol communication systems used by some pupils with SEN are supported by software programs to enable pupils, for example, to write and e-mail. (Florian, 2004: 15)

Therefore, this category may be one that receives praise for its ability to support those with a disability or Special Educational Needs as a process allowing the individual to access systems to communicate and therefore afford integration. This is particularly praised when it comes to the subject of adults as it has been pertinent in the work environment, to allow adults to live independently and for a means of socialisation. For these reasons, it is apparent that this category does fit into the report of positive appraisal through the systematic reviews, but it needs to be acknowledged that these systems are best suited to those with a certain level of intellect or skill to be able to carry out the processes need to benefit from these technologies.

Another of Florian's terms to categorise technological interventions in SEN education is 'Applied as Tool' (2004). This term is less focused on the academic abilities of the children, as if is more to support their additional needs; 'many assistive devices are available to overcome the barriers to learning posed by physical and sensory impairments. Access devices range from simple switches and touch screens to specialist key-boards and voice-activated software' (Florian, 2004: 14). In this list, advances in eye-tracking software also seem relevant, which has shown how innovative design truly can break down the barriers faced by many with physical disabilities yet have little-to-no effect on their intellectual

[69] This is a term used in relation to use of technologies such as TVs, desktop and laptop computers, tablet devices, smartphones and gaming devices.

abilities (a diagnosis like Cerebral Palsy or Motor Neuron Disease would be examples).

As the examples suggest, in many cases, these *tools*, as Florian describes them, are additions aligned with the use of computers, phones and tables in order for them to become more accessible. This category appeals to those who have a certain level of ability; 'they are not in themselves a panacea: significant skill is needed to operate them successfully' (Florian, 2004: 14), but they go some way in evidencing claims of inclusivity the systematic reviews are often quick to report. Even still, the individual comes into play when deciding on the types of *tool* to apply in each setting, for each child. This process seems to be a way to avoid the short-term solution, with unintended consequences, and Florian writes the following:

> If children are to use ICT as a tool successfully, a comprehensive assessment of their strengths and needs is vital. Hardy (2000) suggests that such an assessment should include information on the following:
> - The learner, including ability across the curriculum, current ICT skills and a rationale for why ICT provision would be helpful;
> - Support available for the pupil;
> - Information about the school;
> - An evaluation including the goals set and a date of review; and
> - Financial considerations. (Florian, 2004: 15)

This section of Florian's text reflects on Hardy's research and discusses the ability for technology to support the way in which children access the curriculum and makes clear that when technology is applied as a tool to aid existing abilities. In light of this Florian also creates a category to reflect specifically on this: 'Used for Assessment Purposes'. Like Colin Hardy, who went on to write extensively about ICT and autism, 'the *Special Educational Needs Code of Practice* (Department for Education and Skills 2001) stipulated that ongoing observation and assessment should be undertaken in the identification of pupils with SEN' (Florian, 2004: 16).

Florian makes clear that despite this being a stipulation the means in which this is carried out is not mandatory. Consequently schools, and their staff, create their own guidelines when it comes to the best way in which to assess a child. Therefore, in many cases, the technology itself may be used as part of the assessment to 'assist in pinpointing the specific difficulty a pupil may be experiencing when learning, there has been a great deal of research interest in

the use of technology to assist in the diagnosis of learning difficulties' (Florian, 2004: 16). This category, is not so much an assistive technology for the child, but more so for the adults supporting that child. Therefore, this area of interest may be outside of the types of technology reflected on in this research, but regrettable will be included in many studies that report a positive impact technology has on children's learning. Many will see this as fundamental in helping the child in the long term, but it is appropriate to include this in conversations about ICT in the education of autistic children: which is misleading.

Likewise, it often feels as though the category 'Used as a Management Tool' (2004) is included and discussed in many studies promoting the use of technology for SEN children, without stipulating its purpose is supporting the teachers and other adults in these environments. This category is described by Florian as having an important place when assessing a child's needs, as well as then implementing processes to support the needs when they been identified. Within the teaching itself the technologies are used in various way and are often seen used as an alternative monitoring tool, where by teachers can log developments academically or can help staff communicate with parents about the child's day. This category again seems to have been developed to alleviate of the lack of time, as a resource, and can often be seen applied when the teachers them-self needs to meet the additional needs associated with SEN pupils. Therefore 'a number of software programs designed to help them manage the day-to-day responsibilities of providing for pupils with SEN have been developed' (Florian, 2004: 16).

When reflecting on the demand for such software, what emerges is Florian's understanding on the pressure placed on the teaching profession, 14 years ago. The demands on the teachers of today have undoubtedly increased in recent years, and not just for those working in SEN. So, it is understandable that she reflects on the need for this category of technologies by explaining that:

> The range of learning difficulties covered by the umbrella term SEN is vast and no one teacher will know about all the potential difficulties individual pupils may experience. This partly explains the appeal of expert systems in the development of special needs diagnosis software. An expert system could be devised to have more information than an individual teacher could retain and, therefore, teachers could use them to help generate teaching solutions to individual learning problems. (Florian, 2004: 17)

Again, this category is not explicitly addressed through literature regarding technology in the education of SEN children. As many reviews do not distinguish between technologies, the overwhelming positive claims regarding ICT for inclusion and to support SEN pupils could easily be referring to alleviating the demands on the teacher rather than interventions for the child. Here, Florian's text supports the concerns of this thesis in that she states the demand on teachers to have in-depth knowledge of all diagnoses is beyond any individuals' ability, and that technology goes some way to alleviate these pressures through management tools. With this in mind Florian includes the use of the Internet as a tool and resource that teachers can access, and then implement, when supporting a child with Special Educational Needs. Already, in 2004, it became apparent that there were several web-based supports for teachers, which are continuously improving tools for the teaching profession allowing to access shared ideas and experiences, although due to the flexibility the internet offers it is increasingly difficult to keep up to date with their use and analyse how it aids the profession.

The category chosen to introduce last, is called 'Used to Explore' (2004). The rationale for doing so was that this category, despite it featuring earlier in her chapter, feels most closely connected to the aims of the interactions with autistic children for this PhD project; during which technology was introduced into the space during movement sessions. Florian gives a thorough and conclusive definition of what she deemed to be included in the term 'Used to Explore' (2004):

> Whereas tutor programs are about teaching, exploratory learning environments allow pupils to interact with the material and have more control over their learning. Exploratory environments represent an increasingly popular contemporary use of technology in education. They emphasize exploration as opposed to drill and practice or the reinforcement of skills and knowledge. They are based on constructivist rather than behavioural views of learning. The idea is to promote authentic learning with an emphasis on assisting learning to collaboratively construct knowledge (Reed and McNergney 2000). Exploratory learning environments include simulations and virtual environments [...]. (Florian, 2004: 12).

Florian's description, written 14 years ago, still does justice to this area of technological intervention. It offers a framework in which the research presented is, contextually, and consequently it is driving force for personal critique of other misrepresentation of ICT through their research into its use with SEN pupils. The comparison being made, to Florian's other four categories, is also clear which

allows her chapter to give the reader a better understanding of how this differs and what more it may be able to offer the child if embraced and implemented.

The concerns this research project has, regarding the other categories, echo the concerns suggested in the quote above. But to further this, all the other categories[70] seem to premise solo engagement with technologies as well as, in many cases, being designed as a way to alleviate the pressures on the teaching profession. This is a prime example of a category being praised for their assistance to teachers and to help a child access the curriculum. Yet, in reality, the child experiences more solo engagement with technologies, instead human interaction, as the result of under-researched and unintended consequences for a technological resource designed to bridge the gap needed to support Special Educational Needs and show inclusive interventions in the teaching profession which is notoriously overworked. Florian observed that 'such approaches to the use of technology are touted as tools that enable teachers and pupils to become co-learners who collaboratively construct knowledge (Reed and McNergney 2000) (Florian, 2004: 12). Nonetheless, these technologies, and the use of technologies in education more broadly, should be implemented to develop the child's cognitive abilities rather than cause a decrease or plateau, in areas not considered in the design process. Therefore, this thesis strongly aligns with the theme of technologies 'Used to Explore' as a way to counteract these unintended consequences.

This type of approach is appropriated through the work of two key researchers; Wendy Keay-Bright and Nicola Shaughnessy. Firstly, this thesis considers both to have been influential throughout the PhD project and understands that both work toward projects that apply technologies 'Used to Explore' with autistic participants. Wendy Keay-Bright is a Graphic Designer interested in interaction, animation, and moving image design. For this purpose of this thesis her work with the autistic community is premise, particularly her projects using a Participatory Design method. Nicola Shaughnessy is a Professor of Performance, but again to support this thesis her work with autistics children[71] will be referenced with interest.

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[70] 'Used to Tutor', 'Used to Explore', 'Applied as Tool', 'Used to Communicate', 'Used for Assessment Purposes', and 'Used as a Management Tool' (Florian, 2006: 11-18).

[71] The work of both Wendy Keay-Bright and Nicola Shaughnessy will be addressed in more detail in the latter sections of these chapter, as well as throughout Part Three of the thesis.

Systematic Reviews

With regard to an overview of interventions reliant on computer technologies, the starting point will be the placement of a paper that presents a systematic review of just that: *Innovative technology-based interventions for autism-spectrum disorders: A meta-analysis* (Grynszpan, at al. 2014). Despite avoiding the discussion of technologies used in their traditional format[72], this paper does include interventions that use interactive DVD and virtual reality; which are key players in the current climate of digital interventions, alongside robotics, so these will not be excluded from this overview sections, but their involvement will be limited throughout the following discussion. This particular paper focused on 22 articles published between 1990 and 2011, limited due to their strict criteria, and 'the type of technology used was mostly based on computer gaming software, with 18 studies employing desktop computers' (Grynszpan, at al. 2014: 354); which this thesis often describes as conventional, solo use, technologies. Throughout the paper, they make reference to the rhetoric surrounding inventions reliant on advances in computer technologies still being referred to as *experimental*, *new* or *in development*. With reference to the interventions reliant on desktop computers, it was clear that these were primarily focused on *communication tools*;

> Their results led these authors only to conclude that computer-based interventions appear to be a promising practice to teach communication skills to children with ASD. They felt that the level of evidence was, as yet, not strong enough to make a more definitive statement (Grynszpan, at al. 2014: 356).

This is a common description for technologies designed to assist the communication skills of those with a diagnosis of autism, and later in the paper showed similar reflections on interventions interested in the development of social skill acquisition. This paper made reference to a systematic review by Reynhout and Carter (2006) and a second by Bellini, et al. (2007) to contextualise their findings:

> Indeed, Reynhour and Carter (2006) conducted a meta-analysis of 16 single-subject studies that used social stories to improve social understanding of children with ASD. They concluded that the effects of social stories were highly variable and criticized some of the articles for the lack of information regarding the profiles of participants. Similarly, Bellini et al. (2007) conducted a meta-analysis of 55 single-subject design studies and examined the effectiveness of

[72] A way to describe software such a *PowerPoint* used merely to present elements of the taught curriculum rather than as an intervention (as an example).

> school-based social skill interventions for children and adolescents with ASD. In contrast to this study, their results suggested that social skills interventions are minimally effective for children with ASD. (Grynszpan, at al. 2014: 354)

Another observation is that this study comments on the saturation of participants with normal-to-advanced intellectual ability, and that there is a lack of research to understand the full effects from the use of technology in education more broadly, but with specific regard to autistic individuals. Therefore, this once again fails to acknowledge that '[p]eople with ASD do not form a homogenous group and the type of technology which suits one student with ASD may not necessarily meet the learning needs of another student with ASD' (Tanner, Dixon, & Verenikina, 2010: 2587).

This is also considered in the 2014 paper by Istenic Starcic and Bagon, which reviews 118 papers published between 1970 and 2011, across seven journals, which opens with the claim that 'research and development of information and communication technology (ICT)-supported learning for people with disabilities have not received adequate attention. It is also difficult to access research findings and developments in this field' (Istenic Starcic & Bagon, 2014: 202). Despite this statement the text endorses papers promoting the use of computer technology and deems its use as exclusively positive for inclusivity across all disabilities, and all age groups, which is misleading and the reason their paper is critiqued. There is only one comment that can be interpreted as sharing the concerns of this thesis, regarding the unintended negative consequences of relying on the inclusion of technologies in the education of those holding a diagnosis evidencing social difficulties, which is; '[w]hile ICT has the potential to promote inclusion and support differentiated instruction, the technology itself could also present the main obstacle to inclusion' (Istenic Starcic & Bagon, 2014: 203).

Regrettably this is not substantiated in the review, proving to be a limitation of the paper, and in many ways, reinforces concerns that research in this field are reliant upon generalisation regarding ICT in education. This oversimplification of the way ICT is reviewed fails to reflect on the true complexity and diversity of technology, education or autism; yet the first two can be overcome by applying Florian's categorisation to research in this field. The fact one critical statement is included yet never substantiated or connected to findings

of any specific paper being reviewed, limits the effectiveness of its inclusion. The reader is unable to refer to the original article and therefore is not offered a clear insight into the climate of ICT used in the education of SEN pupils. It could be argued that this contradictory statement, which clearly juxtaposes the findings of the majority of publications reviewed, was avoided as it would refute the resounding message of the paper, which seemingly presents a scenario in which all technologies used in SEN provisions are exclusively positive.

Despite offering an overview connecting to the topic of computer technology's role in inclusive school settings, this push towards technology, to be seen as positive for inclusivity, was made clear in one of the concluding statements of the review; 'especially for students with disabilities, ICT provides accessibility and equal engagement and facilitates overcoming of potential isolation by connecting them to social environments and enabling their participation in education and wider society' (Istenic Starcic & Bagon, 2014: 224). Such a statement is typical of papers aiming to prove the benefits of ICT and is a statement that is inherently too generalised and generic when claiming to address such a heterogeneity of ages, let alone disabilities, and is similar to the statements made by Grynszpan, at al. (2014).

This type of juxtaposition between statements evidences with a lack of rigour in research by still concluding that ICT is positive, is also referred to in Adam N. Joinson's book *Understanding the Psychology of Internet Behaviour* (2003). Here he discusses the internet use of the general population specifically to focus on the effect this has on social interaction more broadly. This is presented primarily through his fourth chapter titled *Internet use and psychological well-being*, by relying on two studies. Joinson concluded that those who engage with the internet in increased amounts evidence notable reduction in social interaction. Additionally, in recent years the isolation seen in autistic adults has become worrying and acknowledged to be a result of various actions, one of which is internet addiction; '[g]iven that there appears to be a strong relationship between use of the internet and those with ASD' (Romano et al, 2014: 1522). Therefore, it is key to consider methods to respond to these attributes, firstly by acknowledging that this has the potential to cause isolation. This thesis aims to expose the concerns in order to present a solution that can be applied in the education of autistic children.

This ethos simply qualifies the statement presented in 2012 by Wendy Keay-Bright, Professor of Technology and Inclusion at Cardiff University, and Dr Imogen Howarth, a Specialist Educational Psychologist; '[…] the majority of research into autism and technology focuses on how the skills of already high-functioning children might be improved upon but there is a paucity of literature addressing the needs of children with more significant difficulties' (Keay-Bright & Howarth, 2012: 130). This clearly explains that the majority of research into the use of ICT with SEN, and autistic, children are designed to show the benefits for children who already have abilities to access such technologies[73]. Research is still lacking to evidence the, assumed, benefits for SEN children who have more profound difficulties, that mean they are not accessing education in a mainstream setting, but in a SEN school designed for their specific needs. 'The difficulty of demonstrating, objectively, by scientifically designed evaluation studies, that a particular innovation is effective makes it imperative that teachers are alert to innovations, make an effort to try them out in their school, and conduct internal audits of effectiveness in collaboration with colleagues' (Hegarty, 2004: 143). Yet, this is not common, and is something that not even researchers are embedding into their studies. A consideration of this thesis is the importance of relying on teaching staff's knowledge and experience through the development and design processes of the technologies themselves.

This type of approach is appropriated through the work of two key researchers; Wendy Keay-Bright and Nicola Shaughnessy. Firstly, this thesis considers both to have been influential throughout the PhD project and understands that both work toward projects that apply technologies 'Used to Explore' with autistic participants. Wendy Keay-Bright is a Graphic Designer interested in interaction, animation, and moving image design. For this purpose of this thesis her work with the autistic community is premise, particularly her projects using a Participatory Design method. Nicola Shaughnessy is a Professor of Performance, but again to support this thesis her work with autistics children[74] will be referenced with interest.

[73] A concern also touched upon when introducing Florian's categories of technology in education; the majority of which rely on the child having existing skills.

Industry and Commercialisation

The main concern, when reflecting on the rationale behind ICT being introduced into the education sector, is that the motive for technology to be used, from the government, and policy makers, has since been further exploited by industry, who are profiting from the design of educational products in abundance. Yet, 'designers and researchers of interactive systems for children can benefit from understanding and supporting the ways in which physicality supports cognitive development' (Antle, 2013: 31). Correspondingly, as long as research is overwhelmingly positive and shows little criticism, the use of sweeping statements about ICT will not allow for any doubts on the effects of using technology. This in turn could lead to educators and industry professionals neglecting the adverse effect this is having of the social lives of a generation, let alone those with Special Educational Needs. This is further exacerbated when reflecting on the cursory policy and governmental decisions influencing the introduction of ICT, in schools, not only to create economic growth by upskilling a generation, but due to the motivation to create more inclusive schools offering a 'situation where parents have real choice of mainstream placement' (Stevens & Waller, 2002: 125).

Due to the persistence to increase inclusivity it would seem that those in SEN schools become missing from policy and research, which supports concerns regarding the lack of research on the adverse effect of ICT in the education of autistic children still present today. It could also be seen to support the concerns connected to how the governmental and commercial drivers have meant that ICT was pushed into SEN schools without clear and concise evidence to avoid the detrimental effects we are now discussing.

> Although many policies reference special needs and the advantages of using ICT with special needs students, few include specific policy objectives or implementation strategies to support ICT in special needs education in general, and Internet use in special education in particular. In fact, the European Agency for Development in Special Needs Education surveyed the ICT and special educational needs (SEN) policy and practice in its eighteen member countries in 2000 and found that none of the respondent countries had an ICT and SEN-specific policy. [...] None of the respondent countries had an SEN and ICT-specific policy as at 1 July 2001. (Phelan, 2002: 148)

Technologies Used to Explore

To return to Florian's category 'Used to Explore' (2004) it gives rise to more detailed information in terms of how, with this PhD project, it is best to apply technologies in the education of autistic children with a more holistic focus in mind. Following the critique of systematic reviews, it is important to reflect on the idea that 'digital technologies are seen as a promising route for engaging autistic people and delivering therapeutic intervention or supporting them pragmatically with every day issues' (Frauenberger, 2015: 57). But, as shown above when introducing the problematic industry drivers and commercial influencers, we must also respond, as researchers, to the 'many challenges [that] remain largely unsolved, for example, how to measure learning gains as a result of technology intervention or how to facilitate the effective transfer of learned skills from the therapy room to the playground' (Frauenberger, 2015: 57).

The dilemma regarding the difficulty in how to measure the successes of many technologies is addressed throughout the chapter, and previous chapters but, in various discussion yet as an underlying issue. Therefore, it feels pertinent to the discussion to address examples of what could be deemed *best practice* to evidence an alternative approach to technologies in education. If we want to avoid the adverse effects that under-researched design and un-adapted application can have on autistic children, we need to begin to address the way we, researchers and/or designers, aim to positively effect change in how ICT is engaged with my pupils. Christopher Frauenberger (2015) addresses this here:

> If we want to be able to respond to needs and desires that go beyond mitigating deficits we need to shift our attention toward a more holistic notion of well-being, empowerment, and the scaffolding of positive experiences. […] While deficits provide clear targets for technology to address, designing more holistically requires us to explore what is meaningful in the lives of autistic people and develop solutions that are firmly situated in their life-worlds. And the only way to do this is to involve people with autism in the design process and let them guide us into the corners of the design space we have not before considered exploring. (2015: 58)

Frauenberger describes himself as researching Interaction Design focusing on novel participatory methods for designing technology for children and people with disabilities, and has worked closely with Wendy Keay-Bright on a number of projects. Due to this, they share similar ideas on the way in which to approach design based work for the autistic community. In a paper jointly authored in 2010, alongside Helen Pain, they explain that:

> Involving children meaningfully in the design of technology is a major challenge in the field, but, as Druin [2002] points out as 'technologies become ever more crucial to our children's lives, we need to be sure these technologies support children in ways that make sense for them as young learners, explorers, and avid technology users. (Frauenberger, Keay-Bright & Pain, 2012: 2377)

This particular paper discusses a project called *ECHOE*S, which aimed to promote learning through technology enhanced environments to help 'scaffold the social skill development of typically developing children and children with high functioning Autism Spectrum Conditions (ASC) or Asperger's Syndrome (AS)' (Frauenberger, Keay-Bright & Pain, 2012: 2378). It is clear again from this project that invidual abilities were taken into account throughout the design and delivery of the project as they decided it was important to 'evolve a participatory process that could include a range of children as design partners from early concept development through to prototyping and evaluation' (Frauenberger, Keay-Bright & Pain, 2012: 2378). This approach is something consistent through Wendy Keay-Bright's research endeavours and can also be seen on a project titled *The Reactive Colours Project* where she again used a Participatory Design method ReacTickles Software: 'This creation of a neutral 'space' via the computer screen or interactive whiteboard has provided a foundation for evolution of ReacTickles play experience' (Keay-Bright, 2007: 8). She explains the motivation as followed;

> [A]although positive motivational outcomes are frequently found when ICT is used to support engagement, research, writing and editing, and presentation of work (Passey & Rodgers, 2004), there is still little use made of sensory engagement, particularly kinaesthetic, spatial/visual, interpersonal and intrapersonal, as a means to encourage collaborative learning, creativity and flexible thinking' (Keay-Bright, 2008: 2).

This description can also go some way to help introduce the work on Nicola Shaughnessy and her project with Melissa Trimingham titled *Imagining Autism: Drama, Performance and Intermediality as Interventions for Autism Spectrum Conditions*. The project saw a practice as research method used to engage with autistic children with the aim to understand 'how do we set up active learning for the autistic child who's very embodying of the world may be vastly different to our own? How can we support and facilitate the capacity for creative and original thinking which may even be superior to our own' (Trimingham & Shaughnessy, 2016: 296). In doing so, as part of the project, they create a Pod which housed 'scenic environment[s] as a place for free play – the Forest, Outer

Space, Underwater, the Arctic and Under the City. These were contained within a portable tent-like performance structure ([the] pod) which, with its rich immersive textures, smells, sounds and light, offered a high arousal environment' (Trimingham & Shaughnessy, 2016: 296).

Unlike Keay-Bright, Shaughnessy was approaching this research less from a technology or design standpoint, but more concerned about the interactions being facilitated with technology being considered as a form of prop or to assist in creating new environment.

> The present intervention, termed 'Imagining Autism', seeks to build on the growing evidence-base for performance-based approaches. The aim of [the intervention] is not to teach the children skills per se but to draw out relevant behaviours and support their development in a playbased environment, allowing the child to initiate and lead the action as much as possible. (Beadle-Brown et al., 2018: 917)

This way of including technology to support an artistic practice is much like the approach developed as part of the PhD project. The projects of Shaughnessy share similarities with Keay-Bright due to both evidencing approaches where the relationship between researchers and participants is shown to be important to the process:

> The physical differences in perception between those who are designated "neurotypical" and autistic children are only just being acknowledged (Bogdashina, 2003) along with the fundamental "affect" upon the child of such differences. […] We discovered how to promote active learning through an iterative cycle of practice as research, finding out through a shared process (between practitioners and participants) of learning through doing, making sense of autism through experiencing the child interacting with the mediality of the pod's scenic environments. (Trimingham & Shaughnessy, 2016: 296)

In creating such a space, despite not formally claiming to use a Participatory Design method, the *Imagining Autism* was also able to allow for the child's experience to have great influence on the way in which the researchers developed the end result and design output. Like Keay-Bright, Shaughnessy (with Trimingham) was able to let the individual children and the process of experiencing their wants, needs, abilities and interests, to inform the process of implementing an intervention with their individuality in mind:

> By necessity, the intervention required a holistic and flexible approach. To fit in with seasons of the year or events that were happening at the time of the intervention, practitioners had to adapt the order of the different scenarios. They had to respond flexibly to the lead of the child rather than working to a script set in stone at the beginning. The environments also needed to be physically

> changeable – while the environments were multi-sensory, they had to be able to adapt to different levels of tolerance and able to respond to both hypersensitivities and hyposensitivities in the children. As such, it was important that sound could be turned up or down and that lighting could be varied depending on the child that was in the environment. Being responsive to individuals and their sensory difficulties and preferences was essential. (Beadle-Brown, et al., 2018: 921)

This idea connects to the idea of individuality in my own practical research, but also to the work of Keay-Bright, who along with Shaughnessy, offers examples of the complexities encountered through the PhD; autism, education and technology, but also shows how they can be collectively responded to through research. The respective projects, by these specific researchers, and their work with autistic participants, will be continued as a reference point through Part Three of the thesis proposes to shed light on the ways in which this project aims to create positive impact and change in order to premise holistic development and inclusive practices that address the use of technology in the education of autistic children.

Conclusion

Throughout this chapter an awareness for the complexity surrounding ICT, education and autism were coexisting as an underlying concern of the thesis. This was further exacerbated by the vagueness presented in the literature addressing the use of ICT with children presenting Special Educational Needs; which premised the extreme positive view without addressing the complexity itself. Unlike the previous chapter in which the application of individual therapies and interventions could be introduced and contextualised, this chapter struggled to discuss specific computer technologies in education. In the case of technologies, the hardware often stays the same, with the computer or tablet devices seen as a permanent feature with the software changing. Therefore, subtleties in application was only truly understood through the work of Lani Florian (2004), and the significances of her categorisations for technologies in education. Not only is the software itself offering different tools for the child's learning, but is also there to support the teaching staff. With this in mind it is apparent that many studies are quick to suggest technological interventions can afford a positive effect on the SEN community, yet the multi-layer reality of the

application of technologies is not being portrayed. Even more worryingly neither is the unintended consequences of technological intervention for those who have predisposed difficulties, due to a diagnosis.

Further research is needed in all aspects of children's education when they are engaging with ICT at an increasing rate, especially as societies interactions with ICT have been transformed during the shift from desktop computers to tablets devices and more recently the smartphone. If it is acknowledged that the overexposure to digital screen based technologies in their everyday lives is having unknown consequences for the general population, literature confidently promoting its use with autistic individuals must be engaged with critically. Another consideration is how we approach evaluation methods as well as the development of interventions that aim to bridge the gap between social implications of using ICT and the need to be open and accepting of the benefits offered by the same devices.

> Like so many educational problems, understanding the role of ICT in children's lives is not a straightforward issue; there was no single theoretical framework available that was sufficiently rich to allow us to 'prise open' all of the complexities that were raised by the questions we wanted to pose. (Facer, Furlong, Furlong & Sutherland, 2004: 220)

Therefore, when looking at the introduction of new technologies for SEN children, research identifies that there is an increased use of Educational Technology in school environments. This also supports research acknowledging an increased affiliation with computer technologies by autistic individuals, that is increasing in line with the general population technology usage. 'Media representatives, the IT-industry, as well as education policy makers over and over repeat the statement that computers are good for learning in schools, and therefore, public money should be spent, even though this claim is not supported by any data' (Spitzer, 2014: 82). It is even more worrying as such computer technologies are being introduced despite a lack of research into the benefits, let alone the harm caused by overexposure. This is especially concerning if we reflect, again, on the statement by Keay-Bright & Howarth (2012) in which they make clear that 'the majority of research into autism and technology focuses on how the skills of already high-functioning children might be improved upon, but there is a paucity of literature addressing the needs of children with more significant difficulties' (2012: 130). Therefore, this thesis specifically focuses on those with said

significant difficulties in communication, language acquisition, attention and social skill development. It is a direct response to such worrying claims, that have been witnessed first-hand, and has been used as groups for the development of the applying mimicry, empathy, touch and technology approach.

The time spent in school settings evidenced that the promotion of technology, used within school environments for autistic children, is primarily devices designed for the conventional user that have been brought into the school with very little adaptation. For example, computer and tablet devices are being relied on more and more to engage autistic children within the curriculum for motivation, and as a form of praise for engagement in other activities. But these devices were originally designed for solo use. The affiliation between technology and the diagnosis of autism, if Simon Baron-Cohen's view is considered; 'computers operate on the basis of extreme precision, and so does the autistic mind. Computers deal in black and white binary code, and so does the autistic mind. Computers follow rules, and so does the autistic mind' (Baron-Cohen, 2007).

Accordingly, it could equally be suggested that a reliance on ICT could in fact compromise the child's development, as this is often accompanied by a reduction in the encouragement of human interaction (or in more extreme cases, used as a replacement), which may cause children to develop less social skills, or for their existing social skills to plateau. With this in mind it is not proposed that solo technological engagement cannot encourage any social developments, but if 'many [autistic children] and intuitive understanding of computers in the same way that other children develop an intuitive understanding of people' (Baron-Cohen, 2007), how can we change our interactions as an attempt to bridge the gap and create an interaction that promotes engagement with technology and other humans as equal methods through educational interventions.

Part Three: Technology in Education: So, What's the Problem?

The third part now specifically outlines the problem and argument of the thesis across two chapters. The first responses to the critical review of technology in the education of autistic children, by drawing on evidence concerning all children - not just those with Special Educational Needs, whereas Chapter Six will introduce the practice more readily. Therefore, the wider placement of technology which will underpin a more rigorous critique of the reliance of computer technologies in the education sector whilst beginning to make comment specifically on screen based computer technologies designed for the conventional, solo user.

Chapter Five: Reviewing creative tools, technologies and therapeutic techniques in the education of autistic children, critiques the influx of technology in the UK education system and evaluates the use of conventional, solo use, technology may not be categorically positive for all those holding a diagnosis like autism. This research highlights the need to include embodiment in the conversation yet questions if autism research has managed to catch up with this way of thinking. The body is then discussed alongside autism, education and technological engagement in *Chapter Six: A Report on Practice; the foundation for new knowledge.* By using information from childhood development touch, mimicry and empathy will be introduced, in relation to practice, and connected to social skills and understanding of the *self* and the *other*. The chapter then acknowledges the placement through information about the programme of work, the participants and more on the rationale of structures and use of theoretical work.

Chapter Five: Reviewing creative tools, technologies and therapeutic techniques in the education of autistic children

Introduction

The fifth chapter will connect previous themes and unpack the complexity surrounding Information Computer Technology (ICT), autism and education. The major themes have been addressed somewhat in isolation so far, or have been limited contextualising information, yet this fifth chapter begins to intertwine the concerns of this thesis into a holistic approach. By also reviewing creative tools and therapeutic techniques, this allows for the concerns of the thesis to emerge and critiques current practices by also emphasise the malaise surrounding ICT in education whilst appropriating these concerns to the specific context of autism and interventions. The chapter then addresses the critical deficit recognised previously through systematic reviews, researchers and highlights the limited rigour when considering how to re-appropriate our relationship with ICT in education for the benefit of those with autism, and considers the limitations of interventions previously discussed. The aim is to support the practical findings before concluding with a discussion of why engagement with technology should not be avoided.

As a placeholder for the link between Chapter One's overview of the cursory introduction of ICT in education, and Chapter Four's focus on technological interventions for autistic children. They will be critically addressed and reviewed as a collective theme, offering thoughts on the general population, and autism, when critiquing unintended consequences of overexposure to technology through childhood, the effect ICT has, and what is seen to be a dilemma across society. Yet, to reiterate, this thesis is most interested in interventions within the education of autistic children, that are reliant on ICT and critiques those designed for the conventional solo user; such as desktop and laptop computers, tablet devices and even smartphones.

The integration of ICT, and as the influence of personal computers, smartphones and tablets on the types of interventions being used with autistic children is referenced. Thereafter, a reflection on autism allows recognition of potential consequences of overexposure to such technologies, if its application is not engaged with critically. Due to this, research will then be used to evaluate how the application of conventional, solo use, computer technology should not be considered categorically positive for all those diagnosed with autism, let alone those under the broader term of having Special Educational Needs, that evidences difficulties in social skills across three areas included in the *Triad of Impairments* (Wing & Gould, 1979). A critical response to the reliance on unqualified statements regarding the positive impact of ICT, when used with such a heterogeneous diagnosis as autism, will substantiate the thesis argument.

The second section of this fifth chapter will include a presentation of work from Manfred Spitzer, and particularly his 2014 paper reflecting on the unintended consequences of ICT; *Information technology in education: Risks and side effects* (Spitzer, 2014). This considers children and young adults engagement with computer technologies broadly, without restricting his concerns to diagnoses, age or gender, which allows for more concise and rigorous research into this phenomenon to support concerns in the following sections. Spitzer, a German psychiatrist, psychologist and neuroscientist recognised for his critique on the digital technologies in education and the term *Digital Dementia*[75]. His research presentation titled *Digital Technology and Cognitive Development* (2014) to European Parliament, is seen as a wider plea in which urged European institutions to reconsider on the use of ICT in schools.

Aligned with the thoughts of Spitzer, this subsection will also introduce Alissa Antle's work titled *Research opportunities: Embodied child–computer interaction* (2013), in the discussion of ICT and children's development. Antle describes herself as an innovator and a scholar and her work is in the field of Human-Computer Interaction (HCI). Throughout her research and design work she promotes the use of interactive environments that afford embodied interaction alongside technologies. Paul Dourish explains that the term

[75] A term first coined by Manfred Spitzer in 2012 due to its use in his book, also called *Digital Dementia* in which he describes the impact that overexposure to digital technologies has in relation to the breakdown of cognitive abilities in children. Unfortunately, this book has need been able to be accessed in the English translation.

‘Embodied Interaction is the creation, manipulation, and sharing of meaning through engaged interaction with artefacts’ (Dourish, 2004: 126), in his text *Where the Action is: The Foundations of Embodied Interaction* (2004). Antle uses this concept to critically reflect on engagement with computer technology to demonstrate how movement supports cognitive development more readily. The work of both Spitzer and Antle is foregrounded for their reference to Cognitive Science; offering insight into the negative consequences connected to the overexposure of technology by all children.

Antle’s work specifically advocates for embodied interactions, which is where the research is connected to the diagnosis of autism and, more importantly, the *Theory of Mind.* In turn, the theme of embodied cognition is introduced, and used to reflect on its connection to autism. The decision to include this in a separate subsection allows the chapter to introduce embodied cognition whilst critically reflecting literature exploring the *cause* or *symptoms* of autism. Consequently, this chapter adopts a strong argument premising an awareness of these concern and promote a rationale for why professionals and researchers should implement discussions inclusive of the bodily practice, in research with autistic participants. This subsection briefly questions if autism research, has under acknowledged the importance of the body. These themes are then grounded in the thesis when connecting this information to the work of both Antle, and Spitzer, and acknowledge how their research influenced the field.

It is this disconnect between literature regarding the critical response to technologies and autism, along with the benefits of embodied interactions, that becomes more apparent through this chapter as a subtler issue. This will raise questions contemplating the promotion of adaptation within our practices and the wider culture of education and design, to ensure the development of an approach to technology that primarily amplifies and extends the possibilities of the autistic child, in addition to their everyday school experiences and holistic development. This chapter begins to make distinctions between the motivations of this PhD and whether this can be said about the included interventions in their current format.

Many of those discussed show a disconnect in that the traditional interventions are not yet embracing technological advance and the technological interventions limit the promotion of embodied interactions. Hereafter the work of Wendy Keay-Bright and Nicola Shaughnessy will also be reanalysed as their

respective research is considered, in this thesis, as examples of technologies embedded and 'Used to Explore' (Florian, 2006), as they clearly facilitate embodied interactions with technology, for autistic participants. In the case of Keay-Bright she employs Graphic Design techniques, whereas Shaughnessy draws on Drama practices. Both afford embodied interactions through their work, and in doing so strongly connect to this PhD project. Yet, despite this there is a need to make distinctions between their work and my own in order to present a contribution to new knowledge.

To respond to these concerns the work of both Wendy Keay-Bright and Nicola Shaughnessy will be included in the section titled; *Facilitating embodied interactions with technology for autistic participants*. Their individual research has been previously introduced, but their work now supports this chapter by concentrating on their facilitated embodied interactions with ICT for autistic participants. This final section shows clearly how their approaches, through adaptive and innovative projects, have evidenced benefits of embodied experiences with ICT for the autistic child. Their distinct projects will be discussed collectively highlighting research influencing this thesis by connecting many themes of this project; autism, technology, embodied experience, education and adaptation.

This conversation directly supports the conclusive chapter of the thesis, in which the application of this research and knowledge is explored through reporting on the Practice-as-Research enquiring and how the application of Somatic Movement Principles, and Contact Improvisation techniques support the argument of this PhD project. Research into the impact of play on embodied experience, as a method throughout the practice will be shown to promote the development of embodied knowledge and empathic understanding. This theme will be further contextualised by reflecting on the use of play within Shaughnessy's work.

The movement techniques applied in practice support an environment that is individual to each child participating, by removing the hierarchy of the teacher-child relationship, and relying on a process driven interaction. Contact Improvisation sees movement as a way for individuals to express themselves and develop through tactile relationships and creative encounters. The founder, Steve Paxton, presented this idea clearly when he stated that 'this system is based in

the senses of touch and balance, […] it is through touching that the information about each other's movement is transmitted' (1975: 40). This exchange of information through the body, holistically, is how I have been able to emphasise, and support, the non-verbal communication of each participating child.

In line with Paxton's description, Sondra Horton Fraleigh describes Somatic Movement Practices as the way that, 'on a primal level, dance expresses and is experienced through the vital body – through movement not words' (Fraleigh, 1987: 47). The term Somatic Movement Practices is used to collectively describe multiple somatic techniques, but here I discuss the work of both Fraleigh's *EastWest Shin Somatics* and Bonny Bainbridge Cohen's *Body-Mind Centering*[76]. Both advocate for approaches to movement that give focus to the body, and again, takes away social pressures and reliance on verbal communication and hierarchical structures in traditional teaching methods. By applying these practices, with my own approach being an iterative and informed by experiences with participants. They also provoke the need to 'set up a non-judgemental framework, which focuses on the relationship between the observer and observed, listener and speaker, mover and witness' (Goldhahn, 2009). Further to this, Chapter Six explains how the practical research offers space for the engagement itself to be the most important embodied experience, instead of being distracted by the need for an end behavioural goal; the subtle developments of participants are therefore recognised throughout.

Consolidating ICT, autism and Cognitive Science

When reflecting on the rationale behind ICT's introduction in education, it is somewhat controversial to consider that the motive for technologies use, from the government and policy makers, has since been further exploited by industry. Yet, this did in turn drive manufacturing costs down, which was soon reflected in computer programmes and technologies being created as a way to profit from the design of educational products, in abundance; 'a booming autism industry sells interventions in the form of behavioural therapies, diets and drugs, and books are also big business' (Shaughnessy, 2013: 322). Yet it is when we consider the lack

[76] Throughout the PhD I continued my training in both techniques. I have worked with Bonny Bainbridge Cohen's *Body-Mind Centering for over three years.* Sondra Horton Fraleigh's *EastWest Shin Somatics* had also been pursued but in a more limited capacity.

of rigorous research by those creating many of the products on offer, we understand the need for research projects like this PhD. Additionally, if the research is overwhelmingly positive, showing little criticism, as discussed through Chapter Four, and appropriates sweeping statements about positive attributes of ICT, then there is no doubt a climate of ICT research influencing educators and industry professionals poorly. Therefore, many are in denial about the detrimental effect this is having of the social lives of a generation, let alone those who have a diagnosis linked to difficulties with social skill development.

This is a contentious issue as the initial policy and governmental decisions to introduce ICT in UK schools, derived from an ethos not only to create economic growth by upskilling a generation, but with a motive to create more inclusive schools that would offer a 'situation where parents have real choice of mainstream placement' (Stevens & Waller, 2002: 125). Despite the intention to increase inclusivity, those in SEN schools were missing from policy and research, which supports the concerns raised here around the lack of research still present today. It could also be seen to support the concerns connected to how the governmental and commercial drivers have meant that ICT was pushed into SEN schools without clear and concise evidence to avoid the detrimental effects we are now discussing.

> Although many policies reference special needs and the advantages of using ICT with special needs students, few include specific policy objectives or implementation strategies to support ICT in special needs education in general, and Internet use in special education in particular. In fact, the European Agency for Development in Special Needs Education surveyed the ICT and special educational needs (SEN) policy and practice in its eighteen member countries in 2000 and found that none of the respondent countries had an ICT and SEN-specific policy. [...] None of the respondent countries had an SEN and ICT-specific policy as at 1 July 2001. (Phelan, 2002: 148)

This ethos simply qualifies Wendy Keay-Bright & Imogen Howarth (2012), as they clearly explain that the majority of research into the use of ICT with SEN, and autistic children is designed to show the benefits for children who already have the intellectual ability to access such technologies. Research is still lacking to evidence the assumed benefits for SEN children who have more profound disabilities[77]; resulting in their education not being in a mainstream setting but in

[77] The saturation of research concerning autistic individuals seen as 'high- functioning' and therefore exhibiting a heightened level of intellectual ability has been highlighted by the likes of Wendy Keay-Bright, and is a concern of this PhD.

a Special Educational Needs school, designed for their specific diagnoses. ‘The difficulty of demonstrating, objectively, by scientifically designed evaluation studies, that a particular innovation is effective makes it imperative that teachers are alert to innovations, make an effort to try them out in their school, and conduct internal audits of effectiveness in collaboration with colleagues’ (Hegarty, 2004: 143), yet this is not common or achievable even within the research community. Even more important than teachers’ having an awareness of the concerns would be the active inclusion of teaching staff through the developmental process and design of the technologies themselves (by employing methods such as Participatory Design).

Further research is needed in all aspects of children’s education that engages with ICT at an increasing rate, especially as our interactions have been transformed during the shift from desktop computers to tablets devices and smartphones, seen from 2010 onwards. If we are still unaware of the social implications of the general public's exposure to digital screen-based technologies in their everyday lives, how can research confidently promote its use with autistic individuals?

Another consideration is how we approach evaluation methods as well as the development of interventions bridging the gap between social implications of ICT and the need to be open and accepting of the benefits offered by the same devices.

> Like so many educational problems, understanding the role of ICT in children’s lives is not a straightforward issue; there was no single theoretical framework available that was sufficiently rich to allow us to ‘prise open’ all of the complexities that were raised by the questions we wanted to pose. A multidisciplinary approach, drawing on sociology, media and cultural studies and socio-cultural psychology, was essential. [Yet] there is a danger that in wanting to draw broadly on a range of different perspectives, one does not do theoretical justice to any of them. (Facer, Furlong, Furlong & Sutherland, 2004: 226)

Therefore, in light of the criticism of solo engagement with computer technology, one response is to address the importance of considering the benefits that could come from technology applied alongside human interaction. This shows how this could, in the first instance, connect to research surrounding embodied interaction, individuality and cognitive development progresses through the infantile years and on to childhood. Returning to Spitzer (2014) is important, but so is research from Keri Facer, Professor of Education, and her colleagues. Two of her texts are

influential here; *Learning Futures* (2011) as it examines education, technology and social change, as well as the aforementioned *ScreenPlay* (2004), which is co-authored with John Furlong, Ruth Furlong and Rosamund Sutherland. This second text is concerned with children and computing in a home environments, but draws on the history of ICT in education, similar to that presented in Chapter One. They state that:

> In contrast with what many early enthusiasts believed would happen when computers were first introduced to schools, it is absolutely clear that the presence of technology alone will not improve education. In the home, parents, siblings and friends are crucial parts of the social system which support people to learn. At school teachers need to develop similar social networks to support their own learning in creative and constructive ways. (Facer, Furlong, Furlong & Sutherland, 2004: 220)

This provoked awareness of the social implications that solo use technologies have, and how their application in schools is intrinsically different from their use in the home. Also, the pressures that come alongside the requirements placed on teachers to be able to apply technology in a constructive way, for children with such a heterogeneity of needs, and the inherent risks that the teaching professional are forced to take in order to make this possible.

Focusing on the need for a multidisciplinary approach is a theme shared by Facer, Furlong, Furlong & Sutherland in their book *ScreenPlay* (2004), whilst acknowledging to difficulty of doing each discipline justice. Shaughnessy shows how this was alleviated within her project, by bringing together a wider team of people:

> The interdisciplinary nature of Imagining Autism involved social scientists and drama specialists endeavoring in an improvisatory manner to work across and between disciplinary approaches and boundaries, negotiating different languages, research paradigms, and values. (Shaughnessy, 2016: 205)

This is not type of team is not commonly necessarily possible within a PhD project like my own, so to work towards the benefits seen from such approaches, the research topics have been broad to apply a variety of information to practice.

Risk and Side Effects

When contemplating the drive towards integrating ICT in the education sector, there appears to be a lack of consideration for the unintended consequences of digital technology in the learning environment. This concern will be reflected

upon, to address the growing interest in ICT, smartphones and tablet devices[78]. These are used in inclusive teaching environments to support individuals in mainstream schools and specific SEN provisions. Yet, to premise this discussion, revisiting Istenic Starcic & Bagon's paper[79] clarifies that 'research and development of information and communication technology (ICT)-supported learning for people with disabilities have not received adequate attention' (2012)[80]. Despite similar statements across research into the diverse effect of digital and computer technology in educational settings, more generally, it has been given significant positive attention, as acknowledged through Chapter Four. Yet, in this chapter the issues surrounding naivety is addressed by referring to papers such as *Information technology in education: Risks and side effects* (Spitzer, 2014) which succinctly addresses the concerns.

It is when considering the overwhelmingly positive reflections on the integration of computer technology in schools, that Spitzer states;

> Media representatives, the IT-industry, as well as education policy makers over and over repeat the statement that computers are good for learning in schools, and therefore, public money should be spent, even though this claim is not supported by any data. (Spitzer, 2014: 82).

This statement was considered among Spitzer's examples of how analogue teaching (a term describing face-to-face learning, hand written work, pen technology, and the use of textbooks for information gathering, for example) increased encoded memory and retention, and how a lack of handwritten work hindered reading skills. Spitzer suggests decreased attention span of pupils when attempting to multitask, or when computers are accessible in the classroom. His work consolidates the concerns presented throughout this thesis by stating that 'a large number of studies had demonstrated, over and over again, that computers either hinder learning in the classroom or - at best - have no effect on grades' (Spitzer, 2014: 83)[81]. Yet these studies seemingly get less recognition compared to those praising ICT.

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[78] Both smartphones and tablet devices are widely accepted as a mobile computer device that uses a touch screen interface as its main input is lightweight, and hand held. The use of such devices is now more common than desktops or laptop computer in the school environment due to less storage require and the ability for them to be transported around the school with ease.
[79] Extensively review through Chapter Four.
[80] Even though they fail to substantiate this through their systematic review.
[81] It is worth noting that Spitzer is talking about the general population here, and is not limited to autistic individuals.

> To sum up: digital media pose serious risk and side effect when used in educational settings. They are distracting, in particular when used for non-course-related activities. They take valuable time away from learning children (i.e., replace more important activities for learning), and they do not appear to be beneficial to competencies, grades and learning behaviour in general. Given the higher rate of learning in younger children (preschool), they appear to be most vulnerable. The detrimental effects do not vanish after school but are pronounced even at college age, when young adults should know better what to do during the time of study and learning. So, it is the task of the professor to tell students about their misconceptions that lead them to dysfunctional learning behaviour, the task of the teacher to know about these finding and be highly careful using IT in class at all, and the task of preschool teachers to prevent little kids from using IT as well as to tell parents about risks and side effects. In the light of these general findings, the spending of public money for even more IT in classrooms should stop. (Spitzer, 2014: 84-85)

This profound statement allows for an additional *task* to be proposed, as he fails to mention the research community. Therefore, it feels necessary to state that it is also the task of the researcher to take into account these findings when focusing on children who are even more vulnerable to these risks and side effects, suggested by Spitzer, due to special educational needs such as autism. In the case of this thesis there is a responsibility to respond to such calls for change.

Throughout his 2014 paper, Spitzer continues to provoke critical approaches to ICT in education, even through simple statements such as; '[...] the less you experience and think for yourself (by having IT do it for you), the less you learn' (Spitzer, 2014: 83). This thought also creates more recognition for those opposing the use of computer technologies that report to educate and teach social skills to those with a diagnosis of autism, much like the concerns of this thesis regarding the use of conventional, solo use, computer technologies. This is noticeable if we consider the adverse effect ICT can have on social skill acquisition. When Spitzer reflects on the need for the teaching professionals, to come together to address his concerns he claims that:

> To understand learning is to understand the brain. Needless to say: Neuroscience is only just beginning to unveil the intricate mechanisms of sensation, attention, perception, emotions, thought, evaluation and action, as well as changes these mechanisms cause in the brain. We call these changes *neuroplasticity* – the most important discovery in the field of neuroscience in the past quarter century. (Spitzer, 2012: 1)

Here he introduces the framework of neuroplasticity; the 'discovery of a stimulus-dependent alteration in the brain's macroscopic structure contradicts the traditionally held view that cortical plasticity is associated with functional rather

than anatomical changes. (Draganski, et al, 2004: 311). The concept of plasticity supports Spitzer's discussion of education in the publication, *Education and neuroscience* (2012), where he highlights concerns regarding cognitive development. Much like the work of Keri Facer and Alissa Antle (discussed in the next section) Spitzer has written provocatively in the hope his research will insight change. He is calling on professionals to begin to think more about the effects they are having on the younger generation, and how to avoid what he feels is longstanding consequences. To conclude his paper, he wrote:

> In the past two years, we have worked hard to start this new journal, *Trends in Neuroscience and Education (TiNE)*, to help establish the field of neuroscience and education, provide a forum for publication and discussion of work in this field and help neuroscientists and educators to sharpen their focus as well as to broaden their view. We need to do both in order to understand the intricacies of the brain and the messiness of the classroom. (Spitzer, 2012: 2)

By presenting these, more general, thoughts about education and, in other papers the introduction of computer technology in schools, his work clearly supports the many studies connecting the increase in computer technology and unlimited and unmonitored access to *The Media*[82] as having detrimental effects and addictive properties. A paper titled *Media and Children, What needs to happen now?* (2009), written by Victor Stransburger, a Professor of Paediatrics[83], has outlined that 'the media have an influence on a variety of health issues, such as sex, drugs, aggressive behaviour, obesity, eating disorders and suicide' (Stransburger, 2009: 2265). This is particularly apparent for those within education due to their age and vulnerability; also considered by Spitzer. At the time of this publication it was suggested that 'education of students about the media should be mandatory in schools' (Stransburger, 2009: 2266)[84]. This is worryingly direct, and again this study is not taking into account those children at additional risk due to Special Educational Needs or diagnosis, such as autism[85].

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[82] To begin this paper, he states: 'Physicians underestimate the influence of the media on children and adolescents.1 On average, children and adolescents spend more than 6 hours a day with media—more time than in formal classroom instruction. In addition, US youth have unprecedented access to media (two-thirds have a television set in their bedrooms, half have a VCR or DVD player, half have a video game console, and almost one-third have Internet access or a computer2), making parental monitoring of media use difficult' (Stransburger, 2009: 2265).
[83] Victor Stransburger researches themes of medicine, children, adolescents, and the Media.
[84] And sees this as a preventative measure to the overexposure to The Media, advertising, computer technology and the internet in the home environment, as well as education.
[85] For this reason, the discussions through the latter stages on this chapter will allow more space for the argument regarding the dilemma of over exposure to digital and computer technologies,

When considering the specific impact of screen based technologies, Spitzer's paper, *To swipe or not to swipe? – The question in present-day education* (2013), focuses particularly on the growth of tablet devices. There is more specific research needed into the impact these have on knowledge retention and overall learning for children, yet Spitzer does address this. Again, he has established an argument for the detrimental effects the touchscreen *boom* is having on the younger generation. He introduces scenarios where parents are proud that their 2-year-old is able to independently navigate the family iPad[86]. A consideration also address by Charles Hymans his *Telegraph* article was titled *One in four children under two has their own tablet, MPs' report shows*:

> Toddlers' use of apps, websites and the internet has exploded to such an extent that the average pre-school child, including under twos, spends more than an hour a day online, rising to two hours or more a day for a third of five to six-year-olds, according to the report compiled for the department of culture. Tablets are so widely used by toddlers that baby equipment manufacturers have launched special iPad holders to fit onto baby high chairs, car seats and strollers with "a water-resistant surface that guards [the iPad] against spills, dribbles and drools". (Hymas, 2018)

This not only shows the ways in which computer technology is increasingly embedded in a child's life from the infantile years, but also makes apparent the commercialisation of such devises and the exploitation of industry. Yet, Spitzer uses this as an example to expand on the developmental difficulties this presents for such young children.

> The development of a child's brain depends upon challenging interactions with the world around: with their senses and ideas, hearts and hands, children conquer the world, learn about objects and features, rules and exceptions. Not only is swiping hardly motorically challenging, it also does not make much use of the hand as a sense organ: on a flat featureless surface, there is nothing to sense! Furthermore, given that the motor phenomenon is always almost identical, just as the tactile sensory feedback, there cannot be any holistic experience of various different things, which in the long run make up our understanding of the world around us. (Spitzer, 2013: 96)

Therefore, it is not only the holistic and embodied experiences that shape our development as children, it is also through variability and exposure to new and

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placing autism within this framework as a comparative and provocative example, leading to the discussion of three key themes: mimicry, empathy and touch in the final chapter of the thesis.

[86] In many cases now, just four years on, 2-year-olds are likely to have their own iPad or similar tablet devise, and industry have responded to this with the likes of Amazon making their own 'child version' of a tablet device which has proved very popular with parents. It is considered as a very effective device to keep a child preoccupied when travelling, entertaining or in restaurants.

challenging experiences that we learn about the world and others in it. Although the theme is simply introduced, in this short paper, Spitzer makes links to the complexities of learning in the infantile years and states that multi-sensory learning cannot be a separate experience at this stage in life. His use of literature from Childhood Development studies acknowledge that all the senses are intrinsic to the learning process, surpassing the visual; 'The eyes may be a bit of a help, but most tasks involving movement are guided by the sensorimotor centres in our brain. In short, the arms of modern robots are tactile-mechanical idiots when compared to the hands of preschool children' (Spitzer, 2013: 95). He continues by advocating a need for holistic experiences, a theme promoted through the practical research sessions facilitated with autistic children, as well through the work of Wendy Keay-Bright, Nicola Shaughnessy and presented by Alissa Antle. Spitzer clarifies his concerns by stating that:

> Interacting with an iPad does not support embodied cognition as it provides no object specific sensorimotor input and output. Hence, the use of an iPad by children will, if anything, be detrimental to their cognitive development and by no means facilitate an educational advancement. (Spitzer, 2012: 97)

Although in the case of Spitzer, he is not discussing Special Educational Needs specifically, his comments on education more broadly have shown that the worrying effect that the increasing use of ICT (more broadly) has on the younger generation needs to be addressed. Of course, we cannot take his work to assume that children are only accessing such technologies instead of interacting with the wider world, but it is clear that the prevalence of such technologies in the past 30 years has increased dramatically and therefore needs careful consideration, especially as here he is talking about pre-school children. His concerns are clearly connected to the work of Jean Piaget, due to relating his thoughts to sensorimotor input and output. Tuddenham (1996) summarise Piaget's work by explaining this to be a stage during infancy where development is demonstrated through motor activity.

> The sensorimotor period as a whole (i.e., from birth up to age 2) carries the child from inborn reflexes to acquired behaviours. It leads the child to body-centered (i.e., self-centered) world to a object-centered one). During this period the various sensory spaces, of vision, touch, and the rest, are coordinated into a single space and objects evolve from their separate sensory properties into things with multiple properties, permanence, and spatial relationships to other objects. (Tuddenham, 1966: 215)

Spitzer also connects his work to neuroscience, as he writes on such topics through his work with the journal *Trends in Neuroscience and Education*, where he begins to create a platform for change through publications and discussions, he is influential throughout this thesis[87].

By referencing the work of Spitzer, and making connections to Facer, this section of the chapter offers a consideration into how the critique of ICT in education connects to the wider context of this research project. It is done so by reflecting on the research presented here concluding that the adverse effect overexposure to computer technologies across all children's educational experiences. An important theme presented through the collective work of Spitzer and Facer is the need for embodied interactions to be more prevalent, especially for younger, more vulnerable, children.

Embodied Cognition

This next section will reflect on Spitzer and Facer's acknowledgement of Embodied Cognition and in doing so the work of Alissa Antle becomes ever more significant. Her work is referenced to progress concerns regarding children's engagement with ICT. Through a paper published in 2013 Antle presents a call to action, a provocative statement much like Spitzer, asking professionals and researchers to proactively facilitate embodied experiences within education, especially alongside interactions with ICT. Her research, therefore, clearly supports the use of mimicry and play in the facilitated one-to-one interactions with autistic children, developed throughout this PhD project. Engaging with children as participants is an approach that Antle also employs, as she states: 'I focus on single-child embodied child–computer interaction because it is where I began my research career and because studying individual cognition is important to inform social interaction' (Antle, 2013: 31). It also recognizes the importance of including technologies, in these sessions, in order to support embodied interactions alongside technological devices (as a method of this thesis). Antle draws

[87] It is regrettable that his book *Digital Dementia* (2012) was not accessible in an English translation yet as it is understood, through citations and reviews, that this is a seminal text for Spitzer. *Digital Dementia* is translated from the title of the book: *Digitale Demenz* (2012).

influence from the field of childhood development, cognitive neuroscience and the arts (to compliment the field of Human-Computer Interaction) in order to offer a potential solution. Her work inevitably inspires others to think of alternative approaches to counteract concerns that overexposure to conventional, solo use, technologies can plateau social development and promote isolation through adulthood for the general population, not just for autistic individuals.

> While this ‘‘technology agenda’’ is not confined to child–computer interaction, the impact of inadequately researched, understood, and designed applications and technologies has had a vast, if largely undocumented, effect on today’s children. (Antle, 2013: 31)

Although sharing the views of both Spitzer and Facer, Antle’s research differs in that it specifically encourages the use of computer technologies in interactive and social formats informed by movement practices. In doing so she reflects again on the limitations, in terms of developmental experience, seen when children engage with the simplified actions needed to manipulate ICT technologies, including tablet devices. Her views seem to be similar to that of Spitzer with regard to the effect this may have on cognitive abilities, and as a result she discusses the failings of the human-computer community, as well as industry designers.

> In the first decade of the 21st century, there was a tremendous increase in research into child–computer interaction through gesture, touch, movement and other modalities, which have not yet been tapped into by traditional human–computer interaction. Largely this has been driven by advances in technology, the commercialization of new platforms, and the rise of simple implementations of new forms of interfaces by the Do-It-Yourself (DIY) community. (Antle, 2013: 31)

By exploring ways in which technologies give and take from the development of social skills through interaction, and how we can develop creative tools to support beneficial adaptations, inclusivity has been used to allow this thesis to expand on existing knowledge in the creation of a tool specifically for autistic participants. Furthermore, it is clear through the papers discussed, that technology and human interaction in a creative setting is an undervalued area of research, yet has the potential to support a more holistic development; for the autistic child. With an interest in design and interactive technologies, Antle’s paper explores how the application of ICT effects how beneficial it may be for a child.

> Whether interacting with computation through a mouse and keyboard, a tangible user interface, or a handheld device, an embodied perspective on cognition both broadens and changes the focus of design to support children’s learning, play, and development. (Antle, 2013: 31)

As mentioned previous the promoted technologies, seen within schooling environments for autistic children, have often been designed for the conventional user, and have been brought into the school with minimal adaptation. Increasingly, ICT and tablet devices are relied upon to engage autistic children, but these devices were originally designed for solo use. Therefore, if we reflect on Lani Florian's categories (presented in Chapter Four), it can be assumed that devices are 'Used as Tutor' or 'Used to Communicate' (2004). Existing research in this area does clearly acknowledge the developmental potential for individual, high functioning, children on the autism spectrum, through technological engagement, as justified by Keay-Bright and Howarth:

> For children with cognitive and developmental delays, discovering a close match between physical control and digital response has proved both rewarding and motivating. (Keay-Bright & Howarth, 2012: 129)

But, many fail to recognise those with more complex needs or the benefits of encouraging more social interactions with ICT. It is necessary to make distinctions when discussing technologies *used as tutor* or *used to communicate,* despite this not being commonplace; which is a rationale for the critique of many studies discussed in Chapter Four. The application of technology, during the practical research of this thesis if using Florian's categorization, would be deemed as being 'Used to Explore' (Florian, 2004: 11-18), which seems increasingly more relevant when reflecting on conversations about embodiment and it is essential to identify this before addressing the work of Keay-Bright and Shaughnessy.

When assessing the collective research of Florian, Spitzer and Antle, they seemingly bring together the principles of inclusivity and individuality, and allow its integration alongside technological mediation to promote a developmental environment for autistic children; much like this PhD project. With Spitzer and Antle suggesting that an over reliance on technologies has the potential to contribute to reductions in a child's holistic development, by limiting the encouragement of human interaction and varied experience, it is acknowledged that this may result in reduced social skill development, or a plateau in existing social skills.

By introducing developmental psychology and media studies the placement of movement is discussed in the context of children's learning and cognitive abilities by advocating for change from those designing technologies, for children. In doing so Antle relates to research by Jane Healy (1998):

> More recently, social scientist Healy argued for the importance of physicality in childhood. She suggested that children's increased access to TV and video games reduces the amount of time they spend on physical, sensorial, and perceptual activities that foster awareness of relationships in the world, awareness that is crucial to their cognitive development. (Antle, 2013: 31)

There is an acknowledgement for the benefits that some solo activity has for children with Special Educational Needs, in order to access parts of the curriculum, but if 'many children with autism develop an intuitive understanding of computers in the same way that other children develop an intuitive understanding of people' (Baron- Cohen, 2007), how can we bridge the gap and create approaches that promotes engagement with technology and other humans in conjunction?

> In general, childrens' embodied cognitive processes mirror those of adults. However, the development of such processes depends on children's individual and age-related physical characteristics, their inherited abilities, and their practical activities played out in a physical and social environment. (Antle, 2013: 31)

Therefore, *Mechanisms of Social Cognition* by Chris and Utah Frith brings further context to social interaction as being essential aspect of social cognition is through learning about others as individuals (Frith & Frith, 2012). This idea promotes the creative and expressive use of movement as it is too often under acknowledged in many studies, yet Antle's paper goes some way to exploring and validating these ideas. 'Conversely, a lack of understanding of the importance of movement to develop cognition can only lead to an impoverished view since it ignores the way children (and all humans) create meaning through action' (Antle, 2013: 31). Subsequently, information considering the need for embodied interactions throughout childhood development seen within the infantile years, highlight that this is an essential developmental process of social learning.

> A perspective on interaction that foregrounds embodied cognitive processes is called embodied interaction. Embodied interaction changes how one thinks about children's cognitive development and how one designs interactive systems to support children's learning and development. A commitment to designing to support embodied interaction with interactive systems changes what you need to know and how you use that information. (Antle, 2013: 31)

Therefore, this is somewhat distinct from what is addressed when using the word *embodiment* throughout this thesis. Throughout the introduction of Embodied Cognition, the explanations are succinct, using the following statement to clarify each different stage/stand of embodied cognition, what they are as independent phenomenon's, and how Antle sees them when combined through research:

> Embodiment means how the nature of a living entity's cognition is shaped by the form of its physical manifestation in the world. Embodied cognition is a perspective based on the notion that psychological processes are dependent on and shaped by aspects of the body including body morphology (form), sensory-motor systems, and interactions with the surrounding world. (Antle, 2013: 31)

This understanding is valid when considering the importance of experiences that shape and develop cognitive abilities. It also justified the need to situate the body in such discussions. This, therefore connects back to information presented about the *Theory of Mind* and its placement in conversations around the diagnosis of autism and how, for a long time, it has been used interchangeable with *Social Imagination* in the *Triad of Impairments.* As mentioned in the introduction to this chapter, there is a need to critically engage with the concept of the *Theory of Mind* and how the language used to describe it seems outdated.

Literature often talks about differences in brain function, and even when discussing sensory difficulties seen by autistic individuals this tends to be connect again to the cognitive aspects associated with this. Subsequently the *Theory of Mind* by its name sake, gives focus to one's mind over one's body. It is described as 'a coherent understanding of the nature of minds that include the ability to attribute *mental* states to oneself and others, to understand others have mental states different from one's own, and to reflect on one's own and others' mental states' (Boucher, 2009: 361). Lastly, to further stress the concerns of this thesis, The *Theory of Mind* in Nicola Shaughnessy's 2013 paper; *Imagining Otherwise: Autism, Neuroaesthetics and Contemporary Performance,* is considered. In the introduction to a section she titles *Myths of Autism* (2013: 322) she explains how autism is dominant through cognitive science, and links this to its associate with *Theory of Mind* and that they are often discussed in conjunction with studies of empathy, attention, intersubjectivity and emotion, much like the ways in which I have introduced it through this thesis. Conversely, Shaughnessy also sheds light on the binary connections between *Theory of Mind* and autism:

> Theory of mind is often discussed in conjunction with autism as the condition is considered to cause difficulties in understanding and interpreting the perspectives of others. This is, however, a two-way mirror as 'neurotypicals' are also encouraged to demonstrate theory of mind, to engage imaginatively with autism and to try and perceive from the perspective of the autistic other. (Shaughnessy, 2013: 322)

These considerations are merely introduced here to create an awareness of how the language surrounding a diagnosis can shape the way it is seen by professionals and society (a theme discussed through the work of Pinchevski and Peter, 2016, and Oliver, 1990). It could also be considered that, through Shaughnessy's view, she advocates for professionals working with autistic individuals to embed *Theory of Mind* into their practices. Despite many research studies failing to acknowledge limitations or avoid the shortcomings of *myths* surrounding autism, the likes of Spitzer and Antle put the body back into the conversation of education with stimulating suggestion and calls for change.

> The body and the mind are inseparable in the roles they play in much of cognition. Embodied theories of cognition foreground the role of activity in specific physical and social environments, operating at scales ranging from the neural to the social. (Antle, 2013: 32)

It is though this paper that the benefits of embodied interactions, as Antle discusses, were truly seen and recognized for their positive impact on holistic development, and how they can assist in the inclusion of ICT in education being justified and beneficial.

Influences from dance and movement

Due to the research presented above, it is relevant to situate the influence of dance and movement on the PhD and the practical research facilitated. With a personal background in dance and movement practices it is pertinent to begin the topic of Community Dance, experienced throughout the Dance undergraduate degree. This offered the opportunity to experience a 10- week placement[88] within primary education settings and it was here that autism, as a diagnosis, became of interests to me after forming relationships with autistic pupils at the school. When reflecting on the place of movement, in this community setting, the field of Community Dance became a source of interest:

[88] Where I attended a school one day per week over this period of time.

> Community dance is primarily a social activity, uniting creatively and physicality in a way that offers the experience of communitas, of solidarity and significance, in an immediate and grounded way. It's in that experience of belonging and being valued that human being flourish, that we open up to learning and develop the ability to trust and be trusted. (Thomson, 2008: xiii)

It was quickly apparent that Community Dance allowed the practitioner facilitating movement interactions to utilise their creative control. Yet, Contact Improvisation and Somatic Movement Practices later became two key practices embedded in the practical research of my undergraduate degree, and subsequently this PhD. Contact Improvisation was studied for five years and offered an awareness that '[…] it is more than just what we do with our bodies, it is about how we negotiate decisions in time and space, how we empathise with others, while having the courage to develop our own ideas' (Benjamin, 2002: 6). Somatic Movement Practices were access later into my training and the most extensive training being a two-year experiential anatomy course which was delivered by *Body-Mind Centering* teachers. Throughout this course the body was central to the learning within a reflexive context. The teacher employed a co-operative inquiry approach which influenced the way in which my own practical research was facilitated.

> Co-operative inquiry is a form of second-person action research in which all participants work together in an inquiry group pas co-researchers and co-subjects. Everyone is engaged in the design and management of the inquiry; everyone gets into the experience and actions that is being explored; everyone is evolved in making sense and drawing conclusions; thus, everyone involved can take initiative and exert influence on the process. This is not research on people or about people, but research with people. (Heron & Reasons, 2008: 365)

These approaches both proved influential through the practical research, and connection to research form those interested in facilitating embodied experiences alongside the embedding of technologies, shows the importance of a hybrid approach which has also been recognised by Antle's research above.

In light of my training experiences, and the importance of movement and embodied experience, it is key to also reflect on how both are seen through Play Therapy (whilst also making reference to Dance/Movement Psychotherapy where appropriate). Throughout my training I soon came to relaised that play, in this setting, as a means of communicating through the body as the sessions were

often without extensive verbal exchange. Here, play and embodied experiences together were shown to be an effective way to engage with an autistic child and is also a process that would support any existing relationships they may have with objects (and toys) to be acknowledge and worked with through a positive setting. This is non-judgemental setting where, like the co-operative approach mentioned above, the child is an equal partner in the interaction. All of which is important in this sessions as a lack of pretend play in childhood is often connected with social difficulties, which is significant in its connection to autism.

Whilst considering the influences of dance and movement, and Play Therapy, on the practice research, and how this is linked to concerns presented by Antle, the work of both Wendy Keay-Bright and Nicola Shaughnessy is discussed below. Both offer examples of how to adapt the way in which we work with children in education alongside technologies. Another advantage to offering their work as part of this fifth chapter is that both Keay-Bright and Shaughnessy have created projects that are specifically designed for use with autistic children through embodied interactions.

Facilitating embodied interactions with technology for autistic participants: Wendy Keay-Bright and Nicola Shaughnessy

The theme of embodied interactions and embodied cognition have been outlined as district but coexisting phenomena by the 2013 paper by Antle. Her research compliments the preceding section that introduced Spitzer's concerns regarding the risks and side effects of ICT in schools, where he outlines the need for embodied experiences in childhood to promote cognitive development. It then supports the brief introduction of how dance and movement have influenced the research, whilst also connecting to the work of Facer and Stransburger, it reinforced the inclusion of examples where embodied experience with technology are facilitated for autistic children.

> Embodied child–computer interaction is grounded in theories of embodied cognition that include a dynamic systems perspective on children's development, different mechanisms for offloading cognition to the world, and inter-related theories about how movement informs learning and cognition. (Antle, 2013: 30)

With movement being used specifically when Antle discusses embodied interactions this relates to my own work, but also to that of both Wendy Keay-

Bright and Nicola Shaughnessy, respectively. With Antle's paper inspiring this subsection, she explains that those designing and researching interactive systems should embed an understanding of how embodied experiences encourage cognitive development (Antle, 2013: 31). Therefore, the research of Wendy Keay-Bright, introduced through Chapter Four, is again prioritised by addressing three of her projects briefly. The first project of Keay-Bright's, noted for its innovative Participatory Design[89] methodology is titled *The Reactive Colours Project* (2007), where interactive technologies were designed for autistic children. In developing this concept, she utilised her expertise in graphic design, animation, and moving image to premise the need for an environment that was interactive, by developing *ReacTickles[90] Software*: 'This creation of a neutral "space" via the computer screen or interactive whiteboard has provided a foundation for evolution of ReacTickles play experience' (Keay-Bright, 2007: 8)[91].

During the research, she was able to create an embodied interaction that is considerate of the different ways cognition develops through childhood. As the designer, she was ahead of her time in understanding 'there is still little use made of sensory engagement, particularly kinaesthetic, spatial/visual, interpersonal and intrapersonal, as a means to encourage collaborative learning, creativity and flexible thinking' (Keay-Bright, 2008: 2); something Antle is calling for in her 2013 publication. When considering the motivation for *The Reactive Colours Project* Keay-Bright states the following:

> The research aims for the project have been to promote relaxation, encourage spontaneous play, and support learning for children on the autistic spectrum. By using the inherent flexibility and controllability of digital media to enable individualised sensory experiences, the project team realised that computers, when enable as embodied play experience, had the potential, beyond that of function, to support the inclusion of the most severely anxious autistic individuals. (Keay-Bright, 2007: 7)

Much like the practical research for this PhD project, it is clear that Keay-Bright acknowledges concerns regarding embodied interactions with technology in

[89] When reflecting on the importance of Participatory Design methods Keay-Bright states: Participatory design requires that people, whose lives stand to be affects in some way by the outcomes of the research, are given the opportunity to identify themselves within the objectives of the research. (Keay-Bright, 2007: 7)

[90] The dates of this project are not clear as it evolved into *ReacTickles Magic* (2010-11); an application for large and small-scale devices, depending on individual need.

[91] Which is an important motive given the description of play as an important development process, and previously in the body of the thesis.

many of her projects. In her paper, *The Reactive Colours Project: Demonstrating Participatory and Collaborative Design Methods for the Creation of Software for Autistic Children* (2007), Keay-Bright makes the following statement, which helped secure the importance of her work for its responses to technologies in education as well as advocating for embodied experiences to be promoted:

> What became clear from this early research was that the use of computers in schools tends to be limited to task-based activities that prompt functional interaction guided by specific educational objectives. Many software programmes adopt a heavily directed approach with explicit rules and highly organised structures, which are designed to specifically minimise the stress of uncertainty. However, the tasks tend to be inflexible, require minimal genuine interactions with others and therefore afford little creative and imaginative potential. (Keay-Bright, 2007: 11).

This statement offers many links between the context of the thesis thus far and goes further to contextualise the concerns of this research project with the likes of Antle and Spitzer, and the category of 'Used to Explore' introduced through the work of Florian (2004), (and explores all of this in the specific context of autism). The statement above is also a useful description to explain how the use of technology is applied through this PhD project, and how to consider the way movement has been embedded.

The second project discussed in this section is *ECHOES*[92] (2006-2011), developed by Keay-Bright, and colleagues Christopher Frauenberger[93] and Judith Good[94]. Through this project they were 'building on a well-known intervention programme [when developing] a system that allowed children with autism to interact with a virtual character on a big touchscreen to learn specific social skills' (Frauenberger, 2015: 57). Therefore, *ECHOES* clearly works with the shared principles of Spitzer and Antle. Keay-Bright did so through a novel Participatory Design method that put the autistic participant at the centre of her design. The following statement from Antle offers a greater appreciation for why I use this the *ECHOES* project as an example here:

> We know so little about how interactive systems and digital media can be designed to effectively support children to learn, play, and interact with the world

[92] The project involved partners from 8 major UK Universities and included the target population of children with high functioning autism, as well as typically developing children, in the design of the system.
[93]Christopher Frauenberger researches Interaction Design focusing on novel participatory methods for project developing technology for children and people with disabilities.
[94] Judith Good is a Professor of Interaction Design and Inclusion with a research interest in autism, technologies and games for learning.

> in ways not enabled by other natural or artificial artefacts. Of course, there have been successes and there are opportunities. (Antle, 2013: 31).

Antle goes on to describe her own work as an *opportunity* (by inspiring others to act) but this thesis considers the work of Keay-Bright as one of the successes. Her work with both *The Reactive Colours Project* and *ECHOE*S have consolidated many ideas used to support the thesis argument and go further in bringing together the worlds of technology and autism. They are discussed as examples of how to approach technologies in education by using a Participatory Design method to ensure the spectrum of autism is considered through the encouragement of embodied interactions with technologies.

The knowledge gained from her time developing these two projects in turn led to her most recent projects titled *Somantics* (2011-12), *Somability* (2013) and subsequently *Somatopia* (2014)[95]. Keay-Bright describes *Somatopia* as a project designed to help bring together artistic practice, technological innovation and participants marginalised due to societal perceptions of disability and/or those with a lack of resources in both the engagement of humans and technologies. Likewise, *Somantics* and *Somability* were influential it their focus on the integration of technologies with live feed capabilities, along with motion capture, to inspire people with a range of physical and learning disabilities to be more active through these embodied experiences. During these projects Keay-Bright has reflected on Arts practices and the involvement of movement practitioners in the application of this technology with adults with additional needs. Again, this offers another layer connecting the work of Keay-Bright to the overall themes of this PhD project, but more immediately support the introduction of Nicola Shaughnessy.

Throughout this section, as well as also being introduced in Chapter Four, the work of Nicola Shaughnessy and Melissa Trimingham's joint research project; *Imagining Autism: Drama, Performance and Intermediality as Interventions for Autism Spectrum Conditions* is also an important example of facilitating embodied experiences with technology for autistic participants. This project used a Practice-Based research method through the engagement with autistic children. When discussing the aims of the project they state 'came to understand the

[95] For the purpose of this chapter these projects will be discussed collectively to replicate the natural progression Keay-Bright discusses in their development.

importance of our imaginative engagement with the autistic experience and perception of physical and social environments, the need to facilitate social (and creative) imagination and empathy on the part of the participants through intermedial elements' (Trimingham & Shaughnessy, 2016: 304). As a result, the design elements of the project were not limited to technological interactions, they also created a *Pod*; an immersive tent-like environment where the participants enter a 'Forest, Outer Space, Underwater, the Arctic and Under the City' (Trimingham & Shaughnessy, 2016: 296).

The *Pod* was developed using many sensory approaches to allow the immersive experience to promote engagement with different, smells, and textures alongside the technological elements supporting different light and sounds. When considering their design approach for the *Imagining Autism* project Shaughnessy and Trimingham's work clearly aligns with the following statement, again taken from Antle's paper:

> In this way, theories of embodied cognition can be used to frame and inform a design space in terms of understandings of the way children interact with their everyday world and how an interactive product might augment or support such interaction. [...]Through the exploratory act of designing (and evaluating) a prototype to enable, support, or augment specific cognitive processes, knowledge about those processes in the context of interactive technology is generated. (Antle, 2013: 32)

Their investigation was more concerned about the interactions being facilitated, than the innovative technologies they could create[96]. Yet, due to Shaughnessy's Arts background[97], knowledge from embodied practices was embedded; much like the dance and movement background, discussed above, influencing the development of this PhD project. The projects offer similarities to the work of Keay-Bright and this PhD project, through the relationships created between the researchers and participants.

In creating such a space, despite not formally using a Participatory Design method, the *Imagining Autism* project was also able to allow for the child's

[96] Which is where Keay-Bright's work differs as her background in Graphic Design.
[97] Nicola Shaughnessy is a Professor of Performance with interests is autism along with research in contemporary performance, applied theatre, autobiography and performance theory. She also is Co-Director of Kent University's Research Centre for Cognition, Kinesthetic and Performance. Melissa Trimingham's research interests include puppetry, masks, costume, objects and scenography; the theatre of the Bauhaus and Modernism; autism and theatre; and cognition.

experience to influence the researchers and the end result and design output. To support this ‘a training programme was developed to facilitate perspective-taking on the part of the practitioners, helping them to engage imaginatively with the autistic experience’ (Shaughnessy, 2016: 190). Therefore, like Keay-Bright, Shaughnessy (with Trimingham) was able to let the individual children and their wants, needs, abilities and interests, inform the process.

> The approach invested each child with agency. We learned not to lead or be led by our anxieties about producing demonstrable outcomes. This involved reducing language and allowing them to discover the ‘mediated’ space, and to initiate their own actions through the tools it afford them – a cardboard tube, a microphone, a cloth, a projection, a puppet. The iterative practices discussed below developed intersubjectivity via the material means – the media – of the pod. (Trimingham & Shaughnessy, 2016: 296)

In the case of Shaughnessy, she has approached this project from a similar concern as shared throughout this PhD project in that she sees that autism has become increasingly ‘topic within both the humanities and sciences as a source of debate, controversy and research enquiry’ (Shaughnessy, 2013: 322). Her thoughts on the commercialisation and exploitation of autism, has been included through previous chapters, along with the way in which autism is seen through society by the two extremes of Autistic Savants or those unable to communicate or care for themselves. In the previous subsection of this chapter Shaughnessy’s views on the way in which autism and the *Theory of Mind* connect has also been included in the hope this will exhibit a more neurodiverse approach to these elements of autism and how they are seen by the public, a concern shared by Oliver (1990), as well as professionals. She responds to these concerns by creating a project that considers ‘what art can tell us about autism with particular reference to performance as a mode of neurodivergent expression’ (Shaughnessy, 2013: 322).

The approach applied throughout the project, being Practice-Based research and grounded in The Arts, was given space to evolve throughout engagement with the autistic participants. When reflecting on the project both Shaughnessy and Trimingham have been reliant on examples and case studies to explore the application of the project[98]. This shows clearly that the environment

[98] An approach used within the teaching manual submitted as Appendix 6.

created, the props used and *The Pod* itself were engaged with in various and individual ways by the participants.

Shaughnessy's 2013 paper, is rich with theory from drama based approaches which reflects their application in the *Imagining Autism* project. With one of her subheadings being *Body* it clearly connects to the themes of embodied interactions and embodiment presented in this thesis. Regarding its connection to The Arts the 2018 publication, *The Routledge Companion to Theatre, Performance and Cognitive Science,* in which she has a chapter, sees Embodied Cognition addressed in the book's introduction:

> The importance of embodied approaches in the cognitive sciences is reshaping how we understand social cognition, those interactions among people in the same society and that facilitate the creation and enforcement of new social norms and that encourage social cohorts to cooperate on projects that can be mutually beneficial. (McConachie, 2018: 4).

When reflecting on the project, she states; 'In our experience it is the materiality of the immersive environment and its affordances which develop deeper levels of empathic engagement' (Shaughnessy, 2013: 329). Here, introducing empathy as a theme she does so in a way similar to her discussion of *Theory of Mind* (ToM). In that instance, she argues that *Theory of Mind*, in the discussion of autism, must be considered as a two-way process in that for professionals and researchers proposing effective ways to engage with the autistic community must themselves enact *Theory of Mind* in order to be convincingly innovative. With conversation of empathy being introduced, this thesis makes a statement about empathy; in that for empathy to be encouraged for the child it also needs to be exhibited by those facilitating the interactions. In light of this it is interesting again to reference the introduction to *The Routledge Companion to Theatre, Performance and Cognitive Science* (2018) where McConachie states that '[w]hile there are different conceptions about how ToM operates, most psychologists agree that successful social iteration depended upon it' (McConachie, 2018: 4).

The final element of Shaughnessy's project, pertinent to the themes of this thesis, is play. Throughout the environment they created the children were offered many different possibilities in terms of how they chose to interact with the facilitators as well as the environment. She has highlighted the importance of play in these interactions, and remarks that:

> Our engagement in modes of play was crucial to the responses we elicited as this is often neglected post diagnosis in favour of skills-based and behavioural approaches to 'therapy'. The non-illusory nature of the methods and materials meant there was no fakery. (Shaughnessy, 2013: 331)

This theme is, again, an important connection to be made to the PhD project as well as the literature and studies presented throughout this fifth chapter, as all are used to compliment and contextualise the themes presented through Chapter Six. Her consideration, like Keay-Bright's, connect to my own inclusion of play as a theme in practice, and my training in Play Therapy. Despite, this training it is important to make clear that the application of play, or dance, in this PhD research is not in a therapeutic capacity, which is a distinction Shaughnessy also makes (in the context of her work and Drama Therapy):

> As practice-based researchers working in education, social and community contexts, we were similarly cautious about the term 'therapy', being mindful and respectful of the tradition of drama therapy with training and practices grounded in psychotherapy. (Shaughnessy, 2017: 82)

This statement is relatable, especially when thinking about the similarities between Drama Therapy and Dance/Movement Psychotherapy. It is also interesting to note that when concluding her 2013 paper, she makes a final, yet significant, statement about the use of The Arts and drama techniques as a method in this project with autistic children, by explaining that; 'As process-based performance, our work is situated in a third space between making and performance, challenging the distinction between the aesthetic and no aesthetic in its form and content' (Shaughnessy, 2013: 331-332). Here she not only addresses traditional drama pieces that may be viewed but is also begins to make consider how the participants themselves shape the progression and interactions due to their curiosities and experiences. As mentioned previously, this is not strictly a Participatory Design project, but there are synergies between the work of Keay-Bright and Shaughnessy for many reasons, and this shared ownership is one such connection. It is suggested that the following statement, by Shaughnessy, could equally be applied to discuss the work of Keay-Bright, cementing their similarities:

> This is extremely pertinent to our experience of working with autism as the participants increasingly recognised that they were performers and authors hat we responded to their cures and that they were at liberty to improvise and play. (Shaughnessy, 2013: 332).

This statement has offered a clear resolution for this chapter as it reinforces the use of both of Manfred Spitzer and Alissa Antle by utilising the information regarding embodied interactions with technology Antle and using Keay-Bright and Shaughnessy as examples to help situate the work. Therefore, their collective research clearly supports the decision to offer insight to facilitated embodied interactions with technology for autistic participants. Lastly, the previous statements by Shaughnessy will also resonate with the content of the sixth chapter of the thesis: which more readily explores the practical research.

In reflecting on the work of both Keay-Bright and Shaughnessy the intention is to allow the information thus far, from the very beginning of this thesis as well as the detail offers in this specific chapter, to outline the dilemmas that this thesis responds to. The work of both of these researchers, and their work with autistic participants, has been an important reference point within a thesis that proposes to substantiate the ways this project aims to create positive impact and change in order to premise holistic development and inclusive practices.

Limitations seen throughout current practices

For this final section, there is a pressing need to outline the limitations of existing work in the field. To do so this section critiques current interventions used within the education of autistic children. The interventions discussed have been introduced in two separate chapters, the first (Chapter Three) addressing traditional interventions and the second (Chapter Four) addressing technological interventions[99]. As made apparent by their individual chapters in this thesis, their opposing nature (put crudely as human interaction or technological engage) allowed for their individual application style to be unpacked. In Chapter Three a number of specific educational interventions (TEACCH, PECS and *Intensive Interaction*) were included, alongside Therapeutic Interventions used within education (Play Therapy, Occupational Therapy and Speech and Language Therapy). Despite many rational indicators for their use with autistic children were

[99] For the purpose of this thesis the guidelines created ensured that all the interventions discussed had been experienced first-hand in school provisions throughout the research process and/or have been used with the participants of the practical research, and all promoted or rely on one-to-one facilitation. When considering the traditional interventions of Chapter Three only, an additional guideline also ensured these were independent of technological influences or advancements.

identified, this chapter now aspires to evidence their limitations. In doing so the critique of said traditional interventions is motivated by their lack of technological engagement.

To begin, in the case of educational interventions, TEACCH and PECS[100], the third chapter highlighted both for their use in the education of autistic children. TEACCH allowing individualised programme promoting independent learning by minimising social pressures of non-individualised settings, and PECS supporting verbal communication through visual means, to engage with others, building towards sentence structures and conversation skills. In the third chapter, addressing traditional interventions, both are included due to their use of physical 'boards'[101] with Velcro attached so that the choices or tasks can be manipulated easily by the child, therefore also easily adaptable for staff. This also premises individualisation[102] and advocates for changes to be made as the child develops new abilities or interests, by nature of their rudimentary design. A limitation of both interventions is that they do not readily embrace technological advances. In truth, this thesis sees this as a positive, at present, as the most logical step available to digitalise TEACCH or PECS would be to have a downloadable app created to be for tablet devices.

This would certainly bridge the gap between the opposing applications of either human interaction or technological engagement but would then quickly be within the concerning realm of touch screen devices designed for solo engagement. This is a theme considered in Chapter Five through the work of Manfred Spitzer, and in doing so it can be assumed that the positive attributes of TEACCH and PECS, especially the latter and its focus on communication, would be limited if not removed entirely. In light of Lani Florian's categories of technologies in education this simple transition from analogue to digital could be considered a technology 'Used as a Management Tool' (Florian, 2006), to simply transfer a successful system into the digital realm to save time for the teacher; in terms of printing, re making, laminating (etc.). In doing so it would not be based

[100] The *Treatment and Education of Autistic and Related Communication Handicapped Children* (TEACCH) was developed in 1966 by the American psychologist Dr Eric Schopler. The *Picture Exchange Communication System* (PECS) was also developed in America, but by Andy Bondy, and Lori Frost in 1985.
[101] Commonly made by printing an image of a time line and then laminated the paper before attaching Velcro stripes to which individual icons and images can be attached and removed.
[102] (two positive attributes acknowledged by this thesis)

on research showing the digital version having more benefits than the traditional application; despite this being a common approach in line with many other technological interventions lacking rigorous research to support the design.

The third traditional intervention discussed was *Intensive Interaction*; an intervention developed with autistic individuals in mind, is used with children and adults with various diagnoses. By nature, it is explicitly focused on human interaction in the form of one-to-one engagements in which mimicry is a significant tool. Much like the application of mimicry in this thesis it is related to its prevalence in the infantile years, and the ways in which this supports social and communicative development. Despite being influential in this PhD project, due to advocating for the use of physical touch in interactions, it has not yet embedded technological advances. Much like the discussion of TEACCH and PECS above, the embedding any ICT would in many ways be counterintuitive for an interaction with very clear aims and processes for application. Again, this thesis is not attempting to discredit the benefits of these interactions, in fact it is influence by this practice, but it does call into question how existing interventions could support positive engagement with technology for autistic children.

To now reflect on the Therapeutic Interventions introduced in Chapter Three, their consideration as traditional interventions is also reliant on one-to-one settings where their application is not dependent on technological influences or advancements. The third chapter Play Therapy, Occupational Therapy, and Speech and Language Therapy were included. In short here, the criticisms of the therapeutic interventions, collectively, is much like that of the educational interventions above. Both share the limitation of prioritising human interaction to the point at which technological advances are not given space to be integrated into the current techniques, or when technology is included it is done so to ease the pressure of teachers rather than as a result of research to show the technology can enhance existing benefits. Therefore, in all cases above technology cannot be seen to be readily embedded in the process, and even more critical when it comes to the therapeutic interventions as the subtler changes needed here are more difficult to implement due to intensive training.

It was due to the current disparity between human interaction and technological interaction that the work of Wendy Keay-Bright and Nicola Shaughnessy was introduced. Yet, to expand on the limitations of current

interventions, there is a need to reanalyse their work and address how their projects could be developed further to respond to the concerns of this thesis, whilst offering distinctions between their work and the findings from this PhD. Throughout Chapter Four their respective research was introduced as an example of technological interventions where the technologies are being 'Used to Explore' (Florian, 2006), yet earlier in this chapter their work was unpacked to show how their research is more definitively an example of facilitating embodied interactions with technology for autistic participants. In the case of Keay-Bright the drivers for the project were a background in Graphic Design, yet Shaughnessy's research draws influence from Drama practices. Both are clearly research enquiries that afford embodied interactions with technology for autistic participants and in doing so connect many themes of this thesis.

Regarding embodied interactions with technology for autistic participants, the overriding need for this PhD was to reintroduce the placement of the body in the wider discussion of autism. This was supported through discussion of Childhood Development and how movement supports developments through the infantile years (primarily social skills and communication), but is also supported by the research presented by Spitzer (2014) and Antle (2013). When considering how the work of Shaughnessy and Keay-Bright respond to the importance of embodied interactions there was insight, through Shaughnessy's work initially, where she discusses the negative connotations associated with *Theory of Mind* (which was introduced in Chapter Five). This concern was abstracted further to allow Shaughnessy's apprehensions, in her 2013 publication, regarding conversations utilising the *Theory of Mind* in autism literature, where the two-sidedness of this theory is under-appreciated. She makes clear her opinions on the need for the *Theory of Mind* to be applied by those working with autistic individuals, as a way to assert the ethos of Neurodiversity. Yet, at this stage of her research it is unclear how she puts these concerns into practice and how they have influenced her engagement with autistic participants.

Despite this it was Shaughnessy's considerations that gave further recognition to the application of empathy, in the practical research, and how this offers new thinking to the way professionals engage with autistic children.

> Fundamental to the project's approach has been a focus on empathic engagement with autism as difference and the use of drama as a means of

> tapping into the experience of perceiving differently. (Trimingham & Shaughnessy, 2018)

The way Shaughnessy explored the idea of two-sidedness reflected on the way empathy has been applied by the facilitator, in order for it to be experienced and understood by the child. To unpack this further empathy will be addressed in its own section of Chapter Six, where an introduction establishes its placement within childhood development literature, and its association with autism as a diagnosis before showing the influence of this research on practice. In doing so, concerns similar to Shaughnessy are evidenced in practice, more readily, to expand on her influential project and support the innovative approach developed through this PhD project. The final area of difference between my practice and Shaughnessy's is that she has facilitated the work with groups of children rather than a one-to-one. In line with the research presented throughout the thesis, regarding individualization, the benefits of one-to-one were clear in the decision connected to my practice. It is suggested here the benefits could be afforded through reduced group sizes, and or the number of adults were increased to ensure true individualization could be achieved.

In the case of Keay-Bright the limitation is almost the opposite, with the primary motived being the interaction being between the child and the technology. Although the technology is advanced in that it uses motion sensors, it abstracts the image into colour and shape therefore on two accounts the human interaction element has been reduced. The design has potential to be in line with the aims of this thesis (which advocates for equal importance of human interaction and technological interaction) but at this stage is too heavily prioritising the technological elements. In addition, the design itself is currently limited to use by one person at a time, so this creates a barrier to simply including a facilitator in the session as it plays out. Therefore, in its current format it falls more in line with the technological interventions limiting human interaction, despite being, in other ways, being praised in this thesis for carefully considering movement and embodied interactions with technology for autistic children.

As mentioned above, when outlining the limitations of other interventions, the inclusion of technology, alone, is not always a positive step for an intervention. The use of technology must be done so in a process ensuring its inclusion will assist the child's development, but so often the motive is to alleviate

the pressures on the teaching profession. In the case of this thesis the process advocated for should be done so with the child's holistic development at the forefront of all decisions. The use of immersive environments, inclusive of computer technology and supporting an embodied interaction, will allow computer technologies to be embedded in interventions that primarily enhance social developments; rather than becoming an element reducing social interaction as a result of technologies introduced without adaptation and/or originally designed for the conventional solo user.

> In this way, theories of embodied cognition can be used to frame and inform a design space in terms of understandings of the way children interact with their everyday world and how an interactive product might augment or support such interaction. (Antle, 2013: 32)

This idea has been applied throughout the practical research and has developed into a theoretical understanding about the combination of such movement techniques and technological approaches in a shared space and time. This approach aims to promote social interaction and engagement with computer technologies through creative and expressive movement, despite movement often being under acknowledged through education (explored through the work of Antle). By facilitating a movement sessions that combined principles from the field of dance, and the fields of childhood studies, cognitive science, and autism, evidence the necessity of hybrid approaches to technological interaction, so that social skill can be individually developed through the inclusion of technology, and that these are not seen as opposing techniques that reduce embodied interaction and social experience.

The previous chapters have therefore taken a critical position on research from the field of technology and autism, whilst utilising the important work of the likes of Antle and Spitzer to show the importance of refreshed relationships with technologies that are often designed for the conventional, solo user. This is done so here, in the fifth chapter, to present an alternative way to embed computer technologies in the education sector, by promoting adaptation to existing interactions where new, immersive and interactive designs are not yet accessible.

Conclusion

This fifth chapter was designed to comprehensively address, this PhD project by understanding the possibilities of movement within interventions for autistic children, and the development of an approach to ICT that amplifies and extends the possibilities for the autistic child, in education. The rationale was to reflect on previous chapters, consolidating ideas surround the introduction of ICT in the education of autistic children, moving towards the work of researchers advocating for interactive technological environments. In doing so the work of Manfred Spitzer outlines the risks and side effects associated with overexposure to computer technologies for children. He outlines the need for embodied interactions, varied experiences and challenging encounters in order for cognitive abilities to be developed.

With resonance to this PhD practice, the chapter then carefully explains the parameters and suggestions of the research by Alissa Antle, where she reflects on her own experience of researching and designing interactive technologies for children, based on one-to-one interactions. This offered recognition for the PhD as her work connects many themes of this thesis; it goes against the common misconception that one idea can be applied to all settings, all ages (and all with a diagnosis of autism). In particular her 2013 paper begins to criticise both cognitive science and human-computer research, before calling on the mixed disciplinary approach to research to rely on information from developmental psychology and media studies; which is where it links to the work of Victor Stransburger's paper *Media and Children, What needs to happen now?* (2009).

Both Stransburger's suggestions to avoid the unintended consequences of ICT, and Antle's criticisms of conventional technologies leads to a reflection on the need for embodied interactions to be used as opportunities. Antle suggests how the design community could take influence from research concerned with cognitive development. She chose to also 'focus primarily on new forms of interaction in [her] examples because an embodied perspective on cognition highlights the opportunities and benefits not supported by traditional desktop configurations' (Antle, 2013: 31). When addressing this concept, she is influenced by existing theories addressing the unintended consequences associated with individuals' engagement with computer technology. She speaks of the need to

acknowledge ‘variability in children’s cognitive development and behaviours (since it seeks to sample a homogenous population), and [that theory often] ignores the contextual variables that influence situated use of interactive products for children’ (Antle, 2013: 32). This conclusion is even more important when considering the participants of this PhD research project are autistic children, making variability a vital consideration. ‘In this way theory may be used to inform analysis of situations into which a new design will be placed or to inform the evaluation of a new design in a real-world setting’ (Antle, 2013: 32).

Like all aspects of Antle’s paper, the information presented offers provocative statements that resonate with the argument of this thesis more broadly. To conclude, this paper proposes adaptation to our use of technologies with children, and the potential for new interventions that have evolved through the analysis of educational techniques by embedding technologies that afford interactive and social experiences; developed by engaging with research from cognitive science.

Again, this statement helps to ground the research and development process within this thesis and suggests of how such projects, when working with designers, could help bridge the gap between the designer industry and theories surrounding embodied interaction. In this way, they can ensure their products are not made redundant, in changing times, or worse become products with unintended consequences. Therefore, the work of Keay-Bright and Shaughnessy were included as examples of projects facilitating embodied interactions with ICT for autistic participants. Their work, retrospectively, proves vital in understanding the connections made between themes of adaptation and the appreciation of individual developments for children, relating and reaffirming the person-centered work with children on the autism spectrum used throughout this PhD project, especially when we consider that ‘the development of intelligence depends on the specifics of the genetic, physical, social, emotional, and contextual environment in which a child is situated. While there may be similar patterns of development, each child is unique’ (Antle, 2013: 32).

When introducing the work of Keay-Bright, the collection of projects she has developed offers insight into her methodology (Participatory Design), and graphic design techniques to create innovative technologies for autistic participants. This unique approach has been supported by comprehensive

knowledge about the ability to develop social and communicative skill through embodied interactions with technology, when it is applied in collaboration with an understanding of autism. For Keay-Bright it is also clear that she shares the concerns of this thesis not only regarding the overexposure to ICT for children in education, but also that the majority of studies promoting its used with SEN and autistic children fail to recognise the heterogeneity of autism and premise those with existing intellectual abilities. Her work helps to validate this theme whilst showing how to address these rising concerns from within the design world.

This approach also offers the chance to create an environment individual to each child participating, by encouraging improvisation as a way to promote individualised facilitation. This gives purpose and attention to the benefits of the process of engagement itself, rather than deciding what should be the end behavioural goal. By using the interactive sessions as a method in this research project it is possible that the process of embodied cognition is complimented when reflecting Spitzer and Antle's discussions around on childhood development, cognitive abilities, social skills. The limitations of this work are later shown to be that only one individual is able to engage with the technology at any one time. Therefore, its main downfall is the lack of true human interaction as being of equal importance to the engagement with technology.

Following this, the *Imagining Autism* project was discussed to offer insight into the work of Nicola Shaughnessy, and Melissa Trimingham. At this stage, the chapter aimed to discuss the utilization of technologies within the school environments, by applying techniques from The Arts, alongside the research themes of autism and technological engagement. The *Imagining Autism* project does just that, by presenting information from the view point of drama based approaches. The project saw engagement with autistic participants through technologies such as projection and the use of microphones, props, and the creation of *The Pod* which was a tent-like structure in which the children would experience different worlds and environments. Shaughnessy's writing also gives insight into the theme of Neurodiversity and how this influenced the ways in which she offered a place for children to explore, whilst being mindful of the importance of individual experience. Despite this, the group based facilitation can be seen to limit the application of a truly an individualised approach, in comparison to that of a one-to-one setting where the individual abilities and

needs are at the forefront of the interactions, which is the case of my own practical research.

Alternatively, her *Imagining Otherwise: Autism, Neuroaesthetics and Contemporary Performance* (2013) offered a clear awareness of the complexities surround autism more broadly and makes comment on the exploitation and commercialisation of autism which links to themes from Spitzer and the concerns of this thesis. There are also connections made to the research of Pinchevski and Peters, presented in Chapter Four; when considering language and societal influences on autism. Introduced here, and earlier in the chapter, the concept of *Theory of Mind* is reintroduced and criticised the way researchers undervalue the two-sidedness of this concept. Shaughnessy makes similar comments regarding empathy and how it is seen in the discussion of autism; yet this in need of further exploration, through practice. Alternatively, this thesis expands on these thoughts to conclude that empathy and autism must also been seen as a two-way experience between the autistic individual and researchers, and other professionals.

The comments on empathy insightful and connected to research into the placement of mimicry in childhood development and the aim to allow the child to have a visual self-mimicry in line with the impact of self-referential ability on developments socially. This is applied in practice by using live feed footage, filmed in the session, to be projected into the walls of the space where the interactions were taking place. It is also a direct response to the critique of current interventions above, which has acknowledged that traditional interventions commonly avoid technological inclusion, and the current technological interventions often underappreciate human interaction alongside its application, or have been designed for solo use (which lacks adaptation) and/ or are primarily designed to alleviate the pressures on the teaching profession. Where this is the case it can be understood as a process by which the technology itself offers a substitute to human interaction as a necessary response to the lack of time as a resource for the teaching profession. In conclusion the simple adaptations and use of cameras and projectors in this PhD project, can allow for both social and embodied experiences to be encouraged alongside the interactions with computer technology, by promoting a hybrid approach.

In light of this the following chapter will benefit from the discussion of Spitzer and Antle, along with the examples proving inspirational in the application of technologies in embodied interactions with autistic children. This PhD project is concerned with the developing an approach to technology that primarily amplifies and extends the possibilities for autistic children, within education, therefore the limitations of other approaches, explored in this chapter, show how my own approach is distinct in its application. Through movement techniques the PhD project employs mimicry and physical touch alongside technology; an approach supported by literature acknowledging the benefits of its use in the development of self-referential ability.

The application of movement techniques is alongside the placement of accessible audio-visual technologies, therefore the aim for this interdisciplinary project is to allow an exploration of social experience to be encouraged alongside interactions with technology: not in any way to work against its inclusion in education. During the one-to-one session with autistic children, the facilitation is individualised by employing techniques from Somatic Movement Practice and Contact Improvisation, to offer embodied interactions with the other. This as, therefore, an opportunity to enhance the child's social, experiential, knowledge, rather than further isolate the child through solo engagement with technologies, which may cause a plateau, or decrease, in social and communicative development.

Chapter Six: A Report on Practice; the foundation for new knowledge

Introduction

This chapter culminates theoretical and practical research, acting as a continuation of themes offered in the previous chapters. The first five chapters of this thesis have prioritised the theoretical framework in order to now embed practical research in the foreground of the discussion. The process and project plan will be outlined in more detail through the first section of this chapter. To support this, it is important firstly to be reminded that, the practical research was conducted in a Special Educational Needs School that supports pupils aged between four and 16[103] years, with all holding a diagnosis of autism. In the school environment, the sessions were delivered on a one to one basis, between myself and the participating child. Early in the PhD process it was understood that technologies, in the education of autistic children, were being overused and had the potential of hindering social interact either by limiting the amount of experiences reliant on human interaction, or by the over exposure to technologies designed for the conventional solo user and therefore not promoting social skill development holistically. To respond to this, it was decided that the Practice-Based research method could be utilised to allow for an exploration of these concerns, and this practical research is reported in greater detail to show the rationale for the structure and content of the practical endeavor.

The thesis prologue introduced the research methods and here the importance of experience in the field was acknowledged as necessary when collecting evidence to show a combined approach to human interaction and technological engagement, with autistic children, as an iterative process. Chapters one to five support the Practice-Based, ethnographic, methods by outlining the myriad of loopholes that have been addressed. Yet, the aim here is to show how these were approached in practice, and in turn show how a mixed

[103] The school now takes pupils up to the age of 18 in line with the changes made to the age children leave school in 2015, rising from 16 years to 18 years.

mode approach to working with autistic children creatively, alongside technology, has the potential to avoid social skill development plateau or reduction and to work holistically to benefit the child's overall development. In the subsequent sections, this sixth chapter will consistently acknowledge the use of practical research with the aim to unite the literature presented thus far to make clearer connections to the wider research context. This chapter offers a brief reflection on the Practice-Based and ethnographic research approaches to provide insight into how these were applied and what they offered.

> For postmodernism, ethnographic practices are ways of acting in the world. These ways of acting (interviewing and observing) produce particular, situated understandings. The validity, or authority, of a given observation is determined by the nature of the critical understanding it produces. (Denzin, 1997: 8)

Therefore, it is the role of this chapter to give a written account of the practice and connect this to the critical engagement with literature previously presented, in order to offer the reader a clear understanding of what this PhD contributes to the field. The rationale for the practical research is acknowledged, throughout the thesis, as originating from intuitive responses to earlier work with autistic children, yet over time became more formally aligning to the research presented in the thesis thus far; as a reflexive and iterative process. The thesis has addressed the extensive theoretical research connecting ICT, autism, traditional and technological interventions, childhood development and cognitive science to outline the concerns regarding the current approach to technologies in the education of autistic children. These topics offered awareness of how children learn and what methods can be implemented throughout education in order to provide rich and varied experiences, whilst not eliminating ICT from the discussion. To develop the conversation of childhood development, empathy, mimicry and touch are a clear focus of this chapter, as these are important elements of the practical research exploration. By doing so this leaves opportunities to reflect on personal experience of how the theoretical and embodied knowledge was applied in the sessions facilitated for autistic children through this chapter.

Before addressing this explicitly, embodied interactions will be shown as pertinent for the placement of empathy, mimicry and touch, in the thesis argument. Regarding embodied interactions with technology, for autistic

participants, the overriding need within the practical research was to reintroduce the placement of the body in the wider discussion of autism. With this in mind, the sixth chapter consolidates information critically engaging with the traditional and technological interventions accessible in UK education, as explored through Chapter Five. It is important to outline that this PhD does not aim to replace or undermine these interventions, yet seeks to evidence a need for embodied interactions with ICT to be more pertinent for the next generation; particularly those with autism. If we do not critique and challenge conventions then the unintended consequences may become normalised and the practices, of those professionals working with autistic individuals, may stagnate.

The third and fourth chapters evidence that many traditional and therapeutic interventions[104] have maintained their place in this ever-changing modern world. This sixth chapter reflects on a key concern of this thesis, whereby the practical research responds to questions that arose when considering how technological advances can be applied in an intervention also prioritising the holistic development. This is done so by addressing the overexposure of the highly stimulating computers, smartphones, and tablets devices. Here the theoretical information from previous chapters is utilised in the process of promoting embodied interactions through a discussion of practice.

When further unpacking the practical research findings, the reflection on limitations suggested in Chapter Five give light to the application of empathy, in the practical research, and how this offers an alternative approach to the way professionals engage with autistic children. To unpack this further empathy will be addressed individually to establish its placement within childhood development literature, and its association with autism as a diagnosis. Due to the placement of embodiment and of mimicry, in the development of empathic understanding in the infantile years a child's ability to comprehend *self* and *other* will be addressed. The theme of touch is then offered to more formally address human interaction within the wider context of Childhood Development, and autism as a diagnosis. Its natural placement in the home environment, for infants,

[104] The interventions discussed included; *Treatment and Education of Autistic and Related Communication Handicapped Children* (TEACCH), *Picture Exchange Communication* System (PECS), and *Intensive* Interaction, as educational interventions, and then Play Therapy, Occupational Therapy, then Speech and Language Therapy – each being a therapeutic intervention used within the education of autistic children.

is juxtaposed by the avoidance of touch between adults and children in the school environment and as such this contentious issue will be addressed further.

In doing so this sixth chapter has afforded the contextualisation of practical research from this PhD alongside the discussion of empathy, mimicry and touch to outline the developing approach to using technologies in the education of autistic children. It suggests the potential for this research to be considered beyond the autistic community, to how we may approach the use of technology in various educational settings which influenced the first iteration of a teaching manual to support a wider understanding and application of the approach[105]. This chapter offers a suggested solution that might help, not hinder, social experiences and communicative engagement through interactions with both humans and technological devices. By the end of this chapter themes will have been brought together from the previous chapters, alongside evidence from scholars, to present the argument for adaptations to the solo engagement with technology often evidenced in the school environment, by autistic individuals. This PhD will conclude with suggestions, and forwarding remarks on how the application of techniques from the Arts, namely dance and movement, can be applied to the education sector in order to prevent further social difficulties and can be seen as a force for change in a generation[106] so familiar with technological devices in every aspect of their daily lives.

Practical Research Method

As mentioned in the introduction of this thesis, the PhD project has been supported by practical research due to being enrolled on a Practice-as-Research PhD; yet later aligned with Practice-Based research methodologies. Within the methods section it is made clear that the Practice-Based research method was preferred over Practice-as-Research to create distance from the requirement that 'a practice (creative writing, dance, musical score/performance, theatre/performance, visual exhibition, film or other cultural practice) [must be]

[105] This document can be seen in full in Appendix 6 and is a work in progress document informed by and written for teachers.

[106] The current generation within the primary school education system is known as Generation Z and is used to refer to those born from the mid-1990s to the early 2000s, but more importantly for this thesis, is also associated with the current generation's use of technology and social media after having been born into a world where the internet was widespread and commonly used in all walks of life.

submitted as substantial evidence of a research inquiry' (Nelson, 2013: 9). In the case of this thesis it was not seen as appropriate to formally submit the practice as separate to the written submission; to avoid the video documentation being misconstrued as artistic or performative. This was far from the intention and when contemplating an edited version of the footage, from the session with autistic children, it became apparent that this would undermine the process of supporting subtle and holistic developments. Linda Candy's short guide to Practice-Based research (2006) allowed for the practice to be seen more for its influence on the theory and presentation of new knowledge; '[w]hilst the significance and context of the claims are described in words, a full understanding can only be obtained with direct reference to the outcomes' (Candy, 2006: 1).

In reflecting on these subtle differences the practice itself, as a method, was formalised by research into the anthropological method of *participant observation*, and would be embedded through an ethnographic approach to the research; which both study human culture, customs, habits and differences through close observation. It was clear from the beginning that my experience and training in movement practices would be interwoven into the PhD and would be a means in which to explore the theories developed surrounding technology, autism and movement, as an iterative approach. This was applied in combination with the method of participant observation; which is described by DeWalt and DeWalt (2011) as being notoriously difficult to express textually, yet this is the ask of this sixth chapter. The practical sessions were held during the second year of the PhD process, with autistic children as the participants[107].

All the children that participated in the project were between the ages of five and 18 years old and to explore this hypothesis with the concepts of, firstly, how movement and holistic processes could aid a child's holistic developments and later to introduce a technological mediation and allow for the child's interactions in the sessions to inform the theoretical endeavours and the findings of this thesis. As mentioned the motivation was also to apply the method of participant observation in these sessions which allowed embodied interactions to be priorities, whilst offering a clear framework for reflections on how to work with the autistic community.

[107] The next subsection will consider the planning stages as well as the complexities that went hand in hand with the practical research process.

The participant observation method not only described the complexity of written accounts of the interactions, and changeability evidenced, but also allowed for the fact that a traditional observational role was avoided. Instead, as facilitation (as practitioner-researcher) I was immersed in the interactions absorbing as much information about the autistic child as possible, in order to ensure an individual and holistic approach. By mimicking their bodily behaviours, the initiative was to learn how they engaged with their environment and how their social awareness was developing. The theme of mimicry later took a more theoretically stance when reflected upon its placement in childhood development and social skill development. It was during this process that the traditions of measuring strengths and difficulties, often used by social sciences, educational psychologists and therapists, were considered to hinder the holistic process.

It is notable that the outline for the sessions were clear in their connection to the dance and movement training achieved before (and during) the PhD. This saw the application of interactions utilising knowledge of Contact Improvisation and Somatic Movement Practices specifically. The format itself, of one-to-one interactions between child and primary care giver was part of the application of information from Childhood Development. This decision was also a result of information from the importance of partnerships within Contact Improvisation and Somatic Movement Practices, a reflection on the relationship between child and primary care giver in the infantile years, as well as to incorporate the traditional and technological interventions used within the education of autistic children; all of which premised one-to-one and individualised work.

My dual role (as practitioner-researcher) was one that presented challenges, yet by employing the method of participant observation they were more carefully considered through the written assessment of the practice. Hume & Mulcock's text *Anthropologists in the Field. Cases in Participant Observation* (2004) allows understanding the decisions made within the practical research elements:

> At the same time, the practice of ethnography also assumes the importance of maintaining enough intellectual distance to ensure that researchers are able to undertake a critical analysis of the events in which they are participating. This mean that they should be willing, and able, to take a step back from the relationships that form with the people they encounter in the field for long enough to identify and reflect upon some of the taken-for-granted rules and expectations of the social world they are studying. (Hume & Mulcock, 2004: xi)

As the practical research was applied in a Special Educational Needs school specifically for autistic children, these themes were important to acknowledge. Rules and expectations were unavoidable in such a setting, along with other practical considerations, yet the process was often exhausted by the need to obtain a close and trusting relationship with the participants, whilst maintaining analysis, for the research project to be successful. Despite this, the chosen method offers a more inclusive approach to consider the knowledge held by those with a diagnosis, especially as so many 'approach[es] when applied to the education of those diagnosed becomes a ''treatment programme'' of modifying the ''autistic person'' as ''best one can'' to fit in with the mainstream culture of society' (Milton, 2012: 884), which he further explains;

> Such views are informed by research that champions the use of the randomised controlled trial, yet discounts the subjective experiences of those who identify as being on the autism spectrum themselves as worthy of rigorous academic study. (Milton, 2012: 884)

This concept is reiterated by the likes of Ilona Roth, and others, who has worked with a number of autistic participants in her research and states that is it 'commonplace, in 2018, for people with autism to speak for themselves, it is important for autism […] to be informed "from the inside" by autistic people's perspectives and experiences' (Roth, 2019: 81). This is the same motivation that informed the ethnographic method and the design and delivery of the practical research, which afforded an iterative approach. Yet, it must be acknowledged that although this thesis and research is not conducted by someone holding a diagnosis, the ethnographic method ensures the autistic modes of knowledge are at the forefront of the research, and that the practical research ensured the experience with autistic children informed the direction and the findings.

Hume & Mulcock (2004) describe this in terms of the ethnographer, as they explain the requirement to be able to be inside and outside of the interaction simultaneously, whist attempting to appreciate the limitations of both.

> Good participant observation requires a self-conscious balance between intimacy with, and distance from, the individuals we are seeking to better understand. By definition, participant observers deliberately place themselves in a series of very awkward social spaces, some of which are more difficult to inhabit than others. (Hume & Mulcock, 2004: xi)

Considering the epistemology of the practical research more closely, and its application supporting this thesis, has provided a more operative understanding

of how to connect to Practice-Based research. Hume & Mulcock's discussion of the ethnographer (2004) provoked interest in how this related to the PhD project, and in turn influenced the decision to consider this PhD as combining participant observation and an ethnographic research method.

When reflecting on the complexity faced when attempting a written articulation of the process and said findings, this was assisted by the video recordings documenting the interactions. Yet, the aim was not to create an edited film to be presented aesthetically, as mentioned previously, but to become a tool and resource alleviating some of the challenging aspects of the written process. Therefore, it is important to make a clear distinction for the reader by explaining this as being separate to the application of technology for research purposes. The cameras for mnemonic purposes were discretely placed in the space during every session and were not included in the implementation of live feed projection as part of the interaction with the autistic participants[108].

It is also worth noting that the practical research helped not only address the multidisciplinary approach but also connect the work to the theory. My practice is intrinsic to the process, the lack of a formal submission of practice meant it was not a true fit with the Practice-as-Research framework. Soon after, the alignment to Practice-Based research was adopted for its acceptance that practice offers simultaneous functions to identify problems, support the research argument, theoretical bases and conclusions in the process of establishing new knowledge. In turn, the practice of this PhD has been referred to as *practical research* throughout this thesis, to help the reader focus on the differences.

Planning the Practical Research in school

The facilitation of one-to-one movement sessions, as practice, informed my theoretical research through experiential knowledge and experimental sessions, as an iterative process. To evidence this I will expand on the practical research process in more detail throughout this sixth Chapter. To do so not only will this be connect to literature presented previously, but it will be supported by a limited selection of images of the space and set up, along with some from the video

[108] An important part of the practical research mentioned here in order to make it clear there was a distinction between this and the use of video footage for documentation. Another contributing factor was the need for video release forms which not all participants' parents/guardians returned.

footage collected during the practical research sessions.

When planning the PhD project I committed the first year to theoretical research and the second to practice. Despite this, the practical planning began earlier in order to reconnected with an autism specific Special School, local to Plymouth. This was the ideal location as this school focused on providing high quality education for children on the autistic spectrum aged between four – 16 years. As I had previous experience working there (in an employed capacity between 2012-2014) this was my first choice because of their willingness to support the dance research project I previously delivered. Therefore, I had an existing relationship with the Head Teacher, Deputy Head Teacher, and other staff members, all of whom had been engaged with the dance research project I facilitated, and advocated for research projects with their pupils.

As I planned to facilitate one-to-one sessions, I needed to ensure any school had the capacity to provide this, and knew that many schools would have limited suitable spaces to do so. My chosen school's on-site dance studio, on the other hand, was ideal due to its a small Octagonal shape and semi-sprung floor, in the form of a Black Box Theater; which enabled minimal distractions. I felt this space offered the best opportunity for my project, and helped to ensure the environment that allowed the child the feel comfortable and engaged with me as the facilitator.

(Image 1: Image of the dance studio)

In the planning stages (during year one of the PhD) I began to make contact with the Deputy Head Teacher of the school, spring of 2015, as the plan was to begin in the 2015/16 academic year. Therefore, we met to discuss which children might benefit from the project. The meeting was fairly informal as the Deputy Head was familiar with my work, from my previous employed role. She suggested children likely to benefit from one-to-one engagement, had underdeveloped verbal communication and were being supported to develop more confidence in social settings. The only form inclusion criteria was a diagnosis of autism. During this meeting we agreed which day of the week I could have access to the dance studio, and she assured me I could occupy it for a full day. Unfortunately, in the July of 2015, the Deputy Head I had been liaising with moved to work in a different school, meaning I needed to reintroduce my project to the new Deputy Head, who was suggested as my new point of contact.

The delay caused by the appointment of a new Deputy Head Teacher was mirrored by many other roles changes within the school structure, meaning September was a very busy month for her. So, we agreed that waiting until after the October half term (2015) would give the school chance to settle into the changes. The extra month gave me time to begin the ethical approval process (evidenced in Appendix 1) and obtain consent from the parents/ guardians of the children who would be participating in the research project, and created a schedule of work:

Dates: 2015/16

October: 26th
November: 2nd, 9th,16th, 23rd, 30th
December: 7th, 14th
Christmas Break
January: 11th, 18th, 25th
February: 1st, 8th
February Half Term
February: 22nd, 29th
March: 7th, 14th, 21st
Easter Break
April: 11th, 18th, 25th
May Day Bank Holiday
May: 9th, 16th, 23rd
May Half Term

When returning to the school I was informed that the school had identified 11 possible participants, which was a large enough group to ensure variety, yet remained a number possible to work with in the suggested in one day per week the school could commit to. Following this, I then created a timetable for the day itself, to support the school in preparing the child and for the class teacher to build it into other ways the child is given information about upcoming events:

Time Slot	Child's Identifier
9.00 – 9.20am	Child 1
9.20 – 9.40am	Child 2
9.40 – 10.00am	Child 3
10.00 – 10.20am	Child 4
BREAK TIME	
10.50 – 11.10am	Child 5
11.10 – 11.30am	Child 6
11.30 – 11.50am	Child 7
LUNCH TIME	
1.10 – 1.30pm	Child 8
1.30 – 1.50pm	Child 9
1.50 – 2.10pm	Child 10
2.10 – 2.30pm	Child 11

(Table 1: Original timetable for participants)

Shortly after the initial meetings the school, I discussed this with my, then, Director of Studies Martha Blassnigg about how, and when, I should introduce the live feed cameras into the sessions. From this discussion it was clear we both agreed that I would need around 4-6 weeks with the child, without the technology, to begin to build the trusting and familiar relationship, an important part of my process with any children I work with. I then arranged to meet a member of the technical support team in the Performing Arts department. We discussed my aims for the documentation and how I would be able to use live feed project the recordings of the sessions, in real time, onto the walls of the dance studio.

This meeting allowed me to also make decisions about how to document the interactions, coming to the conclusion that I will create a triangle of cameras consisting of two mini action cameras which, due to their size, would be discretely fixed to the wall and then I would only need one camera on a tripod (for the live

feed). Regarding the set up for documentation, this suggestion would allow me to revisit the whole session once it is complete, as the studio space allows us to work in a 360 degree setting without the designated “front”, seen in traditional forms of teaching (both school based and dance training). This set-up also allowed me to record and replay the subtleties of the interactions, and fully capture the complexities of the movement and my mimicry of it. I feel this enabled me to use this combination of footage, as a mnemonic, to later reengage with a complex interaction, between myself as facilitator, and the child as participant. Regarding the live feed process, this meeting was influential in decisions about the camera used, the need for HDMI cable and to ensure the projector had the capacity to receive HDMI. The final set up can be seen in the image below:

(Image 2: Image of camera set up in studio)

Modifying the plan

As mentioned above, some of the structural changes within the school pushed the start date back from September 2015 to November 2015. This subheading now outlines some of the other contributing factors, and how I adapted to these challenges and changes along the way. The first significant event to mention here is the untimely death of my original Director of Studies, Mather Blassnigg. This came very suddenly, whilst she was travelling abroad, naturally resulting in delays and discrepancies throughout the PhD process due to the grief felt. This

grief was experienced by the whole department and caused many of us to slow down and take time out before settling into our academic life without her support. Of course, on top of the emotional processing that needed to take place, this also meant some of the formalities of the PhD process dropped behind schedule, and there were logistical changes that needed to happen. The first issue I wish to mention here was the quality of my original ethics application which was rushed through, resulting in a number of amendments. Secondly, and more significantly there were changes to my supervisory team which saw Michael Punt moving from the position of Second Supervisor, to my Director of Studies and for the Second Supervisor role to be replaced by Dr Hannah Drayson[109].

Although their involvement provided many positives and new insights, the one area of support that was specific to Martha's experience and expertise was in anthropology. It was through Martha's advice that I decided to implement the Participant Observation method and of course her death had an effect on the ongoing process in terms of reduced support and advice in this area. It didn't take away from my passion and plans but I feel might have been documented or presented slightly differently with her support being there. Also, with her death being in the September of 2015 I felt I had to continue with the original start date of October despite, upon reflection, not being ready (mentally or formally) to begin work, but I was very anxious about further delaying the start date.

In terms of the work with participants, during this time there were also changes to the plan than had been created in July. The first difference seen was the number of participants that I began working with. The original number suggested was 11 children, by the time the sessions began in the school, there were seven pupils continuing. This group originally consisted of three females and eight male pupils, yet the final seven resulted in one female and six male pupils. As mentioned the sessions were scheduled to run once a week for around 20 minutes per pupil. This meant that the reformed timetable looked as followed:

[109] Lecturer in Digital Art and Technology/Immersive Media Design and long standing member of Transtechnology Research.

Time Slot	Child's Identifier
9.20 – 9.40am	Child 1
9.40 – 10.00am	Child 2
10.00 – 10.20am	Child 3
BREAK TIME	
11.10 – 11.30am	Child 4
11.30 – 11.50am	Child 5
LUNCH TIME	
1.10 – 1.30pm	Child 6
1.30 – 1.50pm	Child 7

(Table 2: Second Timetable for Participants)

At this stage I could see that the reduced number of participants offered a more realistic schedule for the day as the original plan has allocated 20 minutes per pupil, with each slot being back to back. Upon reflection, this was a naively optimistic plan as it would have meant only 10 of those 20 minutes were in the studio, as I had not accounted for the time to collect/return the pupils to their class or the time to reset the room. The timetable for the seven pupils allowed for 40 minutes per pupil and gave me the chance to reflect and process the experience after each session and get into the habit of creating *field notes*.

I had originally planning for at least 20 sessions, with the original dates allowing for 23 sessions per child to ensure a contingency time of 3 sessions. As the sessions did not start until the 16th November 2015, a further two weeks behind schedule, the contingency time was reduced. As the process began, it was clear that there would be a need for more than 20 sessions. This was for a number of reasons but also before it didn't feel comfortable to introduce the use of live feed camera footage, of the interactions, as early as anticipated. There were two additional deciding factors; the first was an injury to my wrist resulting in ligament damage to my left wrist. This was caused by an untreated injury in the November that progressively worsened. I was told that the recovery for such an injury was reliant on a number of weeks of rest in combination with treatment from a physiotherapist. This process lasted, in total, 5 weeks before I was able to return to the school and continue the research causing a 5 weeks delay. To mitigate the loss of I arranged to continue the next academic year.

This had an impact on the work with children as when moving across the

academic years, this meant the participant numbers again dropped, from the seven that had begun the initial stages, to the final number of four children, all of whom were male. The additional three pupils that had begun the project did complete between six and eight sessions, in comparison to the final four completed 24 – 25 sessions[110]. The reduction of participants was firstly due to the remaining female participant changing schools, the other two pupils were not able to continue due to lack of availability on Mondays. As mentioned before the idea was to introduce the live feed processes around week 6 (in line with the minimum of 12 sessions and this being the mid point). The change of dates and injury meant that the first academic year only saw a maximum of eight sessions, with any one child, so I decided not to introduce the live feed at this point.

The secondary factor was within the school itself, and the studio space that I had originally been told had been booked out for a whole day on a Monday, yet, by the October there was a clash in times. I was now not able to access to the studio until 10.30am. This soon changed again and this same child was to be given one-to-one support in the space all day on a Monday, which was delivered in a small corridor space behind a curtain, shown in the photograph below.

(Image 3: Studio showing position of curtain)

[110] See the full participants log in the Appendix 5 for the full list of sessions per participant.

Rationale and Practical motivations

When considering the practical motivations, it is key to reflect on research presented thus far. The thesis attempts to refresh the relationships with technologies by presenting an alternative way to embed them into the education sector, through adaptation. In my PhD project the chosen adaptation was through the live feed footage, filmed in the session, projected into the space where the interactions were taking place, which simply required a camera, HDMI cable and a projector. This simple adaptation took technologies commonly seen in the education section and allowed a social experience to be encouraged alongside the interactions with computer technology. By appropriating Keay-Bright's statement regarding her own research project, Interactive Play (2008), the benefit of this approach 'is that it shifts the focus away from the functional demands of the technology towards encouraging users to explore, create and communicate through the actions they perform' (Keay-Bright, 2008: 8). This statement is a useful description to explain why technology was applied through the PhD project, and considers the technology as being embedded to amplify and extend the possibilities for autistic children, through social embodied interactions.

My approach has been supported by comprehensive knowledge about the ability to develop socially and communicatively, and was applied in collaboration as three principles (empathy, mimicry and touch) in the development of an approach designed specifically for autistic children. Once these key principles were established and understood in terms of the fundamental elements of the interaction, the use of ICT was seen as an opportunity to enhance the child's social, experiential, knowledge, rather than further isolate the child through solo engagement with technologies, which may cause a plateau, or decrease, in social and communicative development. This approach also offered the chance to create an environment individual to each child participating, by encouraging improvisation as a way to promote individualised facilitation. This gives purpose and attention to the benefits of the engagement itself, rather than deciding what should be the end behavioural goal (seen in so many interventions). By using the movement sessions as a method in this research project it is possible that embodied practices offered a complimentary appreciation of mimicry and touch as access to empathy, as a core concern. By applying this research in practice, it

was possible to acknowledge the limitations of the traditional and therapeutic interventions whilst also expanding on the work of Shaughnessy and Keay-Bright.

This understanding allowed the connection between childhood development and position of mimicry, and touch, to be comprehended and connected to ideas of *self* and *other* in the conversation of empathy, and the need for self-referential abilities to assist in this developmental process. As referred to previously in this thesis, Lombardo et al., state that there are 'several ways that self-referential cognition and empathy are inextricably linked' (Lombardo, et al., 2007). This understanding gave weight to a research project, beginning as a process of exploring one's intuitive responses to autistic children, and later supported by the research evidencing the importance of the practice within education and research. Therefore, empathy and mimicry are the first of the three key principles carefully considered to enhance an approach designed for those with social difficulties.

The early considerations of this thesis have briefly introduced the importance of mimicry, empathy and touch in the development of social skills, and the ways in which these have been underappreciated by the education system, also influenced the interactions themselves. The rationale being (as this thesis understands) that the use of technology in educating autistic children limits the placement of social and human interaction, and more specifically the experiences of empathy, mimicry and touch. The practical research therefore focused on these three themes to allow for their benefits to be evidenced when reporting findings throughout this sixth chapter, and to further support the need to re-evaluate the placement of technological interventions that have become commonplace, in the education of autistic children, with little adaptation.

The presentation of these themes, individually, allows for a brief introduction into their role in childhood development, how they relate to the diagnosis of autism, and lastly how the connect with each other collective within the practical research especially as all three have a vital role to play during the infantile years of all children. Empathy is seen here as an output of the successful inclusion of mimicry and touch by a child's primary care giver, and in doing so has the ability to support the child to understand *self* and *other.* It is only whence this skill is understood by the child that empathy can be developed.

Therefore, this thesis proposes that the facilitation of individualised sessions with autistic children, such as the practical research supporting this thesis, offers an understanding of how empathy, mimicry and touch can be applied as tools to support an autistic child's holistic development alongside computer technologies. Empathy, mimicry and touch are vital for autistic children's holistic development, especially in education, as they allow the child to continue experiencing such interactions that afford social and communicative skill to progress past the infantile years. When used together alongside technology it also allows the child to develop social experiential knowledge in their interactions with technology by removing the conventional solo user set up, whilst offering a digital mimicry by use of live feed footage. These considerations will be further addressed through the remainder of the chapter, yet at this stage, this presentation of knowledge is offered as a way to contextualise the impending information and allow the reader to begin to question why technology is not more readily embedded into social and creative settings and why empathy, mimicry and touch are not more readily prioritised as important tools when interacting with the autistic child.

Childhood Development: Empathy

With the movement sessions being a method in this research the process of embodied practices offers a complimentary appreciation of mimicry as access to empathy, as a core concern and key research principles, when reflecting on childhood development, cognitive science, social skills and language acquisition.

> Mimicry and the imaginative transposition of oneself to the place of the other are no doubt elements of empathy, but they are founded on more fundamental pre-reflective couplings of self and other at the level of the lived body: it is the passive (non-voluntarily initiated), pre-reflective experience of the other as an embodied being like oneself that sets the stage, as it were, for mimicry and the more elaborate mental act of imaginative self-transposal. (Thompson, 2001: 12)

This understanding allows the connection between childhood development and position of mimicry, in this process, to offer insight to ideas of *self* and *other* in relation to empathy, and how self-referential abilities assist this developmental process. Therefore, empathy and mimicry are considered to offer a context to the practical research endeavour, whilst also reflecting on their relationship to the diagnosis of autism. The movement sessions themselves naturally began to

employ mimicry, and further research into its application in childhood development highlighted how it offers access to empathy, by reflecting on Evan Thomson's consideration of the body and 'pre-reflective experience of the other as an embodied being' (2001: 12). This statement is important in understanding why mimicry is such a key tool in the interactions with autistic children, and how the reflexive approach shaped the theoretical focus. After all, as Thompson (2001), citing Goldman, endorses the idea that 'Empathy, on this view, is a special case of mental simulation, in which the output states are affective or emotional states: empathy consists of a sort of "mimicking" of one person's affective state by that of another' (Goldman, 1995 in Thompson, 2001). This clearly attributes the development of social abilities, as the enacting both empathy and mimicry, in a circulatory developmental process where each influence the other; which became a key consideration also allowing this PhD to be distinct from the interventions previously introduced through the thesis.

Despite the fact that 'empathy is a commonly used, but poorly understood, concept [and] it is often confused with related concepts such as sympathy, pity, identification, and self-transposal' (Davis 1990, 32), it is a humanistic process of social behaviour allowing us to relate to others, and is reliant on embodied interactions. It is understood as a subconscious experience of applying the situation to one's self to the other by imagining the feeling we would get if we were in that situation. The more complex side to empathy as a social skill develops as we gain social maturity along with the ability to understand *self* and *other*, as emotional mimicry takes place as we empathise.

Carol M. Davis' article *What is Empathy, and Can it Be Taught* (1990), expands on this, as Davis concludes that it cannot be taught, per se, but is intrinsically linked to social understanding, and linked to embodied, not just cognitive experiences, and develops into complex empathetic understanding through the teenage years. 'Empathy seems to be a communication process that develops as we mature. Cognitively and emotionally mature people should be capable of experiencing empathy' (Davis, 1990; 35). By also connecting empathy to communication it is apparent that if the autistic child has underdeveloped cognitive abilities, limited complex empathetic understanding is often

evidenced[111]. When considering the need for maturity, as Davis describes it, it is important to address the need for an understanding about the *self* and *other* in this process. This allows focus to shift to the embodiment of empathy and how this aligns with the sociability of humans, and primates alike.

Empathy itself has a discernible relationship to autism through a variety of literature, and it is often claimed or assumed that all people with autism lack empathetic understanding. If we consider that empathy is a social skill reliant on emotional mimicry and imagination as well as being a communicative process (as Davis states above) then it is understandable how this assumption has come into fruition. Yet, even the likes of Simon Baron-Cohen are considering the problems of this assumptions through personal experience, explaining that the autistic spectrum is just that, a spectrum, and is therefore too broad and individual to make such generalised statements about the specifics for each individual with the diagnosis. This is a similar response to a consideration presented earlier in this thesis, regarding the overwhelming positive evidence for the integration of technology in the education of autistic children. To support this theory, Baron Cohen presented some distinctions:

> I've met hundreds of [autistic people] over my career and my experience tells me that whilst most people with autism struggle with the cognitive aspect of empathy (also known as 'theory of mind'), most have intact if not well-developed levels of affective empathy (caring about others, and wanting to alleviate their suffering). (Baron-Cohen, 2014: 800)

Likewise, my experience of interacting with autistic children led to my agreement with his statement. The differences between individuals, when it comes to autism (and any child for that matter), can be subtle or distinct, and the level of empathetic understanding therefore varies. So, the approach developed through practical research was not to encourage, or focus on, empathy being developed as a goal for the child, it is more a consideration in terms of the delivery and facilitation and the decision to embed mimicry in the process. If we can replicate elements attributed to the development of empathy, social skill, and language acquisitions, by employing mimicry as a technique, whilst encouraging holistic development, as seen in the infantile years, through embodied interactions.

[111] These ideas are important for this particular research project, as the group of children participating in the primary research have been highlighted as having a cognitive developmental age much lower than their chronological age.

A thorough understanding, of the association between mimicry and complex empathetic understanding, it is clear that they were more than just aligning in the research supporting the development of my approach. This research has utilised the 2007 paper by Lombardo, et al., where they describe the link between self-referential cognition and empathy as being inseparable (Lombardo, et al., 2007). This understanding, as mentioned previously, supported the research project and allowed for the initial intuitive responses to autistic children to be understood theoretically leading to its more formal use as evidence of the importance of embodied interactions in the sessions facilitated. The iterative approach was not only influenced by the theoretical understanding of both autism and childhood development, but also by the training experienced in Contact Improvisation and Somatic Movement Practices.

> Somatic inquiry, essential to so many integrated psychotherapeutic approaches, especially when working with pre-verbal and other deep issues, instructs the practitioner how to work at depths and delicacies without projecting or interfering. (O. Weaver, 2006)

Therefore, this training allowed for the one-to-one and individualised work to be a priority through the practical research. Not only this but the training in Somatic Movement Practices also encourages a process of reflexive learning that encourages the practitioner to take theoretical knowledge into the embodied experience, and knowledge gained from the embodied experience to also, in turn, lead the practitioner to new theoretical interests and endeavours. For this thesis, the theoretical knowledge has been prioritised through chapters One – Five, to respect the traditional PhD format, but it is through the reflexive practice that they had impact on the participants involved, by implementing the participant observation method.

> In general, children's' embodied cognitive processes mirror those of adults. However, the development of such processes depends on children's individual and age-related physical characteristics, their inherited abilities, and their practical activities played out in a physical and social environment. (Antle, 2013: 31)

These individual characteristics were also appreciated by the decision to apply one-to-one interactions within the sessions facilitated, which inherently supported an individualised approach. The process of embodied interactions itself is a term used within movement practices such as Contact Improvisation and Somatic

Movement Practices[112], but has also been introduced throughout this thesis via the work of Alissa Antle:

> Embodiment means how the nature of a living entity's cognition is shaped by the form of its physical manifestation in the world. Embodied cognition is a perspective based on the notion that psychological processes are dependent on and shaped by aspects of the body including body morphology (form), sensory-motor systems, and interactions with the surrounding world. (Antle, 2013: 31)

To reflect on this understanding within autism research empathy is often seen to be often limited, except when social understanding is developed, as those who are more mature socially evidence stronger empathetic responses to others. This embodied social instinct, can be connected to an embedded need for social experiences, and through this complex empathetic understanding is developed. In Thompson's text *Empathy and Consciousness* (2001) he quotes the work of Janet Wilde Astington to explain that 'between the ages of two to five, children begin to be able to interpret themselves and others in human psychological framework of thoughts, feelings, beliefs, desires and perceptions' (Astington, 1993 in Thompson, 2001).

When reflecting on the variety of research concerned with the contributing factors for the development of empathy, the majority of the literature also makes connections to the process of language acquisition in childhood development, which was also reliant on the use of mimicry through the embodied interactions. For this PhD investigation, it was vital to acknowledge the involvement of gestural communication (considering both the verbal and nonverbal elements) and the importance of understanding the *self* and *other*, along with maturity of social understanding, and the use of mimicry. When initiating a more formal connection between mimicry, and an understanding of the *self* and *other*, through explanations of complex empathetic understanding the following idea was explored:

> This concept is interesting, in its connection to the understanding of empathy and neuro-typical development from a self-referential viewpoint, in combination with childhood imitation as a development tool. […] It is understood that by using kinaesthetic and proprioceptive awareness to understand one's own body, and

[112] When considering the work of the (so say) 'grandmother of Somatic Psychology and Body Psychotherapy' Judyth O. Weaver states her motivations were as followed: 'She wanted freedom for people to explore independently and to develop individually – a way to experience and learn from one's own somatic behavior in all of life's situations. Her work developed, offering opportunities for each person to become more aware of what was happening in their own organism' (O. Weaver, 2006)

> the bodies an individual interacts with, it is possible to develop a complex level of empathy. (Jackson, 2014: 209)

This is also the rationale behind the third component of the approach, which is touch. By introducing the theme of touch in this chapter, the intention is to address the need, that Thompson describes to support the ability to understand the physicality of the body, and other bodies, and objects, a like.

> This experiential grasp of inter-subjective space is a condition of possibility of one's ability to experience one's own living body as a physical body like other physical things in the world. If one were confined to one's own first-person point of view such that one had absolutely no empathetic openness to other (an impossibility because of the open inter-subjectivity of consciousness), and hence to how one would be experienced by another (empathy as the experience of myself as being an *other* for you), one would be incapable of grasping that one's own body in physical object equivalent to the other physical things one perceives. (Thompson, 2001: 19)

With touch playing such a large part in childhood development it is presented as being equal to mimicry in this approach due to their complementary involvement in social development. It seems clear that both are important pieces of the larger network of research encouraging knowledge surrounding the importance of holistic developments through embodied experiences for the all children, but in particular those with autism.

Childhood Development: Mimicry

As mentioned above, the application of mimicry was intuitively embedded in the practice as a way for me to build a relationship, offer a chance for engagement and self-reflection (for the child) and a chance to me to learn more about the child's ability and interests. Since on the discussions within childhood development studies the importance of mimicry was comprehend due to its placement in a wider developmental setting, as well as its connection to developing empathetic understanding. In her paper *The Social Role of Imitation in Autism* (2010), Brooke Ingersoll states that 'changes in imitation [are] associated with improvements in other social-communication skills, including language, play, and joint attention' (Ingersoll, 2010: 2). Therefore, there are evidential advantages to its application within the practical research elements of the PhD, with autistic participants. Childhood development inherently links human interaction as being socially motivated with by caregiver, as well as the peers,

with particular emphasis during the infantile years, which shares its time of development with empathy.

> For example, in typical infants, early face-to-face interactions with caregivers are often characterised by mutual or reciprocal imitation in which both the caregiver and the infant engage in imitation of the others' vocalisation and facial expressions. (Ingersoll, 2008: 108)

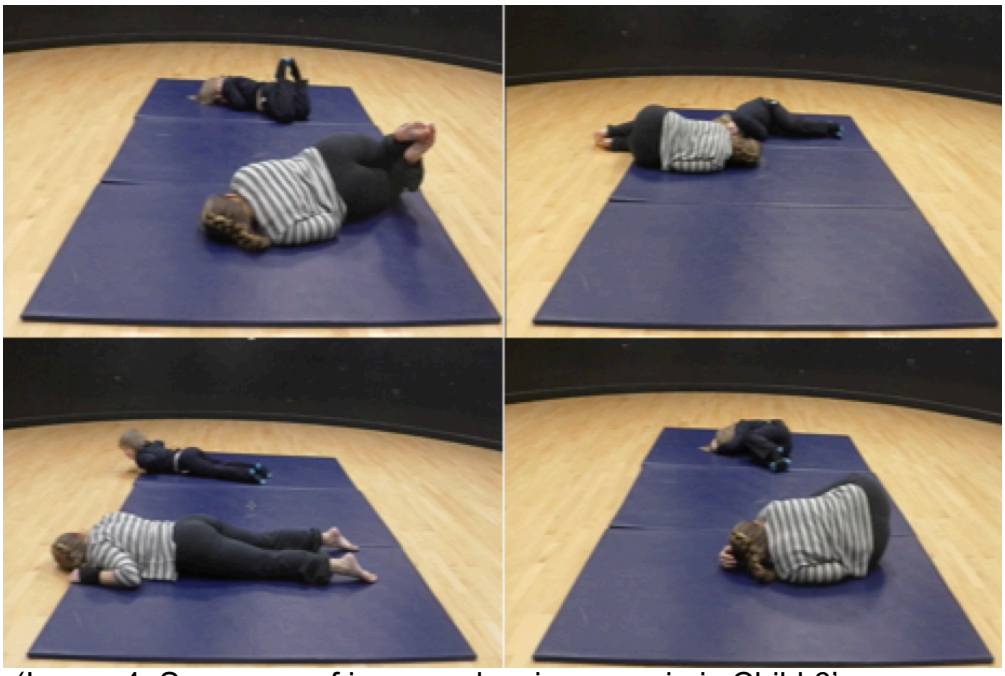
Ingersoll goes on to explain that by using mimicry within playful interactions the infant learns to communicate for social interest and in the process, develops comprehension of shared interaction and communicative turn taking. Due to this, and through the literature supporting early childhood development, the process of mimicry is emphasised as an imperative feature through the holistic development of the infantile years. This vital progressive stage insights experiential knowledge of *self* and *other*; a consideration increasingly refined as we mature. As previously mentioned, Thompson (2001: 12) addresses the idea that mimicry is a vital component of empathy, especially when it comes to the ability to imagine the others' situation, and connects this with the lived body and embodied experiences of *self* as well as *other*, where physical and mental mimicry both take place.

This understanding allows the connection between the childhood development of neuro-typical children, and position of mimicry to be comprehended and connected to ideas of *self* and *other* in the conversation of empathy, and more so the need for self-referential abilities to assist in this developmental process. Therefore, the position of mimicry becomes clearer the as the three key research principles applied in the practice. After all, if we again consider Thompson's (2001) use of Goldman (1995), the connection between empathy and mimicry are considered to be interlinked. Goldman is suggesting that the process of empathy is in fact a metal mimicry of the *other's* emotional state. This research also connects to Lombardo, et al. (2007) and the statement relating self-referential cognition and empathy as being co-dependent; an understanding considered for its ability to ground the placement of mimicry and empathy as having equal importance through the practical research. Through this more thorough understanding of the association between mimicry and complex empathetic understanding it was clear that these elements were more than just aligning in the research supporting this project, and they were intrinsically linked.

With this thesis reflecting on the role of mimicry in empathic experiences, the phenomenological processes highlighted by Thompson shows how the abilities develop. The importance of social human interaction is paramount, which the thesis also discusses through use of the term embodied interactions[113]. In particular, when considering the neurodiverse population and diagnoses such as autism, understanding the connection between neuro-typical childhood development and the development of complex empathic experiences can give focus to an area of research that is often under-acknowledged[114]. Through the comprehension of human interaction, self-referential abilities, and embodied interactions the cognitive abilities needed to produce complex empathic responses are linked to the ability to mimic as an infant, as exemplified by Thompson, Goldman, Davis, Ingersoll.

This thesis proposes that by applying mimicry, when working with those who have social difficulties, it is possible to facilitate the development of social interaction, social communication, and social imagination[115], by using one's own empathic understanding (as the facilitator) projects acceptance and understanding into the interaction, and replicates interactions experienced in the infantile years. This consideration relates directly to the comments Shaughnessy (2013: 322) makes on the two-sidedness of the *Theory of Mind* and how those working with autistic individuals must employ this in order to best support and design for those with autism. Here, this is expanded on to situate the need for empathy to be reciprocated between the autistic child and the adults supporting them, as a key concern of the thesis due to it being underappreciated or at least under-acknowledged by other interventions and research projects presented in this thesis.

[113] A term developed by Paul Dourish (2004) and introduced through the work of Alissa Antle in Chapter Five.
[114] Here this is primarily considered in the case of industry who have been shown to under-acknowledge such research when designing technologies for autistic children. Yet, the use of mimicry is often also under-acknowledged by those educating autistic children, as well as in many research projects brining technology into this setting.
[115] Three elements of social development collectively referred to as the *Triad of Impairments*.



(Image 4: Sequence of images showing me mimic Child 6's movement)

As a practical solution, it is proposed here that consolidating information about the development of empathic responses, and the noted difficulties in social skill development for autistic individuals, the link between self-referential abilities and the need to visually comprehend interactions in order to mimic is also a connection undervalued through interventions. This is again a consideration addressed through the practical research reflected upon through this chapter.

(Image 5: Sequence of images showing me mimic Child 3's movement)

These responses to literature lead to the understanding that the PhD approach, developed through the practical research, could aid the ability of those with social difficulties, to empathise with others, which is further supported by the incision of technological adaptation allowing the child to visually see, and therefore mimic, themselves and the other (in this case myself as the facilitator) thorough the projected live feed footage. Research by Ingersoll again supports these claims by outlining 'the social function of imitation and its role in the development of social communication skills' (Ingersoll, 2008: 107), which can be enhanced further through the inclusion of technology:

> By creating technological methods of interaction (visual displays and physical robots), play and comfortable interactions can be garnered from children with autism. There is a feeling of "safety" by having the main form of interaction occur with non-humans. Further, these devices allow the child, rather than a third party, to be in control of the interactions. This research has much potential. To date, however, it has not focused on encouraging more communication-based activities, such as speech and human- to-human interaction. (Hailpern, 2007: 48)

When reflecting on the various research concerned with the contributing factors for empathy development, literature also makes connections to the process of language acquisition in childhood development, also reliant on mimicry through interactions between the child and their primary care giver. It is understood that communication is also developed following the ability to understand the *self* and *other*, along with mature social understanding, and mimicry, which again shows how empathy and mimicry are interlinked, but also how embodied interactions focusing on holistic development are increasingly important.

With the placement of mimicry and empathy being vital throughout this thesis, as applicable tools to support social skill development they quickly become more pertinent to the PhD project in general, therefore they are important themes to unpack in this chapter. Mimicry can be connected to all children's cognitive development, as their abilities to understand *self* and *other* are further supported by the visual elements of interactions. This is a consideration of Phoebe Caldwell, when discussing *Intensive Interaction.*

> When repetitive behaviours are reflected back, the person recognizes and accepts them, but he/she is surprised that they come from outside him/herself. This surprise, which is often visible, leads him/her to search for an external source and draws his/her attention to the outside world. (Caldwell, 1997: 751)

Here her comments are interpreted for the importance of mimicry with autistic individuals and creates awareness for more holistic experiences where mimicry is applied as a tool. Embedded in the discussion of *Intensive Interaction* is the use of touch; advocated for by the founder of the intervention David Hewett. In his 2007 publication Hewett rejects opinions against the use of touch in education (which stems back to touch too quickly being deemed as inappropriate or misconstrued). In doing so he promotes touch for its developmental benefits and for its use to support those with Special Educational Needs to build social skills, but also to support sensory needs.

His statement gives focus and attention to the need for physical contact through the process of learning about *self* and *other*. By learning about the physicality of one's own body, we are also enhancing our abilities to understand the physicality of another's body. Effectively, such experiences have a positive impact on the development of complex empathetic understanding, as is a theme supported by Thompson's paper (2001). With empathy and mimicry now shown to have deep connection to touch, in the infantile years and by being advocated for through research and existing interventions.

Childhood Development: Touch

By addressing touch, as a key component of the practical research, the intention is to address the benefits of its application to support the ability to understand the physicality of the *self* and *other*, and objects, alike. The significance of this skill is described by Thompson:

> This experiential grasp of inter-subjective space is a condition of possibility of one's ability to experience one's own living body as a physical body like other physical things in the world. If one were confined to one's own first-person point of view such that one had absolutely no empathic openness to other (an impossibility because of the open inter-subjectivity of consciousness), and hence to how one would be experienced by another (empathy as the experience of myself as being other from you), one would be incapable of grasping that one's own body in physical object equivalent to the other physical things one perceives. (Thompson, 2001: 19)

With touch playing such a large part in the childhood development of all children, it is no wonder that many children naturally made physical contact with me during the interactions facilitated. Therefore, it is seen through the thesis as being of equal importance to mimicry due to also being vital through the infantile years,

and supports the larger network of this thesis argument outlined through previous chapters and the sections above address both empathy and mimicry.

Within the diagnosis of autism, the *Triad of Impairments* can present itself in many different ways, individual to the child holding the diagnosis, yet; 'sensory functioning is recognised to be different for [autistic children]' (Cullen, Barlow & Cushway, 2005: 183), when discussed in comparison to neuro-typical children. Even subtle sensory sensitivities may be evidenced through visual or auditory stimulation or tactile sensations including physical touch of another human or animal, clothing, food, heat, etc. Temple Grandin discusses touch from her personal experience, as an autistic woman, of developing the *hug machine* and her work with livestock, but clearly articulates the need for positive experiences of touch:

> When I first used my squeeze machine it was overwhelming, too. I had to force myself to relax into it and let the good feeling wash over me. Today I think it's very important to desensitize autistic children to touch, because all children need to be touched. It's not that autistic children don't want to be touched; it's that their nervous system can't handle it. A lot of occupational therapist have ways to work with an autistic child so that touch starts to feel much less intense and more normal. That's important. (Grandin & Johnson, 2005: 118)

Therefore, the discussion of touch, here, is seen to be important in understanding the development of social skills and cognitive abilities, as well as being addressed in connection to autism and such sensory sensitivities in this section. Throughout literature on childhood development, the sensation of touch is explained as being more important than vision and hearing, in the infantile years, so being considerate that those with sensory sensitivities who resist or find discomfort in touch, at a young age, sees the likelihood of such sensitivities remaining into adulthood if a positive association with touch is not reached. This was clearly articulated by Grandin above, but the likes of Cullen, Barlow & Cushway also discuss this in their text *Positive touch, the implications for parents and their children with autism: an exploratory study* (2005):

> Understanding more about the role of the senses for [autistic children] may help identify avenues for learning and skill development previously unexplored. Touch provides the first sensory input in life while a baby is still in the womb and continues to play an important part of how children learn about the world as well as being essential for children's healthy grown and development. [Autistic children] may be aversive to, and avoidant of, touch, they may also be hyper or hypo sensitive to touch and may display tactile defensiveness in the form of

> rubbing, scratching, withdrawal and negative expressions. (Cullen, Barlow & Cushway, 2005: 183)

A difficult obstacle in this discussion is that many schools, and similar institutions, especially in the UK, have become wary of using any kind of touch within their interactions between teacher and pupil/ adult and child, in recent years. This appears to connect to a fear that touch is too quickly regarded as unnecessary in such a setting, and as a consequence may be interpreted as inappropriate in the first instant, without assessing the need for touch when working with an individual a child. Yet, it important to consider when interacting with children who present a negative response to touch is the effects this can have on not only their development of the comprehension of *self* and *other*, but also their ability to gain social understandings.

> This is particularly important to consider when interacting with children who present a negative response to touch, and the effects this can have on not only their development, but also their ability to gain social understandings about the use of touch between peers, family, and members of authority. (Jackson, 2016: 150)

It is these considerations that help support the intuitive inclusion of touch in the early stages of the practical research. This reflection begins to evidence how reflexivity has allowed for the theoretical research to be applied in practice as well as the exploration through practical research supporting the areas of interest theoretically. When connecting the used of movement practices with autistic participants Stephanie Lord offers a chapter titled *Dance and Drama* (1997), in. Stuart Powell and Rita Jordan's 1997 book; *Autism and Learning.* Lord addresses the use of touch in such interactions and in doing so makes clear that this is not an issue to be overlooked:

> This poses a dilemma as many children we teach seem to find being held or touched highly distressing and avoid contact wherever possible. There may be understandable reasons for this as unpredictable and uncontrolled human contact has been described as frightening and confusing by [autistic individuals]. There may also be underlying sensory and motor disturbance that contribute to the avoidance of personal contact. (Lord, 1997: 85)

With the reality that an avoidance of touch in childhood has the possibility to effect developments socially, steps need to be taken to prevent the potential negative effects in later life. Consequently, this thesis proposes that those working to assist an autistic child's developing social and communicative

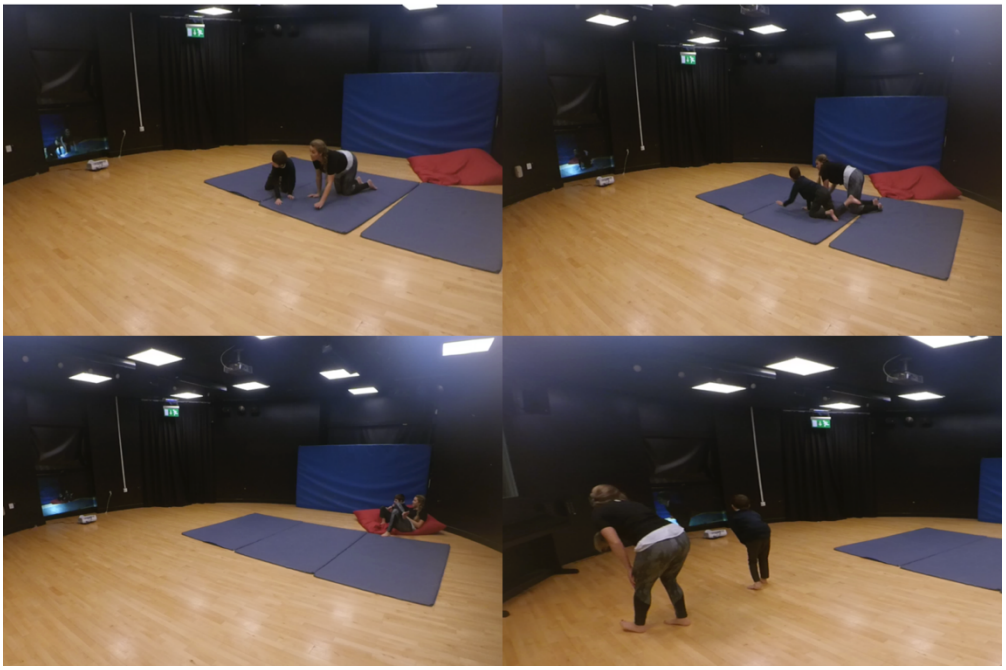
understanding, need to be embrace touch as an element included in the majority of the social aspects of life.

With acknowledgement of the contentious issue of touch with regards to sensory sensitivities, and the evidence supporting its use to, again, replicate key processes of childhood development through the infantile years, in its application through the practical research, this section focuses on embodied and holistic approaches. Therefore, touch is purposefully included within the interactions to support an embodied experience and to allow the children to feel physically present, in an interaction that embeds new approaches to encourage more embodied forms of experience and holistic development when relating back to the understanding of one's self in the development of empathetic and social understanding.

Impact on the school

Following the extended period of time working with these pupils, at the chosen autistic specific school, it became clear that the impact that I was having on the school was hard to track. Teachers would often stop me in the corridor for a chat about the sessions, or to give me feedback on the child development, but this was often a difficult time for me to truly capture the conversations and a formal interview was never possible due to their time already being stretch. Therefore, I eventually managed to sit down and chat to the Deputy Head, near the completion of my work, to discuss how things had been progressing.

I reported to her some of my own thoughts on the children's progress, and this was focusing only on the four pupils who worked through the whole intervention (ie. were introduced to the technological mediation aspect). I explained to her that Child 4 had started out with very little verbal exchange with me would produce small and repetitive movements over and over for a number of weeks. He seemingly had little awareness of me to begin with, yet over time he enjoyed me mimicking him and would slow down or pause between action to watch me until I had also completed it. When introducing the technology he enjoyed seeing his own image and would then watch me mimic him on the screen.

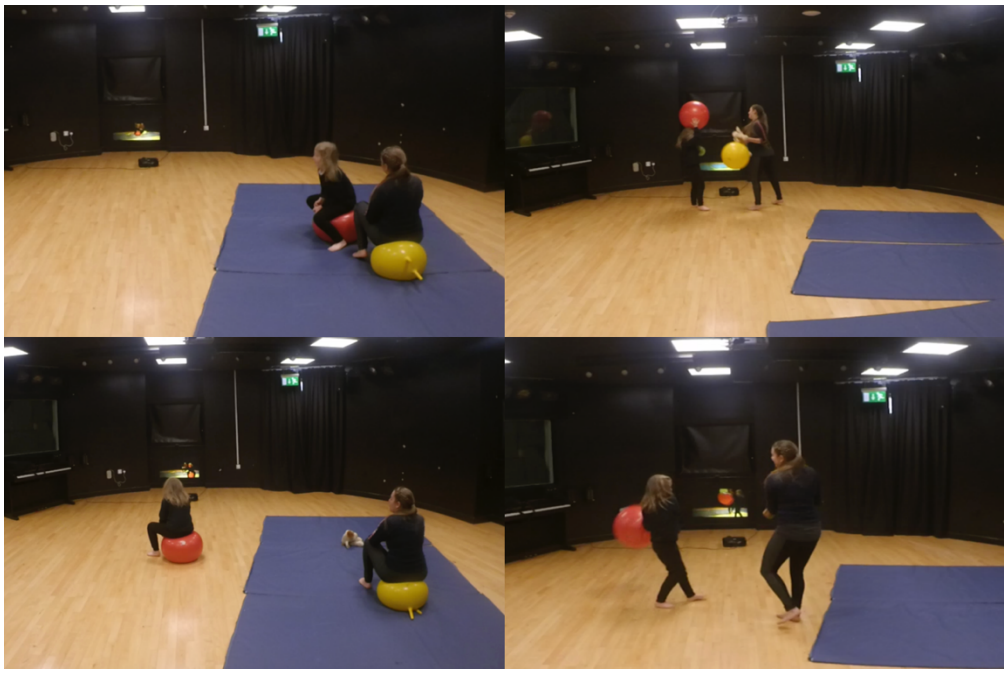


(Image 6: Child 4 interaction with live feed camera)

Child 5 was somewhat similar in that he was not actively engaging with me or my mimicry, but in this case, there was no verbal exchange and the child would run in circles around the room, week after week, and there was not much that I did to impact on this decision. This was until I introduced the camera, yet at first he would still ran past it, but soon realised he could see me, and then that he could see himself. In the images below you can see how curious this child became.

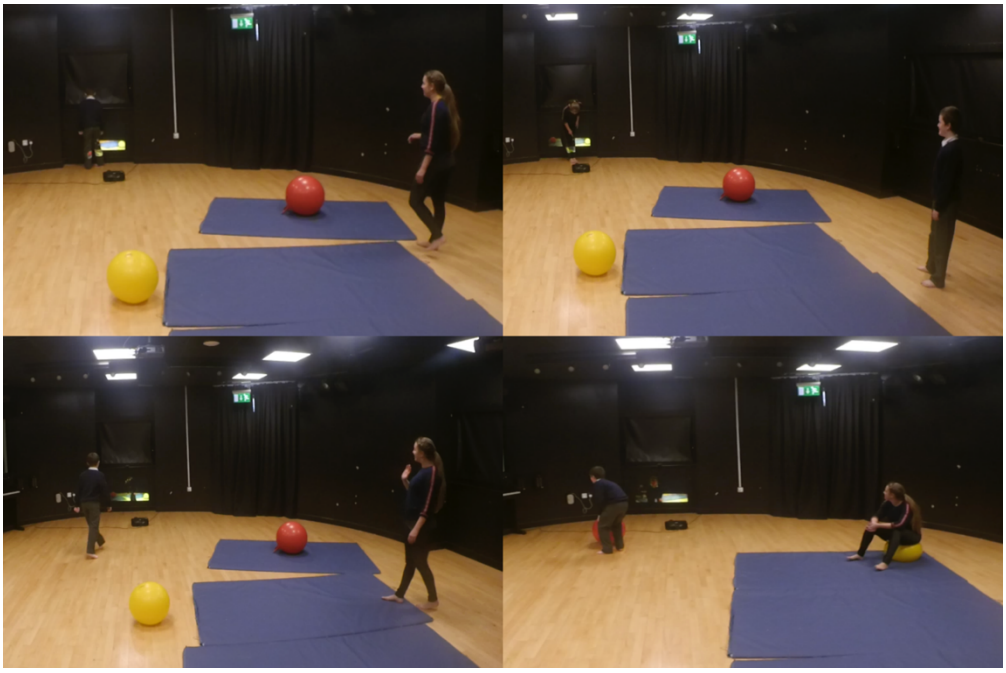
(Image 7: Child 5 interaction with live feed camera)

The sixth child I was working with was the most verbal and playful among all the children I have worked with. He used his imagination to create storylines and act out games, giving himself and me actions and characters. Here the mimicry came and went naturally and when it did appear it was often met with lots of laughter. He enjoyed the additional element of the camera and used it to play a digital game of hid and seek often, where we would take it in turns to mimic each other in view of the camera. In the images below you can see him moving the prop in and out of the screen.



(Image 8: Child 6 interaction with live feed camera)

Child 7 was also very playful, but clearly had a strong avoidance of failure so would often verbally explain what he wanted to do but found it difficult to put into action. Here the mimicry was often of me acting out his tasks to show him how it might work before him joining me and us doing this together. This child's confidence grew and grew over the weeks that we worked together, and by the time I had introduced the live feed camera he was curious and playful. He enjoyed experimenting with space and would often move close and then very far away from the camera, his sense of self and spatial awareness rapidly increased after the technology was brought into the sessions.



(Image 9: Child 7 interaction with live feed camera)

The Deputy Head found these observations extremely interesting and, along with a sense of appreciation, made it clear that the school wanted to embed some of the positives from my work into the school environment once I had left. Therefore, we can to the mutual decision that a short and informal booklet about the work would be the perfect solution to the lack of teachers' time.

She asked for the booklet to simply explain the rationale for the work, help teachers reduce their concerns around one-to-one work and to think more about the benefits of movement and touch. Therefore, I created this manual, with the help of a Graphic Designer, and managed to get a teacher (regrettably not from this school) to give me some feedback. Once the booklet was created, during the summer of 2018, it was sent to the school for feedback but with more changes in employment at the school, and a whole academic year having passed, there was no feedback received before the submission of this PhD.

By creating the booklet, I had the chance to also think about how the approach would be received and I now feel that, by nature of its individualised application it initially felt difficult to capture what an interaction might look like, but also how to describe an approach that, until this point, had no name. Therefore, I created the name MEDIATE; standing for *Mimicry and Empathy Delivered through Inclusive approaches to Autism, Technology and Education.* This title describes the approach but the word *mediate* refers to both the idea of mediation

between technologies and human interactions, but also makes reference to the use of *media* in its application. To accommodate the changing nature of the approach the following sections were included:

1. Introduction to the approach
2. Summary of research
3. Background to autism
4. How to begin
5. What to expect
6. How to encourage change
7. How to introduce technologies

In the two sections, 'what to expect' and 'how to encourage change' rely on short case studies and anecdotal evidence from my work with participants to show the teachers how the sessions might play out, and how to respond and work with certain types of children. The booklet is considered a first draft and having a working title, which is my it has not been heavily referenced throughout the main body of the thesis, but could be further developed to support the dissemination of this work into the education system more readily. The full manual can be seen in Appendix 6 of this submission.

Conclusion

This sixth chapter has made specific comments on the education of autistic children, in SEN provisions, to contextualise the argument further, and situate the practice more fully into the discussion. Through the practical research, an approach was developed, for the autistic child, to offer movement sessions that facilitated environments for holistic development. Alissa Antle's work regarding practice and the placement of movement in education, she states:

> Conversely, a lack of understanding of the importance of movement for cognition can only lead to an impoverished view since it ignores the way children (and all humans) create meaning through action. (2013: 31).

It was Antle's research regarding movement in the context of Human-Computer Interaction that offered this thesis connections between the principles of inclusivity and individuality to the world of movement practices. In accordance, the practical research created a setting in which the integration with technological mediation was applied to promote a developmental environment for autistic

children that embraces technology and social interactions; through embodied interactions.

> In this way, theories of embodied cognition can be used to frame and inform a design space in terms of understandings of the way children interact with their everyday world and how an interactive product might augment or support such interaction. (Antle, 2013: 32)

The concept of embodied interactions has been applied as part of the practical research during my PhD project and has been presented in this chapter to show how it developed into a theoretical understanding about the combination of such techniques and approaches in a shared space and time. Therefore, the sessions were designed with the individual needs of the child at the heart of the interaction. This approach aims to promote social interaction and engagement with computer technologies through the creative and responsive use of movement. By facilitating a movement sessions that combines principles from the field of dance, and the fields of childhood studies, cognitive science, and autism, evidence shows the need for balance a more balanced approach so that embodied interactions can be experienced through the inclusion of technology, and that these were not seen as opposing techniques.

Through literature from the field of childhood development the process of mimicry is emphasised as an essential feature through this important developmental period and is shown to be influential in the development of *self* and *other* as becoming increasingly refined. Within the practical research, the children are offered an opportunity to comprehend their effect on the social interaction as it plays out through visual means, whilst they have the choice to mimic the facilitator's digital image rather than engaging purely in human interaction, as this is so often avoided by many autistic individuals. This also proved to be particularly important as both mimicry and self-referential ability are evidenced as key processes prevalent in social developments and language acquisition – both verbal and nonverbal. Embedded in this discussion is the use of touch and how it gives focus and attention to the need for physical contact through the process of learning about *self* and *other*. 'As new haptic and tangible technologies are developing, this is changing, and the body is increasingly seen as a new form of interface' (Facer, 2011: 63), which is an idea that could see designers use interactive technologies to premise the physical more readily, or at

least begin to consider embodied interaction through the design period so that it doesn't stay underappreciated.

By focusing on the place of mimicry, empathy and touch in childhood development, the physicality of one's own body was shown to enhance our ability to understand the physicality of another's, thus having a positive impact on the development of both social skills and complex empathetic understanding. These skills are intrinsically linked throughout the literature of childhood development, and can be enhanced by technologies that allow for a visual representation of the child, and or interaction, to be accessed in an immersive environment that supports embodied developments, and is a way to respond to the detrimental effect that solo engagement with screen based technologies are having on the social integration of autistic children.

The dichotomy between ICT in education and information from the likes of Spitzer and Antle (regarding the value of embodied interactions for cognitive development) underlines this sixth chapter. The informed claims of this thesis, regarding the cursory introduction of ICT in education, and the concerns raised considering the unintended consequences of overexposure to ICT by children within the education system, with an increased concern for autistic individuals due to difficulties substantiated in the Triad of Impairments (Wing & Gould, 1979). Due to this, the malaise running through this thesis shows how to afford embodied interactions, mentioned above, alongside technologies that grant positive engagement for autistic individuals, not limited to those with higher intellectual abilities. Within the process of facilitating the interactions with autistic children the experience was prioritised as intuitive reflections from the interactions were then used to drive theoretical explorations. The purpose of this thesis is to acknowledge ways in which this research more broadly can promote change in the design industry, and intervention development, but is primarily interested in offering the teaching profession information that will assist in the adaptations needed to afford embodied interactions with technologies (for the autistic child). To support this understanding the first draft of a teaching manual has been created as part of this submission. It is an informal guide to the *MEDIATE* approach, as a chance for this thesis to begin to consider how the approach might be disseminated to the education of autistic children, and as a suggestion for the school worked within.

It shows that by applying mimicry, empathy and touch, it is also proposed that the facilitated sessions offered advanced knowledge surrounding the developmental process of children with the ability to apply these principles to allow social and communicative skill to progress for the individual children. When used together with the technology in this setting we also allow the child to develop holistically in their interactions with technology by avoiding, or adapting, the solo user designs.

> The literature provides strong evidence that interacting with technology often can motivate children with ASD. Further, existing literature shows that real-time visualizations, which act as social mirrors, can influence communication interaction [3]. Therefore, we see the potential of technology to aid teachers in the development of sounds, words, and speech; thereby contributing to what is an exclusively human-to-human interaction. By introducing technology into this form of treatment, we believe we can alleviate a degree of apprehension experienced by the children when interacting with humans, and provide teachers with a new technique to complement and supplement their existing approaches. (Hailpern, 2007: 48-9)

By outlining the practice in detail and giving the reader insight to the programme of work, rationale and structural decisions, and some information regarding the participants, the presentation of knowledge contextualises the research. The aim being that the teaching profession (and designers) begin to question the way in which technology is used within a school setting, with the hope that adaptation and the inclusion of embodied interactions with autistic children becomes commonplace. Therefore, the combined approach of using mimicry, empathy, touch and such technologies shows potential to be an important tool when interacting with the autistic child, and proves vital in the move away from screen based technologies, towards interventions used to created embodied forms of experience.

Conclusion:

To summarise the PhD project, the conclusion reflects on research presented to ascertain future uses, derived from the practical research findings. This section continues the establishment of alternative uses of technology, and the potential benefits for children interacting with them. The final aim for the conclusion is to recognise the specific argument developed, whilst also achieving the aim to encourage the wider application of this research, by the introducing the potential for movement and embodied interactions in education more broadly.

The PhD applied a number of fundamental elements in practice, influenced by educational and technological concerns, which included embodiment, mimicry, empathy, and touch[116]. These themes were discussed in the latter stages of the thesis when addressing the practical research process. The conclusion consolidates these ideas by summarising the work of key researchers to assist the overall topic of this thesis. With childhood studies extensively influencing the thesis (focusing on the developmental stage of social skills, play and language acquisition through the lens of autism as a diagnosis) it is important to consider this through this conclusion.

Throughout the earlier chapters this thesis, emphasis was given to research that reflected on education, autism and technology, but also studies that acknowledge The Arts, to support discussions of movement and dance practices alongside interactive technologies. This decision was influenced by my Dance Research background, which had direct influence on the PhD aligning with creative approaches as alternative interventions within the education of autistic children. Throughout the thesis these interests were evidenced through critical engagement with research focusing on the application of technology within education, particularly researchers offering an analytical understanding of the need for human interactions to be prioritised.

Therefore, adaptations to existing technologies, where interactive computer technologies are not accessible, was favoured as a solution embracing digital mediation as an embedded feature in a response to current practices in

[116] As well as these, the PhD research project is also a continuation of themes conducted throughout a BA Hons Dance, the Master of Research Dance, PGCert Autism (Children), therefore the thesis cannot do all of these different stages justice.

the education of autistic children. Whilst interactive computer technologies are increasing in education, my research project did not rely on the presence of such sophisticated devices; and instead investigated adaptations to existing technologies through the practical research within the PhD. As creative experiences are seen to offer a sense of social understanding I was keen to show the benefits for autistic children, in an approach applying movement in collaboration with ICT; evidencing the potential to increase the ability to support social development alongside a creative framework.

Part One

To review the thesis, the decision was made to work chronologically through the thesis chapters whilst reviewing how the Research Questions and Project Aims[117] have been responded to throughout. It is in Chapter One that the historical context of ICT's integration in education, offered a context in which to approach and understand the subsequent chapters of this thesis; which foregrounds the response to the third and fourth Project Aims[118]. By presenting the influence that technological advances had, on governmental decisions, gave insight the problematic integration of ICT and the pressures created for the teaching profession. Chapter One identified two main causes, first being the lack of involvement from teachers when decisions around ICT in education were made. Secondly was the commitment needed by teachers in order to understand and implement ICT rapidly, which generated bewilderment surrounding the choice of software, the need for regular updates and how to manage the disparity of access (between school and home) and the effect this had on the *digital divide* across the UK. These topics therefore also helped offer research supporting the fourth Research Question[119] by beginning to outline the uses of ICT in education (a topic expanded to autism specific uses in Chapter Four).

[117] Outlined in detail through the Thesis Introduction.
[118] Project Aim 3: To critically investigate audio visual technology in the context of creative movement, imitation and mimicry, and autism throughout a research project that will make links to research in these individual fields, whilst contributing to knowledge about human interaction. Project Aim 4: To explore the effectiveness of audio visual technology in the development of a creative intervention for children on the autistic spectrum, situated in reflexive movement principles and the benefits of human interaction.
[119] Research Question 4: How can research into technological mediation and creative movement enhance knowledge about the benefits of working towards the promotion of human interaction, with focus on working developmentally with autistic children?

The likes of Richard Ager and Larry Cuban outlined the cursory introduction and little need for ICT (as identified by the teaching profession) to have resulted in its integration becoming problematic. The challenges associated with ICT in education derived from a lack of training, causing teachers to not feel confident with ICT; therefore, facing the burden of additional and independently accessed training to effectively counteract this. Their contact with pupils meant that both trust and confidence in ICT was key for its successful implementation. The teaching professions commitment to ICT was integral to its growth, and previous problems were alleviated by the new generation of teachers who were more comfortable with ICT due to previous exposure.

Through the latter stages of the Chapter One it was made clear (when considering Special Educational Needs) that the use of ICT in inclusive provisions had become popularised. In the early phases of ICT integration, those with Special Educational Needs were enrolled in mainstream schools with additional teaching support, which promoted inclusivity. This is where the chapter concluded and offered a context in which to read the following discussion surrounding specific interventions used in SEN provisions (a topic addressed through chapters Three and Four).

The second chapter was a direct response to the second Project Aim[120], and began to align two important research approaches succinctly by offering more in-depth knowledge about the history of autism and information on the diagnostic framework. Consequently, Chapter Two aimed to illustrate a pragmatic understanding of where autism sits within the thesis argument. The chapter provided clarity on the diagnosis, and initiated subsections relating to the potential problems faced when autistic children are exposed to conventional, solo use, technologies (also addressed throughout the successive chapters). Chapter Two avoided research searching for the *cause* of autism and instead focused on the evidenced characteristics of someone already holding a diagnosis. As made apparent through Chapter Two, the diagnosis of autism is complex and

[120] Project Aim 2: To illustrate the use of pragmatic reflections, and analysis, to promote a comprehensive understanding of the developments of an autistic child, to help expand current understandings surrounding autism; with particular focus given to discrete, non-verbal, communication.

changeable as new research emerges, whilst being influenced by autistic self-advocates in recent times[121].

By working systematically and chronologically the key concerns of autism historically[122], were addressed whilst being supported by contemporaries[123]. To discuss the classifications of autism the DSM-4 (1994) and DSM-5 (2013) were offered to guide the reader through the complexities seen. The *Triad of Impairments*[124] was presented in individual sub sections and the chapter argued that these three elements were co-existing, and in direct correlation to each other, making discussing them separately difficult. Therefore, Research Question 3[125] is reflected on by introducing empathy, mimicry and self-referential abilities through literature relating to the *Triad of Impairments.* Here, the complexity surrounding autism, and how it exists for individuals, was addressed by presenting conflicting information. It offered perspective on how the heterogeneity of autism is often overlooked; resulting in sweeping statements and generalisations, which led to stereotypes embedded in society.

Chapter Two included Additional Diagnoses (often comorbidities of autism), by considering overlapping diagnostic features, and acknowledged the possibility of similar schooling and applied interventions. This theme continued into the Misdiagnosis, Dual-Diagnosis & Early Diagnosis subsection, which felt broad but began to contemplate the reality of multiple or misdiagnosis and its effect on autistic children (and those supporting them)[126]. Alongside this consideration, seven specific diagnoses were highlighted for their overlapping features with autism; providing a comprehensive understanding of autism in a wider Special Educational Needs context.

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[121] Their first-hand experience has influenced the way autism is discussed and approached, particularly in the case of autistic females. Therefore, the choice was made to align with Neurodiversity throughout the thesis, and language was altered to avoid negative connotations associated with archaic descriptors such as *disorder* and *disabled*.

[122] By reflecting on the work of Leo Kanner and Hans Asperger primarily.

[123] Such as Judith Gould and Lorna Wing and their influence on the *Triad of Impairments.*

[124] A diagnostic tool developed by Judith Gould and Lorna Wing (1979) including Social Communication, Social Imagination/ *Theory of Mind*, and Social Interaction

[125] Research Question 3: How will the effects of imitation and mimicry in collaboration with projected images, enhance the understanding about the importance of self-referential ability, to aid the development of empathetic understanding and social interaction, communication and imagination, be used in knowledge exchange?

[126] The second chapter also referenced the heightened prevalence of autism, in recent years, and aligned with connections to misdiagnosis, diagnosis at an earlier age and dual-diagnoses.

Chapter Two also reports the benefits of early diagnosis along with the problems many people faced when gaining a diagnosis. The chapter concluded with two sections acknowledging the Gender Bias and Societal Impact on Autism, albeit briefly. Both encouraged a broader consideration of autism and for the thesis to be considered with this in mind. A limitation of this chapter is the failure to address all topics equally, but by acknowledging the gender bias it hoped to highlight the position of gender yet made it clear that this is not a key concern of the thesis. When introducing the work of Pinchevshi and Peters (2016) (reflecting on societal influencers on autism) the chapter concludes that their text supports the argument of this thesis by recognising literature connecting two main themes: autism and technology.

By considering the breadth and complexity of autism, Chapter Two gave context when addressing education, interventions, technological advances and lastly this PhD's response to these through practical research encouraging alternative solutions by premising adaptation and embodied interactions. Collectively these two chapters (in Part One of the thesis) allow for Part Two to forge an understanding of ICT and autism coming together in education, which proves to be the equally as complex.

Part Two

The combination of chapters Three and Four in this Part of the thesis are created to respond to the first Project Aim[127], by understanding interventions thoroughly. Chapter Three unpacked Traditional Interventions[128] as seen across UK specialist school provisions specifically developed and/or applied with the diagnosis of autism. Background information created a clear historical overview of traditional interventions in the education of autistic children. As a topic, individuality throughout the implementation was acknowledged as an important factor when considering how an autistic child may benefit, or how the interventions were implemented in educational and home environments. This

[127] Project Aim 1: To identify and investigate current interventions, for autistic children, that use audio visual technology as a key developmental aid, and to examine the benefits of expanding these applications to be inclusive of human interaction through creative movement.

[128] Within this chapter, guidelines were created so all interventions discussed had been used in the educational provision the participants attended, promoted or relied on one-to-one facilitation and were independent of technological influences or advancements (which created a distinction between traditional interventions and the technological interventions discussed in Chapter Four).

chapter also considered the different professionals implementing interventions, and the differences seen between educational interventions and therapeutic interventions[129]. With education being the most common setting in which an intervention is implemented, the role of a Special Educational Needs Co-Ordinators (SENCOs) was introduced to evidence their influence in deciding whether an intervention should be trialled with a child.

It was also reported, in Chapter Three, that Early Interventions are traditionally implemented before the child begins school, and more awareness of the diagnosis resulted in age appropriate interventions for children under the age of three. Here exercise, dance, and creative outputs are more readily relied upon as viable options for children (and preferred for their embodied interaction methods)[130]. These types of interventions are applicable for all children, yet regrettably are not commonly used in the education system; a concern of this thesis and the motivation for research into the benefits of movement and embodied interactions with autistic children.

Two educational interventions were introduced due to promoting one-to-one facilitation with autistic children, by offering the child individualised learning in a supportive environment were; TEACCH[131] and PECS[132]. These interventions create consistency and are often seen used with children who struggle with transitions or changes to routine. Like all of the interventions discussed, the human interaction element of the PhD approach gives each child the required support whilst favouring adaptation. These principles are echoed in the third intervention discussed; *Intensive Interaction*, an approach included for its use of mimicry, one-to-one interactions and its acceptance of touch. *Intensive Interaction* recognises the importance of the relationship between primary carer giver and the child, whilst aiding holistic development, and premising adaptation. It also transpires, that the work of Nicola Shaughnessym is also interested in how Intensive Interaction used the body as a form of interaction as she explains that the Imagining Autism project also 'has synergies with Phoebe Caldwell's (2008)

[129] With the main difference being that no one other than a trained therapist is qualified to apply therapeutic interventions, yet educational interventions were more readily applied by a variety of professionals

[130] Which helped ground conversations on movement and embodied interactions; all relating to Research Question 4, again.

[131] *Treatment and Education of Autistic and related Communication handicapped Children*

[132] *Picture Exchange Communication System*

work on intensive interaction' (Shaughnessy, 2016: 190). When discussing this technique alongside the important influences from childhood development, this thesis relates it to the lack (or significant reduction) of touch used throughout in the education system is called into question by David Hewett (2007)[133]. He advocates for the use of touch due to its ability to aid development and encourage engagement, within embodied experiences through movement[134].

These considerations are supported by research focusing on play and Play Therapy, which considers movement as a key component offering benefits for autistic (and all) children. When introducing Play Therapy, its application as an intervention used for those with a diagnosis of autism was discussed. When introducing the broader application of therapeutic interventions, Occupational Therapy, and Speech and Language Therapy were included. All were introduced briefly, outlining the benefits to having options available for autistic children and their families, and to situate the work of this PhD alongside existing interventions in the education of autistic children.

Much like Play Therapy the use of Occupational Therapy focuses on the natural ways in which children communicate and express themselves. Therefore, play and mimicry, are often both seen in Occupational Therapy sessions with autistic children. Koscinski (2016) makes it clear that play is vital to children's learning and growth and that through the infantile years this is how they develop knowledge. Similar to the practical research of this PhD, both Play Therapy and Occupational Therapy utilise the child's interests to direct the interactions, supporting their holistic learning through variety. Lastly Speech and Language Therapy echoed the theories and approaches introduced by all other interventions and therapies, whilst showing how it can be applied to align with individual children's needs. Like the other therapeutic interventions, Speech and Language Therapy is applied with autistic children, but not exclusively, and in doing so focuses primarily on aspects of communication; whereas Play Therapy and Occupational Therapy adopt a more holistic approach.

The seven Traditional Interventions discussed in Chapter Three gave an overview of current practices within the education of autistic children. It presented

[133] The founder of *Intensive Interaction* alongside Melanie Nind.
[134] Touch was later discussed via its benefits through the infantile years by connecting it to literature from Childhood Development.

insight from personal experience[135] in educational provisions and offered the reader a clearer context of where, and how, this research can be further applied. This afforded a conclusion of how these interventions - not reliant on technological engagement - may only be responding to a portion of the child's needs, and that holistic developments can only be premised through those intervention that support individualisation and adaptation without avoiding ICT.

Chapter Four more explicitly address Project Aim 4[136] and Research Question 4, by beginning to present the complexity surrounding ICT, and education, which was further exacerbated by the vagueness presented in the literature addressing the use of ICT with children presenting Special Educational Needs. This soon became an underlying concern of the chapter when the extreme positive view (without addressing the heterogeneity) was evidenced through the literature review. Unlike the previous chapter, the fourth chapter struggled to discuss specific computer technology-based interventions. In the case of technologies, it was seen that the hardware (namely tablet devices or computers) was a permanent feature whereas the software changed. Therefore, the subtleties in application was understood through the work of Lani Florian (2004) and her categorisations of technologies in education. It became clear that ICT not only offer tools for the child's learning but also supported the teaching staff in various ways. It was soon apparent that many studies were quick to suggest that technological interventions afford positive effects on the SEN community, yet the complex reality, considerate of different applications of technologies (as just one area of critique) was not portrayed. Even more worrying neither was the unintended consequences of technological intervention, when used with those predisposed to social difficulties due to a diagnosis like autism.

It was clear that further research is needed in all aspects of children's education if we consider that they are engaging with ICT at an increasing rate, especially as the whole of society's interactions with ICT transformed following the shift from desktop computers to tablets devices and smartphones. Even

[135] This overview was written theoretically to afford context over practical exploration yet acknowledged similarities between the interventions and personal practice.
[136] Project Aim 4: To explore the effectiveness of audio visual technology in the development of a creative intervention for children on the autistic spectrum, situated in reflexive movement principles and the benefits of human interaction.

where research acknowledged overexposure to digital screen-based technologies, has unknown consequences for the general population, the same literature still confidently promoted its use with autistic individuals. This literature was engaged with critically throughout Chapter Four, whilst considering the development of interventions that aim to bridge the gap between social implications of using ICT, and the need to accept the benefits offered by the same devices if adaptation is pursued.

Therefore, when looking at the introduction of new technologies for autistic children, the research presented in Chapter Four highlighted the increased use of technology in schools. This was further supported by research acknowledging an increased affiliation with computer technologies by autistic individuals, that is often surpassing the general populations technology usage. Manfred Spitzer's research was included to consider how media representatives, and the IT-industry, continuously promote computers as being beneficial in schools and that this was supported by education policy makers; resulting in public money being spent to encourage their use despite not being supported by substantial research (Spitzer, 2014). This fourth chapter reflects on the worrying effects, considering that computer technologies are often introduced into education despite a lack of research into the benefits, or the harm caused by overexposure (a key concern of this thesis). The work of Keay-Bright & Howarth was used to support these concerns as they acknowledge that where research into autism and technology is being done, work for those with more complex difficulties again goes under prioritised. As a response, this thesis specifically focuses on children with more significant difficulties in communication, language acquisition, and social skill development. This decision was a direct response to such worrying claims (that have been witnessed first-hand) and has supported the development of the approach applying mimicry, empathy and touch alongside technologies.

Part Three

Despite personal experience being resided to the sixth chapter of this thesis, the fifth chapter begins to acknowledge the importance of the time spent in the school setting. It allowed for an insight into the promotion of technology, with autistic children, as primarily being technologies designed for the conventional user (brought into the school with very little adaptation). Chapter Five reports the

reliance on computer and tablet devices more readily to engage autistic children within the curriculum, for motivation and as a form of praise for engagement in other activities. Accordingly, it could equally be suggested that a reliance on ICT compromises the child's development, as this is often accompanied by the reduced encouragement of human interaction (or in more extreme cases, used as a replacement), which have the potential to cause limited development in social skills, or for existing skills to plateau. With this in mind it is not proposed that solo technological engagement cannot encourage any social developments, but if autistic people do naturally align with computers over humans (Baron-Cohen, 2007), then how can we change our interactions as an attempt to bridge the gap and create an interaction that promotes engagement with technology and other humans in equal measures[137].

The fifth chapter worked to address and understand the possibilities of movement within an intervention for autistic children, and the development of an approach to ICT that primarily amplifies and extends the possibilities for the autistic child (making connection again to Research Question 3). To do so Chapter Five reflected on chapters One to Four whilst consolidating ideas surrounding the introduction of ICT in education, autism and researchers advocating for interactive technological environments. The work of Spitzer offered insight to the risks and side effects associated with overexposure to computer technologies for children. His worked also outlined the importance of embodied interactions, varied experiences and challenging encounters to support cognitive development.

By connecting this work to the practical research of this PhD, Chapter Five introduced Alissa Antle's 2013 paper, where she reflects on her experience researching and designing interactive technologies for children, based on one-to-one interactions. As a similar method to the PhD, her work went against the misconception that one intervention can be applied to all children, all ages and all diagnoses. This stimulating research offered a chance to recognised her awareness of both cognitive science and human-computer research, resulting in

[137] Which is a theme connecting to Project Aim 5: To investigate the benefits to approaching education and interactions with technology with the body in mind, with specific interest in how dance and movement practices can bring an embodied insight into the field of autism.

her advocating for a mixed disciplinary approach to research and the integration of work from developmental psychology and media studies[138].

Antle's criticisms of conventional technologies supports Chapter Five's reflection on the benefits of embodied interactions as an opportunity to encourage the design community to embed research from cognitive science[139], whilst giving recognition to the critical review of creative tools and technologies also included in this chapter. Like this PhD, Antle focused on engagement with technologies that support embodied interactions, explaining that desktop configurations do not do so (Antle, 2013). This concept supports existing theories addressing the unintended consequences associated with individuals' engagement with computer technology; a theme this thesis responds to, and reports the need to acknowledge the benefits of variability and to allow this to influence design (Antle, 2013). Her findings are more potent when considering the participants of this PhD are autistic children, making variability vital. Antle's research offers carefully considered and informative findings that resonate with the argument of this thesis more broadly. To conclude, Antle's paper proposes adaptation to our use of technologies with children, and the potential for new interventions created through the analysis of educational techniques by embedding technologies that afford embodied interactions and social experiences.

Her research helped to ground the topics and developments within this thesis and suggests how, there are possibilities to bridge the gap between designers and theories of embodied interaction. In this way, industry can ensure they do not become redundant in changing times, or worse become products with unintended consequences. It is at this stage of Chapter Five that Wendy Keay-

[138] Which is where it links to the work of Victor Stransburger's paper *Media and Children, What needs to happen now?* (2009).

[139] Therefore, the topics cover Project Aims 3, 4, & 5:

3. To critically investigate audio visual technology in the context of creative movement, imitation and mimicry, and autism throughout a research project that will make links to research in these individual fields, whilst contributing to knowledge about human interaction.
4. To explore the effectiveness of audio visual technology in the development of a creative intervention for children on the autistic spectrum, situated in reflexive movement principles and the benefits of human interaction.
5. To investigate the benefits to approaching education and interactions with technology with the body in mind, with specific interest in how dance and movement practices can bring an embodied insight into the field of autism.

Bright and Nicola Shaughnessy were reintroduced as examples of projects facilitating embodied interactions with technologies for autistic participants. Their work, retrospectively offered an understanding of the connections being made between themes of adaptation and individualised interventions for children, reaffirming the person-centered approach used with the participating autistic children in the PhD project[140]. This was seen as important when we consider that 'the development of intelligence depends on the specifics of the genetic, physical, social, emotional, and contextual environment in which a child is situated. While there may be similar patterns of development, each child is unique' (Antle, 2013: 32)

When introducing the work of Keay-Bright, her Participatory Design method was seen across multiple projects, developed by applying her graphic design skills to create innovative technological interactions for autistic participants. This unique approach was supported by embodied interactions with technology, grounded in her understanding of autism. It is clear Keay-Bright shares the concerns of this thesis regarding overexposure to ICT by children in education, as she acknowledges that the majority of studies fail to recognise the heterogeneity of autism and in turn premise those with existing intellectual abilities. Therefore, her work validates this thesis' concerns whilst showing an example of how the design world should address these rising concerns.

The use of technology, in all her projects, is applied to enhance the child's experiential knowledge, yet could do more to avoid isolating the child through solo engagement with technologies. Her approach allowed for the creation of individualised environments for each child participating, with the projected images and motion capture technology, yet did not encourage engagement with others. Despite this, her work gives attention to the benefits of the embodied interaction itself, rather than focusing on an end behavioural goal. By also using interactive sessions as a method in this PhD, the process of embodied cognition is achievable; when reflecting on Spitzer and Antle's discussions around on childhood development, cognitive abilities, social skills.

To support this, Nicola Shaughnessy and Melissa Trimingham's project *Imagining Autism* allowed Chapter Five to discuss the utilization of technologies

[140] Sharing motivation with Project Aim 5.

within creative environments, by applying techniques from The Arts, for autistic children. The *Imagining Autism* project presented techniques from drama-based approaches with the technological elements being introduced to support these through the use of projection and props inside *The Pod* (a tent-like structure giving children an experience of different environments). Shaughnessy's writing gives insight into the theme of Neurodiversity and how this influenced the development of a space for children to explore, whilst being mindful of the importance of individual experience.

In her paper *Imagining Otherwise: Autism, Neuroaesthetics and Contemporary Performance* (2013) Shaughnessy discusses the complexities surround autism more broadly and makes comment on the exploitation and commercialisation of autism, which links to themes from Spitzer and the concerns of this thesis. There are also connections made to the research of Pinchevski and Peters (2016) (presented in Chapter Four) when considering language and societal influences on autism. She makes comments regarding both *Theory of Mind* and empathy and how they are seen in the discussion of autism. This thesis expands on these thoughts to consider how empathy and autism must also be seen as a two-way experience between the autistic individual and researchers, or the professionals they interacting with. The research regarding empathy's connection to the placement of mimicry in childhood development and my practical research responded by allowing the child to have a visual self-mimicry in line with the impact of self-referential ability on developments socially.

To conclude the fifth chapter I offer the reader a critical review of the traditional and technological interventions, creative tools and therapeutic techniques discussed throughout the main body of the text. This serves to outline their limitations, and in doing so the work of both Wendy Keay-Bright and Nicola Shaughnessy are included to offer comments on how this PhD extends on their existing research. Regarding the traditional and therapeutic techniques it was clear that their main limitation is the current avoidance of technological advances. As mentioned throughout the PhD, this research project is not apposed to the inclusion of technology in education, it critically engages with this field to better the approaches. Therefore, a total lack of technologic mediation is a limitation. On the contrary many technological approaches are seen to fall in one of Lani Florian's many categories that see the benefit, or lack there of, to the child being

underappreciated. When reviewing Keay-Bright's work it seems that despite sophisticated design with the autistic population in mind, human interaction has not been given equal importance, where as in the case of Shaughnessy the work could be extended further to embed themes of empathy more readily, and to work towards more individualised approaches that are afforded in one-to-one settings.

In light of this the sixth chapter then benefited from the discussion of Spitzer and Antle, along with the examples proving inspirational in their application of technologies in embodied interactions with autistic children. To do so Contact Improvisation and Somatic Movement Practices were discussed as influential movement techniques[141], alongside mimicry and physical touch, all considered key tools throughout the embodied interactions with autistic children[142]. The application of movement techniques, in the practical research, was considered alongside the placement of accessible audio-visual technologies, through live feed footage projected onto the walls of the school's dance studio, during the sessions. The aim for this interdisciplinary project was to allow an exploration of social experience to be encouraged alongside interactions with technology: and not to work against ICT's inclusion in education. During the one-to-one sessions with autistic children, the facilitation was individualized by employing techniques from Somatic Movement Practice and Contact Improvisation, to offer embodied interactions with the other.

Chapter Six creates greater clarification surrounding the programme of workshops, rationale for their structure and an insight into who the participants were. It then presents literature from the field of childhood development to show that the process of mimicry is emphasised as an essential feature through this important developmental period and it is through this vital stage of progression

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[141] A topic aligning with Research Questions 1, 2 & 5:

1. What are the necessary processes to understand discrete, non-verbal, communication, and attempted verbal interaction, and in what ways can my project give emphasis to the benefits of this, throughout my practical research, to be understood holistically?
2. Can the placement of mimicry in early childhood studies - and its links to social understanding, empathy and language acquisition - and its use through movement practices - such as Contact Improvisation and Somatic Movement Practices - provide a method through the practice in this research project?
5. Can the combination of creative movement practices and technological mediation create an environment that promotes development for an autistic child, as well as contributing to the progression of understanding about the interventions specific for autism?

[142] This was supported by literature acknowledging the benefits of their use in the development of self-referential ability.

that the idea of *self* and *other* becomes refined. Within the practical research, the autistic children participating were offered an opportunity to comprehend their effect on the social interaction through visual means, as it plays out, whilst also being given the opportunity to engage with the facilitator's digital image rather than engaging purely in human interaction. This proved particularly important when recognising that both mimicry and self-referential ability are evidenced as key processes prevalent in social developments and language acquisition. Embedded in this discussion is the use of touch and Chapter Six gives focus and attention to the need for physical contact in the process of learning about *self* and *other*[143]. This is shown to be an idea that could see designers use interactive technologies to premise physical experiences more readily, or at least begin to consider embodied interaction through the design period so that it doesn't stay underappreciated. This could help to ensure that touch between human and computer is not seen as being more appropriate, and important, than touch between humans.

By learning about the physicality of one's own body, we are also enhancing our abilities to understand the physicality of another's, thus having a positive impact on the development of both social skills and complex empathetic understanding. With this in mind it appears that mimicry and self-referential abilities are intrinsically linked throughout literature from childhood development and can be enhanced by technologies that allow for a visual representation of the child to be accessed in an immersive environment supporting embodied developments. This is an important way to respond to the detrimental effect that solo engagement with screen-based technologies are having on the social integration of autistic children. This thesis merely hints at ways in which this research can more broadly promote change in the design industry yet is primary interested in offering insight into the adaptations needed to afford embodied interactions with technologies for the autistic child; by reporting the concerns and solutions.

By applying mimicry, empathy and touch, it is proposed that the facilitated sessions will offer advanced knowledge surrounding the developmental process of children with the ability to apply these principles to allow social and

[143] A theme supported by the work of Evan Thomson and David Hewett

communicative skill to progress for the individual child. When used together with technology in this setting the child is also afforded the ability to develop holistically in their interactions with technology by avoiding, or adapting, the conventional, solo user, designs.

This presentation of knowledge is offered as a way to contextualise the research with the hope that it will help researchers, the teaching profession, and designers, to begin to question the way in which technology is used within a school setting, by showing that adaptation and the inclusion of embodied interactions with autistic children should become commonplace[144]. Therefore, the combined approach of using mimicry, empathy, touch and such technologies shows potential to be an important tool when interacting with the autistic population and proves vital in the move away from screen based (solo use) technologies, towards interventions created to support and encourage embodied experiences and interactions for all children.

[144] A theme supported by the teaching manual submitted within Appendix 6.

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Appendix

Appendix 1: Ethical Approval Form

RESEARCH WITH PLYMOUTH UNIVERSITY **FACULTY OF ARTS AND HUMANITIES** **Arts and Humanities Research Ethics Sub-committee** **APPLICATION FOR ETHICAL APPROVAL OF RESEARCH**		**(For ArtRESC use only) Application No:**	
		Chairs action (expedited)	Yes/ No
		Risk level -if high refer to UREC chair immediately Cont. Review Date	High/ low / /
		Outcome (delete as necessary)	**Approved/ Declined/ Amend/ Withdrawn**

ALL PARTS OF THIS FORM MUST BE COMPLETED IN FULL IN ORDER TO GAIN APPROVAL. Please refer to the guidance notes.		
1.	Investigator **Note1*	If Student, please name your Director of Studies or Project Advisor: Michael Punt (DoS) Course/programme: MPhil/PhD School: Arts and Humanities
	Contact Address: Transtechnology Research, Room B321 Portland Square, University of Plymouth, Drake Circus, Plymouth, PL4 8AA. Tel: 01752 586264 E mail: michael.punt@plymouth.ac.uk	
2	Title of research*: Responsive movement, technological mediation and human interaction, in the study of developmental disorders*	
3.	Nature of approval sought (Please tick relevant boxes) **Note 2* a) **PROJECT:** **X**	b) TAUGHT PROGRAMME (max. 3 years): ☐
	If a,) please indicate which category: *Funded/unfunded Research (staff)* ☐ ***MPhil/PhD, ResM, BClin Sci, EdD*** **X** *Taught Master*	*Undergraduate* ☐ *Or Other (please state)* ☐

4.	a) Funding body (if any): b) If funded, please state any ethical implications of the source of funding, including any reputational risks for the university and how they have been addressed. **Note 3* c) Do you need a formal letter of approval for your funding body? Yes☐ **No X**
5.	a) Duration of project/programme: **Note 4* b) Dates: Oct 2014 – Jan 2018
6.	Has this project received ethical approval from another Ethics Committee? Yes☐ **No X** a) Committee name: b) Are you therefore only applying for Chair's action now? Yes☐ **No X**
7.	Attachments (if required): a) Application/Clearance (if you answered Yes to question 6) Yes☐ ☐ No b) Information sheets for participants **Yes X** ☐ No c) Consent forms **Yes X** ☐ No d) Sample questionnaire(s) **Yes X** ☐ No e) Sample set(s) of interview questions Yes☐ **No X** **f)** Continuing review approval (if requested) Yes☐ **No X** g) Other, please state:

**1. Principal Investigators are responsible for ensuring that all staff employed on projects (including research assistants, technicians and clerical staff) act in accordance with the University's ethical principles, the design of the research described in this proposal and any conditions attached to its approval.*
**2. In most cases, approval should be sought individually for each project. Programme approval is granted for research which comprises an ongoing set of studies or investigations utilising the same methods and methodology and where the precise number and timing of such studies cannot be specified in advance. Such approval is normally appropriate only for ongoing, and typically unfunded, scholarly research activity.*
**3. If there is a difference in ethical standards between the University's policy and those of the relevant professional body or research sponsor, Committees shall apply whichever is considered the highest standard of ethical practice.*
**4. Approval is granted for the duration of projects or for a maximum of three years in the case of programmes. Further approval is necessary for any extension of programmes.*

8.	**If you are staff**, are there any other researchers involved in your project? Please list who they are, their roles on the project and if/how they are associated with the University. Please include their email addresses.
	If you are a student, who are your other supervisors?

	Hannah Drayson, Becky McKenzie and Ruth Way Have you discussed all ethical aspects of your research with your DoS prior to submitting this application? **Yes X** No ☐
9.	When do you need/expect to begin the research methods for which ethical approval is sought? *August 2016*
	How long will this research take and/or for how long are you applying for this ethical approval? * *From August 2016– June 2017. I will be facilitating my research in the form of one-to-one movement sessions once a week within the school term times from September 2016. Prior to the debriefing/ meeting with staff at the school, which is planned to be early 2017, I will give all attending a questionnaire, this will be written anonymously but will also be used to lead the discussion at the debriefing.*
10.	Please provide a 200 word description of the project. *For this project I facilitate responsive movement sessions, with autistic children, and will be integrating digital mediation in the investigation by filming the sessions and projecting the footage via a live feed camera. This project aligns with research into the increased connection with technology, for the autistic child, as new technologies are introduced to the schooling environment. The diagnosis of autism specifies difficulties in complex social interaction, communication and imagination, which became specific areas of interest through my project.* *My movement practice is influenced by the principles of Contact Improvisation and Somatic Movement Practices, as well as an intervention called Intensive Interaction. The movement sessions facilitated are bringing together mimicry and imitation, becoming an innovative tool to develop a relationship between the child and adult, as well as to aid the development of self-referential ability within the child through the integration of technology through projected images. It is through physical engagement with the participants that I am able to comprehend the importance of combining these research investigations through my primary research. The movement sessions are a method in this research, and are a platform for the involvement of mimicry and imitations, in collaboration with projected images, as the technological mediation. This area is of particular significance when connecting research about the autistic child's affiliation with technology, and aims to inform research surrounding the use of technology in current interventions.*
11.	Please describe all methods and procedures which involve human participants in this project (You should specify subject populations and recruitment method, etc.): *Note: If you have indicated that you are using questionnaires or semi-structured interviews, etc. you are expected to attach indicative samples to this application.* *Methods:* *<u>Movement</u>*

The Practice-as-Research element of this project consists of the facilitation of one-to-one movement session with children on the autistic spectrum. During these sessions I rely on a method called Participant Observer, which is used within anthropology and ethnographic research. My movement training and research embeds principles from Contact Improvisation and Somatic Movement Principles, both of which I was introduced to during my BA Hons Dance Theatre and MRes Dance, here at Plymouth University. My movement practice is also influenced by my research into an intervention develop with autistic participants in mind, called Intensive Interaction.

<u>Video and Sound Recording NUMBER THESE</u>
During all the movement sessions conducted from Sept 2016 onwards I will be recording my interactions, with the children participating, on 3 separate cameras situated in the dance studio at the school I am working in. The recordings will provide me with video footage from 3 angles and allow the interactions to be captured and reviewed at a later stage. This footage will firstly be used as a mnemonic during the latter stages of the PhD, when I begin writing up the thesis, but will also be used to disseminate my research in appropriate educational settings (such as conference presentations, educational presentations, etc). This will also aid me when analysing the Practice-as-Research in the form of case studies within the written thesis. The central camera that is recording will also be used as the live feed camera, when connected to a projector, as the footage that is projected into the space for the children, and myself, to interact with.

<u>Written Notes</u>
I will be collating written notes at the end of each session in which I describe the interactions between the child and myself and make comment on any changes in behaviour from week to week. This information is written with none of the children's names, age or school, but simply with a number reference for myself. These notes are being used as a way to keep a record of my work with the children in terms of how many sessions they have participated in, and on which dates. This will also aid me when analysing the Practice-as-Research in the form of case studies within the written thesis.

<u>Data protection</u>
All written notes are anonymous in their original format, therefore the child is not identifiable from this information. All video footage is being stored on an encrypted external hard drive; no files are saved with the child's name, or the school's name, evidenced. The hard drive is kept in my home and is only accessibly by me personally, and it password protected, it is not taken to any other location or used for any other purpose. All files will be kept for ten years to adhere to the University Research Ethics Policy.

12. Please answer either **YES** or **NO** to **<u>ALL</u>** questions below by placing an X in relevant box.

Do any of your research methods include research:	YES	NO
With vulnerable groups – for example, children and young people, those with a learning disability or cognitive impairment, or individuals in a dependent or unequal relationship?	X	

	With vulnerable groups – for example, children and young people, those with a learning disability or cognitive impairment, or individuals in a dependent or unequal relationship?	X	
	That involves sensitive topics – for example, participants' sexual behaviour, their illegal or political behaviour, their experience of violence, their abuse or exploitation, their mental health, or their gender or ethnic status?		X
	With groups where permission of a gatekeeper is normally required for initial access to members – for example, ethnic or cultural groups, native peoples or indigenous communities?		X
	That involves deception or which is conducted without participants' full and informed consent at the time the study is carried out?		X
	That involves access to records of personal or confidential information, including genetic or other biological information, concerning identifiable individuals?		X
	That may induce psychological stress, anxiety or humiliation or cause more than minimal pain?		X
	That involves intrusive interventions – for example, the administration of drugs or other substances, vigorous physical exercise, or techniques such as hypnotherapy (i.e. interventions that your participants would not normally encounter, or which may cause them to reveal information which causes concern, in the course of their everyday life)?		X
	If you answered yes to any of the above questions, please provide further details of these potentially ethically sensitive aspects of your research. **With vulnerable groups – for example, children and young people, those with a learning disability or cognitive impairment, or individuals in a dependent or unequal relationship?** *I have give then answer yes to this question as I am working specifically with children on the autistic spectrum who are classified as being children and young people as well as those with a learning disability or cognitive impairment. I am working with these children in their schooling environment and am supervised by a member of their teaching staff during my interactions.*		
13.	**Ethical Protocol:** Please write an ethical protocol using the following the headings: **a) Informed Consent;** *- The teaching staff at the school will give the information sheet and consent form to parents/ guardians, allowing the parents/ guardians to understand the project and to allow them give consent knowing the purpose of the research and the activities involved. This will also make clear the process for withdrawal.* *- As the researcher I will gain consent from the parents/ guardians of the children the children to participate in the practical elements of the research project, as well as consent for the sessions to be filmed.* *- They will also be made aware that the footage is used for two purposes, to support the written thesis, but also to make an edited film to act as a way to disseminate the research at conference presentations, educational presentations,*		

etc. It will be clear on the information sheet that the parents/ guardians will need to sign an additional Photograph & Video Release Form before I, as researcher, can use any video recordings evidencing their.
- Any child who is to included in the edited video, used for the dissemination of this research project, will be given a video release form to be signed by their parents/ guardians before the film is used publicly.
- All teaching staff, with a pupil involved in the project, will also be given an information sheet to allow then to understand the purpose of the research and activities involved.

b) Openness and Honesty;
-Every parents/ guardians/teacher I am in contact with, on behalf of the children participating, will know the aims of my research project in the form of an information sheet, which will be explained both verbally, and in written form.
-Those who will be part of the project throughout its duration, individual children's class teachers and parents, will be informed of any changes to the project as and when it may occur, in verbal and written forms.

c) Right to Withdraw;
-Through all of my information sheets I have explain that all participants have the right to remain anonymous (all children participants will automatically be referred to by an alternative name or just their surname). Their right to withdraw their child from the research project is made clear on the information sheet in two ways, they can remove their child from the practical research as well as remove their child from being included in the edited video, used for the dissemination of this research project.
- If they do not want their child to be featured in the edited film they are advised not to sign the Photograph & Video Release Form. If they do sign this form and later change their mind, the right to withdraw specifically from the film is made clear on the Photograph & Video Release Form.
- Upon conclusion of the practical research session I will be meeting with all members of staff involved, and all parents involved will also be invited. This will be an opportunity to discuss and debrief my research project and withdraw any sections they feel are not necessary or appropriate, as well as a chance to ask further questions.
-All participants are made aware that this research project is an element of my MPhil/PhD research project, and therefore are made clear of the deadline for their right to withdraw, so this their withdrawal does not effect the submission of my final thesis.

d) Protection from Harm;
-As I am primarily working with children, in their schooling environments, who are considered to be vulnerable, I will be renewing my DBS checks before returning to the school in September, 2016. This DBS check will be presented to the school for their own records.
-I have also had professional training in safeguarding and child protection to ensure I am aware of current policies for the protection of vulnerable children and the methodologies that are working with a "child-led approach" or "individualised approach".
- I will be adhering to the code of conduct from the following professional bodies:

- *Foundation for Community Dance*
- *The Body-Mind Centering® Association, Inc.*
- *Contact Improvisation*
- *Somatic Movement Practices*
- *Intensive Interaction*

- I will also be renewing my Public Liability Insurance with Foundation for Community Dance in August 2016
- I have also communicated with the Deputy Head and we have agreed that a Teaching Assistant will accompany the majority of children participating to the session; therefore I will rarely be alone with the children. Additionally there is an adjoining room to the dance studio I work in where a teacher is present to support me in needed.
- I also have the following professional training:

- *Safe Guarding and Equality and Diversity Training: Sept 2016*
- *Makaton for Parents and Carers Beginners Workshop: Oct 2013*
- *Emergency First Aid at Work Training: Oct 2012*
  Wheelchair and Movement Training With Adam Benjamin: Jun 2012
- *Safe Guarding and Equality and Diversity Training: Apr 2012*
- *LSIS Safeguarding Training (online): Mar 2012*
- *Child Protection Training: Oct 2011*
- *Health and Safety Training: Oct 2011*

e) Debriefing;
- The debriefing to teachers will be used to share my observations and show them my findings and to disseminate my research project more broadly. This is to be scheduled as part of a staff meeting and the Deputy Head has agreed that the parents of the children participating in the project will be invited. This is scheduled to be before the Easter holidays, 2017.
- One week prior to the debriefing/ meeting I will give all staff involved a questionnaire, this will be completed anonymously, but will also be used to lead any discussions at the debriefing.

f) Confidentiality;
-When documenting writing up my primary research, for the thesis, the children's names will be changed, as all children participants automatically being referred to by an alternative name or just their surname to allow them to have anonymity.
-When documenting work with adults, from the debrief session, I will also allow all adults to remain anonymous on their questionnaire. As this questionnaire will also be used to lead the discussion at the debriefing, during which I will make notes from the conversations and transcribe the conversation to be used within the thesis.
- I will also ensure these conversations are presented anonymously (only be distinguished as a parent/guardian or a teacher of the child participating). These conversations will only be used to allow alternative insights into my project from the perspective of the teacher or parent, to support my findings.
-All video documentation of the children exported to an encrypted external hard drive specifically purchased to store these files. The hard drive is kept in my home and is only accessibly by me, it is not taken to any other location or used for any other purpose.
- For still images, to support my research on any online platform or in the form of a research poster, I will only be use images in which the child is not facing towards the camera as this will insure that the identity of the child is not be revealed.

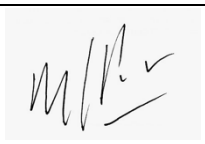
	- With the video footage that will be captured from September, 2016, onwards I intend to create an edited film and once I have decided which children will feature in the edit I will supply those individuals with a video release form, which will then allow me to use this footage including these children publicly to disseminate my research. *- The university's research ethics policy states that data should be securely held for a minimum of ten years after the completion of the research project. Electronic data will be stored on password protected computers or laptops and individual files and/or discs must be encrypted. Hard copies of data must be stored in locked filing cabinets and disposed of securely when no longer required.* **g) Professional Bodies whose ethical policies apply to this research.** - *Foundation for Community Dance Professional Code of Conduct* - *The Body-Mind Centering® Association, Inc. Code of Ethics and Standards of Practice* **If you have indicated that you will be using Information Sheets or Consent Forms, etc. you must attach an indicative draft version to this application and complete Question 7 accordingly.** ***Please refer to Guidance Notes when completing this section.***

14.

Declarations:

For all applicants, your signature below indicates that, to the best of your knowledge and belief, this research conforms to the ethical principles laid down by Plymouth University and by the professional body specified in 6 (g).

For supervisors of PGR students:
As Director of Studies, your signature confirms that you believe this project is methodologically sound and conforms to university ethical procedures.

	Name(s)	**Signature** (electronic is acceptable)	**Date**
Applicant	Abigail Jackson	ARJackson	15.06.16
Other Staff Investigators			
Director of Studies (if applicant is a postgraduate research student):	Prof. dr. Michael Punt		15.06.16

Completed Forms should be forwarded BY E-MAIL to Claire Butcher (claire.butcher@plymouth.ac.uk), Secretary to the Faculty Research Ethics Committee no later than 2 weeks before the meeting date.

Permission for Children Participation in
Research Project titled:

Responsive Movement, Technological Mediation and Human Interaction, in the study of developmental disorders.

The purpose of this form is to provide you (as the parent/guardian of a prospective research study participant) with information to help you decide whether you are happy for your child to participate in this research project. I will describe the project to you, and your decision should be indicated on the consent form attached.

The purpose of the research is to support a PhD project conducted by Abigail Jackson, a student at Plymouth University. The researcher aims to work with children on a one-to-one basis during the school day, in the school's dance studio beginning in September 2016. During the sessions the research will imitate your child's movements and behaviours to promote engagement and develop social interaction. The researcher has based these sessions on an intervention called Intensive Interaction, as well as her own experience of improvised movement, during her Degree in Dance, and as a dance teacher. Each session will last 20 minutes and will be delivered one day a week, during term time.

During the session your child will lead all the movement, as the research's aim is to copy the child's movements. This will develop into a more playful interaction as the researcher purposefully delays, slows down, speeds up, or exaggerates the movement, whilst engaging your child further. There are no expectations for your child to do anything or to act in a certain way; the session is purposefully unstructured to encourage individuality.

The sessions will be filmed on three cameras, and one of these cameras will be used to project the film onto a wall in the space, for the child and researcher to interact with. The footage will also support the researchers written work, and be used in other educational settings to support the dissemination of the research in the form of a film. The university's research ethics policy states that data should be securely held for a minimum of ten years after the completion of the research project. Electronic data will be stored on password protected computers or laptops and individual files and/or discs must be encrypted. Hard copies of data must be stored in locked filing cabinets and disposed of securely when no longer required.

The researcher will write up their understandings following 10 sessions, and this will form part of the final hand-in for the PhD. In the writing your child's name will not be used. Only your child's sex, age, diagnosis and the session's events will be discussed. Photographs are likely to be used to support the written work, but without your child's face directly shown.

Thank you for reading this information; if you have further s about the project, you can contact Anne Throne, (Longcause School's Head Teacher) who liaises with the researcher. Attached is the consent form, please fill this in and return to the Main Reception at Longcause School.

Thank you,

Abigail Jackson

CONSENT FORM:

TO BE COMPLETED ON BEHALF OF THE YOUNG PERSON BY THEIR PARENT OR LEGAL GUARDIAN

I, as parent or legal guardian of _____ hereby grant permission to the rights of my child's participation in the research project titled: Responsive Movement, Technological Mediation and Human Interaction, in the study of developmental disorders.

By signing this form I acknowledge that I have read and understood the accompanying information sheet, and am aware that my child will be participating in a research project facilitated by Abigail Jackson as part of her PhD Research Project at Plymouth University. I understand that the research will see my child participate in one – to – one movement
sessions that will be facilitated by the researcher.

I know that the identity of my child will not be disclosed during the written document of her research, and that have a right to withdraw my child from the movement sessions involved in the project, at any time. To do so I understand I am required to contact the Head Teacher at Longcause School, who will to pass my request to the class teacher and Abigail Jackson, who will jointly ensure your child is removed from the project immediately.

I understand that I am also required to sign an additional Photograph & Video Release Form before any images, or video footage, containing my child, is allowable to be used in any public or educational setting. To withdraw my child's image from any Photographs & Videos used to disseminate the research project, I understand that there will be a deadline made clear on the Photograph & Video Release Form.

Full Name: _____Child's Name: _____

Address: _____ Post Code: _____

Phone: _____ Mobile: _____Email: _____

Signature_____Date_____

Photograph & Video Release Form

As parent or legal guardian of _____ I grant permission to the rights of my child's image, likeness and sound of their voice, as recorded on audio or video tape, without payment or any other consideration. I understand that my child's image may be edited, copied, exhibited, or published and waive the right to inspect or approve the finished product where my child appears. I also understand that this material may be used in diverse educational settings to support Abigail Jackson's PhD Research project, and the dissemination of this, within an unrestricted geographic area.

Photographic, audio or video recordings may be used for the following purposes:

- conference presentations
- educational presentations or courses

By signing this release I understand that this permission signifies that photographic or video recordings of my child may be electronically displayed via the Internet or in the public educational setting. I also know that I have the right to be consulted about the use of the photographs or video recording for any purpose other than those listed above.

There is no time limit on the validity of this release nor is there any geographic limitation on where these materials may be distributed. I also understand that this release applies to photographic, audio or video recordings collected as part of the sessions listed on this document only.

I know that the identity of my child will be visible in the final edited film, and that I have a right to withdraw my child's image from the film up until the **1st March 2017**, by contacting the Head Teacher at Longcause School, who will pass my request to Abigail Jackson, the researcher. As the researcher Abigail Jackson will ensure your child is removed from the final film.

By signing this form I acknowledge that I have read and understood the above release and the date by which I can withdraw my child's image from the film, and how to do so. I hereby release any and all claims against the researcher utilizing this material for educational purposes.

Full Name: _____Child's Name: _____

Address: _____ Post Code: _____

Phone: _____ Mobile: _____Email: _____

Signature_____Date_____

Information sheet for Research Project titled:

Responsive Movement, Technological Mediation and Human Interaction, in the study of developmental disorders.

The purpose of this form is to provide you (as teacher of a prospective research study participant) with information to help you understand the research project your pupil will be participating in.

The purpose of the research is to support a PhD project conducted by Abigail Jackson, a student at Plymouth University. The researcher aims to work with children on a one-to-one basis during the school day, in the dance studio beginning in September 2016. During the sessions Abigail will imitate your pupil's movements and behaviours to promote engagement and develop social interaction. The researcher has based these sessions on an intervention called Intensive Interaction, as well as her own experience of improvised movement, during her Degree in Dance, and as a dance teacher. Each session will last 20 minutes and will be delivered one day a week, during term time.

During the session your pupil will lead all the movement, as the research's aim is to copy the child's movements. This will develop into a more playful interaction as the researcher purposefully delays, slows down, speeds up, or exaggerates the movement, whilst engaging your child further. There are no expectations for your pupil to do anything or to act in a certain way; the session is purposefully unstructured to encourage individuality.

The sessions will be filmed on three cameras, and one of these cameras will be used to project the film onto a wall in the space, for the child and researcher to interact with. The footage will also support the researchers PhD Thesis, and be used in other educational settings, such as conferences, to support the dissemination of the research in the form of a film. The university's research ethics policy states that data should be securely held for a minimum of ten years after the completion of the research project. Electronic data will be stored on password protected computers or laptops and individual files and/or discs must be encrypted. Hard copies of data must be stored in locked filing cabinets and disposed of securely when no longer required.

Abigail will discuss her findings, following a minimum of 10 sessions, and this will form part of the final hand-in for the PhD. In the writing only the child's sex, age, diagnosis and the session's events will be discussed. Photographs are likely to be used to support the written work, where appropriate.

Thank you for reading this information; if you have further questions about the project, you can talk to the Head Teacher, or the researcher directly.

Thank you,

Abigail Jackson

Appendix 3: Sample of Questions

Abigail Jackson – PhD Research Questionnaire for teachers
Plymouth University – Project Supervised by Michael Punt

Questionnaire for teachers of children participating in Research Project titled:

Responsive Movement, Technological Mediation and Human Interaction, in the study of developmental disorders.

Please indicate if you have read the information sheet provided by the researcher: Yes/No

1. How many pupils from your class were involved in the project? Yes/No
2. Did you attend any of the session with the researcher? Yes/No
3. Do you feel your pupil was engaged with the researcher? Yes/No
4. Has your pupil expressed interest/ enjoyment before or after the sessions? Yes/No

   If answered yes please explain how?

   _____
   _____
5. Do you feel your pupil engaged with the video projections? Yes/No
6. Do you feel the video projections offered your pupil and additional level of engagement? Yes/No

   If answered yes please explain how?

   _____
   _____
7. Would these sessions be appropriate for other children you teach? Yes/No

   If answered yes please explain how?

   _____
   _____
8. Do you feel there is any room for improvement in the session? Yes/No

   If answered yes please explain how?

   _____
   _____
9. Do you feel you, or other staff in your classroom, would be interested in learning more about how to lead one of the sessions? Yes/No

   If answered yes please explain how? Yes/No

   _____
   _____
10. Do you feel this type of work is beneficial for social interaction and further a child's understanding of the self? Yes/No

    _____
    _____

Appendix 2: Additional Diagnoses/ Examples of Misdiagnosis

Rett Syndrome:
Like autism, Rett Syndrome is connected to genetics and is present from birth. This syndrome shows a delay in typical developmental stages as an infant, as well as elements of regression as a toddler. The main difference between this diagnosis and one of autism is that this has a higher likelihood of effecting the child physically, both skeletal and muscular.

Childhood Disintegrative Disorder (CDD):
This disorder is also known as Heller's syndrome and evidences social and communicative difficulties, which is also seen through those with a diagnosis of autism. The main difference between the two is that those with CDD often show typical development from birth until the age of two, following this there are signs of regression.

Attention Deficit Hyperactivity Disorder (AD/HD):
Attention Deficit Hyperactivity Disorder is a term used in an inclusive way, as are Autistic Spectrum disorders. The outcomes for AD/HD are seen through a heightened difficulty conforming to acceptable behaviours in many social situation, such as: schools, supermarkets, doctors, etc. All of these environments have unwritten rules, formed by society, for the behaviour deemed appropriate for these different settings. The child may also show signs of difficulty focusing or holding their attention for prolonged periods of times and/ or controlling their impulses. Again, this disorder is neurologically based and is individual to each diagnosed

Sensory Processing Disorder (SPD):
Sensory Processing Disorder is another neurological disorder that affects the child individually and is present from birth. The outcomes of this disorder are most commonly seen through an oversensitivity or under sensitivity to the way which they process things within, or around them. This can result in having poor hygiene and a lack of understanding what their own body is telling them. On the other hand they may show difficulty processing the world around them, for example not comprehending the knock on effects of certain actions. They may have difficulty with textures, including clothing, food, and footwear; all of which may result in the child being unable to function typically.

Nonverbal Learning Disorder (NLD):
Nonverbal Learning Disorder is a neurological syndrome which shows difficulty interpreting, and understanding, the non-verbalised aspects of communication. It is not, as commonly thought, a syndrome in which the person diagnosed is

nonverbal themselves. The person may not be able to interpret or understand the differences n facial expressions, body language, and gestures. This difficulty in interpretation is commonly seen through those with autism, and is commonly seen throughout those who may have a seemingly good ability to verbally communicate; Nonverbal Learning Disorder may result in confusions and frustrations.

Selective Mutism (SM):
This is a disorder sees the child lacking in verbalised communication and, as a result, will evidence an inability to verbalise their wants and needs due to anxiety or lack of self-esteem. This is a process that the child may adopt when they feel uneasy in a situation, or self-conscious about their speech. This is commonly seen though those with a diagnosis on the autistic spectrum.

Appendix 3: Females With Asperger's Non-Official Checklist By Samantha Craft of Everyday Asperger's, March 2012

Females with Asperger's Non-Official Checklist By Samantha Craft of Everyday Asperger's, March 2012

This is a non-official checklist created by an adult female with Asperger's Syndrome who has a son with Asperger's Syndrome. Samantha Craft holds a Masters Degree in Education. Samantha Craft does not hold a doctorate in Psychiatry or Psychology. She has a life-credential as a result of being a female with Asperger's Syndrome and being a parent of a child with Asperger's Syndrome. She has created this list in an effort to assist mental health professionals in recognizing Asperger's Syndrome in females.

Suggested Use: Check off all areas that strongly apply to the person. If each area has 75%-80% of the statements checked, or more, then you may want to consider that the female may have Asperger's Syndrome.

Section A: Deep Thinkers

1. A deep thinker
2. A prolific writer drawn to poetry
3. Highly intelligent
4. Sees things at multiple levels including thinking processes.
5. Analyzes existence, the meaning of life, and everything continually.
6. Serious and matter-of-fact in nature.
7. Doesn't take things for granted.
8. Doesn't simplify.
9. Everything is complex.
10. Often gets lost in own thoughts and "checks out." (blank stare)

Section B: Innocent

1. Naïve
2. Honest
3. Experiences trouble with lying.
4. Finds it difficult to understand manipulation and disloyalty.
5. Finds it difficult to understand vindictive behavior and retaliation.

6. Easily fooled and conned.
7. Feelings of confusion and being overwhelmed
8. Feelings of being misplaced and/or from another planet
9. Feelings of isolation
10. Abused or taken advantage of as a child but didn't think to tell anyone.

Section C: Escape and Friendship

1. Survives overwhelming emotions and senses by escaping in thought or action.
2. Escapes regularly through fixations, obsessions, and over-interest in subjects.
3. Escapes routinely through imagination, fantasy, and daydreaming.
4. Escapes through mental processing.
5. Escapes through the rhythm of words.
6. Philosophizes continually.
7. Had imaginary friends in youth.
8. Imitates people on television or in movies.
9. Treated friends as "pawns" in youth, e.g., friends were "students," "consumers," "soldiers."
10. Makes friends with older or younger females.
11. Imitates friends or peers in style, dress, and manner.
12. Obsessively collects and organizes objects.
13. Mastered imitation.
14. Escapes by playing the same music over and over.
15. Escapes through a relationship (imagined or real).
16. Numbers bring ease.
17. Escapes through counting, categorizing, organizing, rearranging.
18. Escapes into other rooms at parties.
19. Cannot relax or rest without many thoughts.
20. Everything has a purpose.

Section D: Comorbid Attributes

1. OCD (Obsessive Compulsive Disorder)
2. Sensory Issues (sight, sound, texture, smells, taste)
3. Generalized Anxiety
4. Sense of pending danger or doom
5. Feelings of polar extremes (depressed/over-joyed; inconsiderate/over-sensitive)
6. Poor muscle tone, double-jointed, and/or lack in coordination
7. Eating disorders, food obsessions, and/or worry about what is eaten.
8. Irritable bowel and/or intestinal issues
9. Chronic fatigue and/or immune challenges
10. Misdiagnosed or diagnosed with other mental illness and/or labeled hypochondriac.

11. Questions place in the world.
12. Often drops small objects
13. Wonders who she is and what is expected of her.
14. Searches for right and wrong.
15. Since puberty, has had bouts of depression.
16. Flicks/rubs fingernails, flaps hands, rubs hands together, tucks hands under or between legs, keeps closed fists, and/or clears throat often.

Section E: Social Interaction

1. Friends have ended friendship suddenly and without person understanding why.
2. Tendency to over-share.
3. Spills intimate details to strangers.
4. Raised hand too much in class or didn't participate in class.
5. Little impulse control with speaking when younger.
6. Monopolizes conversation at times.
7. Bring subject back to self.
8. Comes across at times as narcissistic and controlling. (Is not narcissistic.)
9. Shares in order to reach out.
10. Sounds eager and over-zealous at times.
11. Holds a lot of thoughts, ideas, and feelings inside.
12. Feels as if she is attempting to communicate "correctly."
13. Obsesses about the potentiality of a relationship with someone, particularly a love interest.
14. Confused by the rules of accurate eye contact, tone of voice, proximity of body, stance, and posture in conversation.
15. Conversation can be exhausting.
16. Questions the actions and behaviors of self and others, continually.
17. Feels as if missing a conversation "gene" or thought-"filter"
18. Trained self in social interactions through readings and studying of other people.
19. Visualizes and practices how she will act around others.
20. Practices in mind what she will say to another before entering the room.
21. Difficulty filtering out background noise when talking to others.
22. Has a continuous dialogue in mind that tells her what to say and how to act when in a social situation.
23. Sense of humour sometimes seems quirky, odd, or different from others.
24. As a child, it was hard to know when it was her turn to talk.
25. She finds norms of conversation confusing.

Section F: Finds Refuge when Alone

1. Feels extreme relief when she doesn't have to go anywhere, talk to anyone, answer calls, or leave the house.

2. One visitor at the home may be perceived as a threat.
3. Knowing logically a house visitor is not a threat, doesn't relieve the anxiety.
4. Feelings of dread about upcoming events and appointments on the calendar.
5. Knowing she has to leave the house causes anxiety from the moment she wakes up.
6. All the steps involved in leaving the house are overwhelming and exhausting to think about.
7. She prepares herself mentally for outings, excursions, meetings, and appointments.
8. Question next steps and movements continually.
9. Telling self the "right" words and/or positive self-talk doesn't often alleviate anxiety.
10. Knowing she is staying home all day brings great peace of mind.
11. Requires a large amount of down time or alone time.
12. Feels guilty after spending a lot of time on a special interest.
13. Uncomfortable in public locker rooms, bathrooms, and/or dressing rooms.
14. Dislikes being in a crowded mall, crowded gym, or crowded theatre.

Section G: Sensitive

1. Sensitive to sounds, textures, temperature, and/or smells when trying to sleep.
2. Adjusts bedclothes, bedding, and/or environment in an attempt to find comfort.
3. Dreams are anxiety-ridden, vivid, complex, and/or precognitive in nature.
4. Highly intuitive to others' feelings.
5. Takes criticism to heart.
6. Longs to be seen, heard, and understood.
7. Questions if she is a "normal" person.
8. Highly susceptible to outsiders' viewpoints and opinions.
9. At times adapts her view of life or actions based on others' opinions or words.
10. Recognizes own limitations in many areas daily.
11. Becomes hurt when others question or doubt her work.
12. Views many things as an extension of self.
13. Fears others opinions, criticism, and judgment.
14. Dislikes words and events that hurt animals and people.
15. Collects or rescues animals. (often in childhood)
16. Huge compassion for suffering.
17. Sensitive to substances. (environmental toxins, foods, alcohol, etc.)
18. Tries to help, offers unsolicited advice, or formalizes plans of action.
19. Questions life purpose and how to be a "better" person.
20. Seeks to understand abilities, skills, and/or gifts.

Section H: Sense of Self

1. Feels trapped between wanting to be herself and wanting to fit in.
2. Imitates others without realizing.
3. Suppresses true wishes.
4. Exhibits co-dependent behaviours.
5. Adapts self in order to avoid ridicule.
6. Rejects social norms and/or questions social norms.
7. Feelings of extreme isolation.
8. Feeling good about self takes a lot of effort and work.
9. Switches preferences based on environment and other people.
10. Switches behaviour based on environment and other people.
11. Didn't care about her hygiene, clothes, and appearance before teenage years and/or before someone else pointed these out to her.
12. "Freaks out" but doesn't know why until later.
13. Young sounding voice
14. Trouble recognizing what she looks like and/or has occurrences of slight prosopagnosia (difficulty recognizing or remembering faces).

Section I: Confusion

1. Had a hard time learning others are not always honest.
2. Feelings seem confusing, illogical, and unpredictable. (self's and others')
3. Confuses appointment times, numbers, or dates.
4. Expects that by acting a certain way certain results can be achieved, but realizes in dealing with emotions, those results don't always manifest.
5. Spoke frankly and literally in youth.
6. Jokes go over the head.
7. Confused when others ostracize, shun, belittle, trick, and betray.
8. Trouble identifying feelings unless they are extreme.
9. Trouble with emotions of hate and dislike.
10. Feels sorry for someone who has persecuted or hurt her.
11. Personal feelings of anger, outrage, deep love, fear, giddiness, and anticipation seem to be easier to identify than emotions of joy, satisfaction, calmness, and serenity.
12. Situations and conversations sometimes perceived as black or white.
13. The middle spectrum of outcomes, events, and emotions is sometimes overlooked or misunderstood. (All or nothing mentality)
14. A small fight might signal the end of a relationship or collapse of world.
15. A small compliment might boost her into a state of bliss.

Section J: Words and Patterns

1. Likes to know word origins.
2. Confused when there is more than one meaning to a word.
3. High interest in songs and song lyrics.

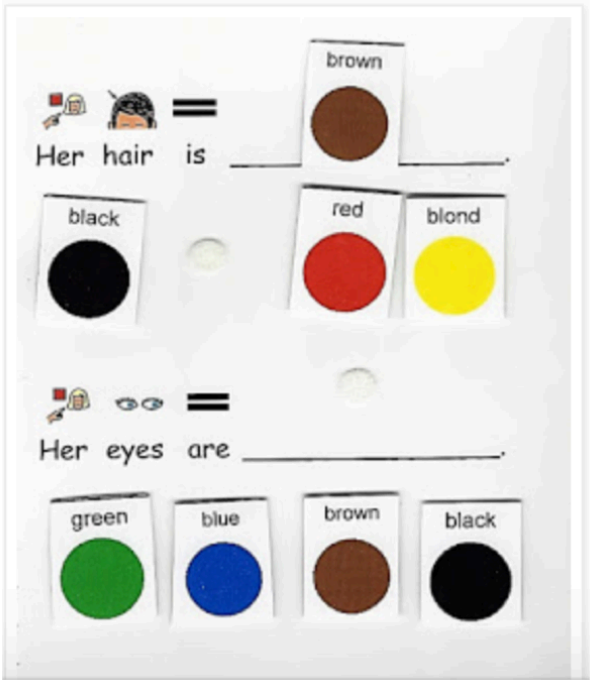
4. Notices patterns frequently.
5. Remembers things in visual pictures.
6. Remembers exact details about someone's life.
7. Has a remarkable memory for certain details.
8. Writes or creates to relieve anxiety.
9. Has certain "feelings" or emotions towards words.
10. Words bring a sense of comfort and peace, akin to a friendship.

(Optional) Executive Functioning This area isn't always as evident as other areas

1. Simple tasks can cause extreme hardship.
2. Learning to drive a car or rounding the corner in a hallway can be troublesome.
3. New places offer their own set of challenges.
4. Anything that requires a reasonable number of steps, dexterity, or know-how can rouse a sense of panic.
5. The thought of repairing, fixing, or locating something can cause anxiety.
6. Mundane tasks are avoided.
7. Cleaning may seem insurmountable at times.
8. Many questions come to mind when setting about to do a task.
9. Might leave the house with mismatched socks, shirt buttoned incorrectly, and/or have dyslexia.
10. A trip to the grocery store can be overwhelming.
11. Trouble copying dance steps, aerobic moves, or direction in a sports gym class.
12. Has a hard time finding certain objects in the house, but remembers with exact clarity where other objects are.

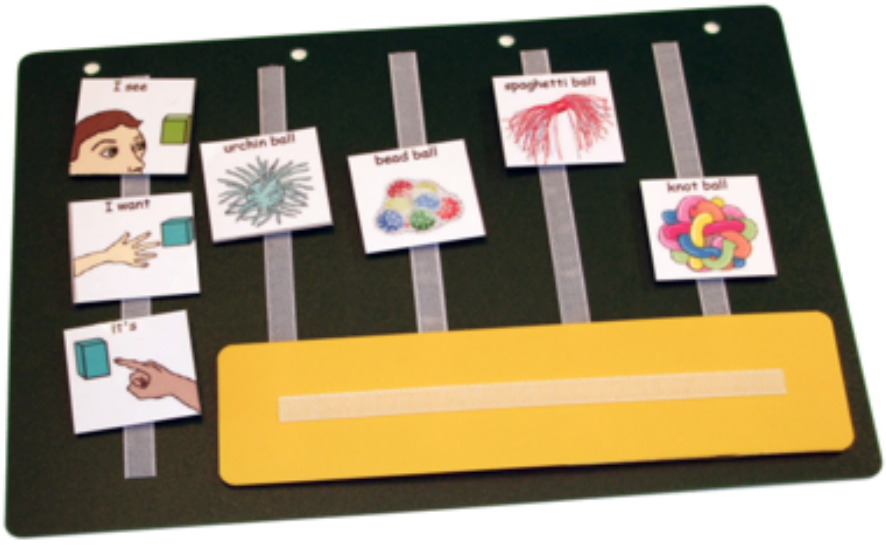
Appendix 4: Examples of TEACCH and PECs

TEACCH examples taken from the TEACCH website resources area (https://teacch.com/resources/)



ELA-25

PECs examples taken from the PECs website shop
([https://pecs-unitedkingdom.com/shop/activity-board/)](https://pecs-unitedkingdom.com/shop/activity-board/)



Appendix 5: Participant Session Log

Child_ 1	Female	Session 1	16.11.2015
Child_ 1	Female	Session 2	23.11.2015
Child_ 1	Female	Session 3	07.12.2015
Child_ 1	Female	Session 4	14.12.2015
Child_ 1	Female	Session 5	22.02.2016
Child_ 1	Female	Session 6	07.03.2016

Child_ 2	Male	Session 1	16.11.2015
Child_ 2	Male	Session 2	23.11.2015
Child_ 2	Male	Session 3	07.12.2015
Child_ 2	Male	Session 4	14.12.2015
Child_ 2	Male	Session 5	29.02.2016
Child_ 2	Male	Session 6	14.03.2016

Child_ 3	Female	Session 1	16.11.2015
Child_ 3	Female	Session 2	23.11.2015
Child_ 3	Female	Session 3	07.12.2015
Child_ 3	Female	Session 4	14.12.2015
Child_ 3	Female	Session 5	22.02.2016
Child_ 3	Female	Session 6	29.02.2016
Child_ 3	Female	Session 7	07.03.2016
Child_ 3	Female	Session 8	14.03.2016

Child_ 4	Male	Session 1	16.11.2015
Child_ 4	Male	Session 2	23.11.2015
Child_ 4	Male	Session 3	07.12.2015
Child_ 4	Male	Session 4	14.12.2015
Child_ 4	Male	Session 5	22.02.2016
Child_ 4	Male	Session 6	29.02.2016
Child_ 4	Male	Session 7	07.03.2016
Child_ 4	Male	Session 8	14.03.2016
Child_ 4	Male	Session 9	26.09.2016
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Child_ 4	Male	Session 11	11.10.2016
Child_ 4	Male	Session 12	18.10.2016
Child_ 4	Male	Session 13	08.11.2016
Child_ 4	Male	Session 14	15.11.2016
Child_ 4	Male	Session 15	22.11.2016
Child_ 4	Male	Session 16	06.12.2016
Child_ 4	Male	Session 17	24.01.2017
Child_ 4	Male	Session 18	31.01.2017
Child_ 4	Male	Session 19	07.02.2017

Child_ 4	Male	Session 20	21.02.2017
Child_ 4	Male	Session 21	28.02.2017
Child_ 4	Male	Session 22	07.03.2017
Child_ 4	Male	Session 23	14.03.2017
Child_ 4	Male	Session 24	21.03.2017
Child_ 4	Male	Session 25	28.03.2017

Child_ 5	Male	Session 1	16.11.2015
Child_ 5	Male	Session 2	23.11.2015
Child_ 5	Male	Session 3	07.12.2015
Child_ 5	Male	Session 4	14.12.2015
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Child_ 5	Male	Session 19	07.02.2017
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Child_ 5	Male	Session 21	28.02.2017
Child_ 5	Male	Session 22	07.03.2017
Child_ 5	Male	Session 23	14.03.2017
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Child_ 5	Male	Session 25	28.03.2017

Child_ 6	Male	Session 1	16.11.2015
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Child_ 6	Male	Session 24	28.03.2017

Child_ 7	Male	Session 1	16.11.2015
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Child_ 7	Male	Session 21	28.02.2017
Child_ 7	Male	Session 22	14.03.2017
Child_ 7	Male	Session 23	21.03.2017
Child_ 7	Male	Session 24	28.03.2017

Appendix 6: Teaching Manual for MEDIATE

MEDIATE

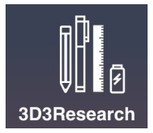
Mimicry and Empathy Delivered through Inclusive approaches to Autism, Technology and Education

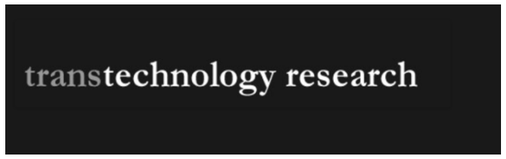
Written by Abigail Rose Jackson as part of her PhD thesis submitted to The University of Plymouth in partial fulfilment for the degree of Doctor of Philosophy (Ph.D.). Main thesis is titled:

Movement, Technological Mediation And Embodied Interactions, in the Education of children with autism.

Transtechnology Research
School of Art and Media — Faculty of Arts

UNIVERSITY OF PLYMOUTH





Arts & Humanities Research Council

Contents

1

Introduction to the approach

MEDIATE is an approach has been designed and developed throughout the authors PhD research project. During which she worked in an autism specialist school with a number of children, in a one-to-one setting. Prior to this the author had spent an additional six years working with children holding a diagnosis of autism, all within a creative and movement capacity. This manual is written, primarily, from her personal experience and reflections, but is grounded in the PhD research she conducted on autism, education, technology, alternative interventions and movement practices. This manual is designed to be a light guide to becoming more creative in our approaches to working with children holding a diagnosis of autism, but also towards how we embed technologies in their education. Throughout you will find comments from personal experience and some hints and tips to help you shake up your practice. You will also see a short summary of the research and a background to autism to help give context to the suggestions seen later in the booklet.

2

Summary of research

To attempt a full summary of my full PhD thesis is something of a task, but here I will pin point a number of findings that helped to shape the way in which the MEDIATE approach was delivered and facilitated.

1. Play
2. Mimicry
3. Touch
4. Empathy
5. Movement in education
6. Technology in education

Of course there is also a need for autism itself to be address, so please see the following section.

Touch

Touch provides the first sensory input in life while a baby is still in the womb and continues to play an important part of how children learn about the world as well as being essential for children's healthy grown and development. (Cullen, Barlow & Cushway, 2005: 183)

Therefore, touch is one of the most fundamental forms of communication between a child and their care giver, and becomes a huge form of communication between children and their families and peers. Touch is used through learning about themselves, others, and their wider environment. In terms of autism (introduced below) there may be a heightened or reduced sensitivity to touch meaning its placement must only be used if it is seen to enhance their experience and promote developments.

Mimicry

When repetitive behaviours are reflected back, the person recognizes and accepts them, but he/she is surprised that they come from outside him/herself. This surprise, which is often visible, leads him/her to search for an external source and draws his/her attention to the outside world. (Caldwell, 1997: 751)

In language acquisition mimicry is key for the child to learn sounds, words, phrases, sentences and wider communication skills associated with gesture. It is used throughout our whole lives, despite being vital for infantile development, as we mimic the facial expression, gestures and postures of those we communicate with, without any formal intention to do so.

Play

'Many of the skills children need in their development as social beings, for example turn-taking, decision making, language skills, monitoring and reciprocity, evolve naturally through play' (Keay-Bright, 2008: 3)

Therefore, in connection to the ideas of touch and mimicry above, it is clear that play often includes both of these skills. In order to play with peers a child will often experiment with both touch and mimicry to form bonds and build relationships with others. Play is a vital learning process that also includes the development of ideas surrounding the self and other. Again to connect this theme to autism there is considered to be a reduction in imaginative play, which is often associate with literature showing a reduction in imaginative problem solving through the early years.

2

Empathy

'Empathy, on this view, is a special case of mental simulation, in which the output states are affective or emotional states: empathy consists of a sort of "mimicking" of one person's affective state by that of another' (Goldman, 1995 in Thompson, 2001).

This is an important social skill allowing individuals to be able to communicate and relate to others by understanding their situation. It is also clear that this skill can only be developed through a deeper understanding of others, supported through touch, mimicry and play. Therefore, this approach sees empathy as another extension of the skills listed above and can also see that through applying such developmental approached within MEDIATE, there is the possibility to develop empathetic skill.

Movement in education

Conversely, a lack of understanding of the importance of movement for cognition can only lead to an impoverished view since it ignores the way children (and all humans) create meaning through action. (Antle, 2013: 31).

Therefore, the PhD research project understood that there is a lack of focus on movement in education and in turn developed the MEDIATE approach to ensure this is readdress. Movement is an important aspect of children's overall development, but can also be seen to help with social skills, expression, creativity, physical health, along with cognition.

Technology in education

Theories of embodied cognition can be used to frame and inform a design space in terms of understandings of the way children interact with their everyday world and how an interactive product might augment or support such interaction. (Antle, 2013: 32)

There is currently a disconnect between approaches using technology as the main form of interaction, with those using human interaction to engage the child. MEDIATE aims to bring both together in the design of an approach helping to support **Mimicry and Empathy Delivered through Inclusive approaches to Autism, Technology and Education**. This approach has responded to questions contemplating the need for adaptation within practices and the wider culture of education and design, to ensure the development of an approach to technology that primarily amplifies and extends the possibilities of the autistic child, in addition to their everyday school experiences and holistic development.

3

Background to autism

It is widely understood that autism we know today originates from the work of two key psychiatrist; Leo Kanner and Hans Asperger. Their individual research project over lapped in time, as well as in their findings, with both practicing in the early 1940s. The work Kanner, an American psychiatrist, was focusing on was with a group of participating children, yet Asperger, in Austria, was working with older adolescent children. This difference in age allowed for two differing insights into a diagnosis now discussed and researched collectively, despite the two knowing little of each others work at the time.

Key findings from Kanner's work on autism was that of withdrawal, obsessive nature, rote memory, heightened specific intellect, lack of communicative intent, over sensitivity and heightened relationships to objects. Whilst Asperger's group of adolescent showed signs of naivety and inappropriate social interaction skills in young adults — which is information that would not have been identifiable purely through Kanner's work (as his research participants were children only). The majority of the participants in Asperger's study had poor motor skills yet were of borderline intellect, unlike Kanner participants, and in many cases evidenced heightened intellect

Kanner's was given recognition at the time, whereas Asperger's was not then seen as being distinct enough. It wasn't until it was translated into English some 40 years later that the subtle differences were acknowledged. This was in part helped by the work of British psychiatrist and physician Lorna Wing and clinical psychologist Dr Judith Gould, whose research was paramount in the concept of the autism as a spectrum, as well as establishing The Triad of Impairments (1979). Although not as commonly used it is important to note that this Triad allowed the communication, social and imaginative difficulties of someone as a diagnosis to be recognised.

In more recently years the term Neurodiverse has been used to discuss autism and a cluster of other diagnoses. This term offers an insight into the diagnosis from the frame work of different rather than disabled. With great text being published it is becoming more clear that the negative connotations attached to disabled and words such as impaired are outdated and in need of being readdressed.

4

How to begin?

'Arguably the most important and valuable aspect of social cognition is to do with learning about other agents not just as types, but as individuals' (Frith & Frith 2012: 295).

Key things to note about the MEDIATE approach before you proceed:

- This is design with a diagnosis of autism in mind
- This approach focuses on subtle and holistic development
- This approach offers an alternative and complimentary approach to other interventions the child might be enrolled in
- This approach is designed to give the adult confidence to be flexible and intuitive
- This approach is designed to follow the child's interests.

With this in mind there is no 'right' child to use this work with it is suggested that MEDIATE is most appropriate for children with at least one of the following traits:

- is working to develop their overall communication skills
- strives in a one-to-one setting
- is looking to improve their social skills
- is identified as isolating themselves
- engages with technology in a solo capacity

Stage 1: Preparation

1. Find a space within your school that can be used comfortably for at least 20 mins without interruptions, and is not too overwhelming for the child if used in a one-to-one session with you (taking into account that large spaces can be just as overwhelming as small spaces).
2. Make sure the flooring works for bare-feet, crawling, rolling, running etc. (not too rough, ideally wooden and sprung flooring, but this is not always accessible).
3. Check the room for any hazards or distractions (think about the individual child here).
4. Bring into the space anything to make it more comfortable (I have used large gym mats on the floor, inflated exercise balls to sit/rest on, cushions, etc). This will help create a comfortable environment used to begin and end each session.
5. Over time you will want to think about how you might introduce technology into the space – I have written a small piece on this in the 'How to introduce technologies' section of the booklet (see page 18).
6. Prepare the child by using any communication style suitable. It is best to explain that they will be working with just you, and to tell them which room you will be going in, before telling them you will be doing some movement and play.

4

Stage 2: Following the child's lead

One of the main questions I have been asked by teachers I have interacted with is 'how do you know what to do?'. Well in the case of every child I have worked with, they just start exploring, walking or running around the room, sitting and rolling on the mats (if you manage to find some) and in general are full of movement. So, simply follow their lead. Here are some short case studies from my experience:

If a child begins to run around the room you have a number of options:

a. Run around the room in the opposite directions so every few minutes you run past each other. This can become a game and you can make a sound, jump, put your arm out for them to run under, etc, every time you pass. This can change a seemingly unengaged child into a very playful child.

a. Sit in the middle of the room and sing a little tune, I simple sang 'Sam is running, running running, Sam is running, round the room' a number of times until he stopped and then sang 'Sam is stopping, stopping stopping, Sam is stopping, Sam has stopped'. Again this brings awareness to the child's own movements and how he is seen by the other, it is still working on the principle of mimicking the child here. It will also offer the child more agency as he/she might change their action to see if you still sing… again it moves to a place of humour very quickly when they do this.

a. Another option would be to use something to make a sound in time with the running, this could simply be tapping the floor but if you have a drum, shaker etc it could be more effective. Here you are working on speed and rhythm and can move into a call and response type task, you might offer a slower or fast rhythm and the child then has the choice to speed up their running or slow down. It is a great non-verbal game that again gives the child a chance to see how you view their actions but also agency to change things within the structure.

5

What to expect

Within the facilitated session, in the development of the MEDIATE approach, a number of autistic participants were engaged with. This firstly showed that the diagnosis of autism is individual and that each child will have their own interests and abilities… and you should go with these. Here are some examples of what to expect with three different types of children.

Shy and non-verbal

In the case of my participant who presented as being shy and non-verbal it was clear that we needed to create a space that was not too overwhelming. This is where the gym mats became useful as they helped me to define a space to work within, reducing the overwhelming size of the room. In the beginning it was important to establish a routine and implement a structure. This was done so by firstly, setting a specific time each week that can be repeated on the same day so the child can be prepared. Always collect the child from class, remind them about the session as you walk back to the room, and encourage them to do the same thing at the beginning (i.e. sit down, take off your shoes and socks, then join me on the blue mats).

Once these have been established it was key to let them explore the space at their own speed, remember here that they are driving the way, so as intuitive as it might be to start listing ideas for them to try, this is not the point of the interaction. Start slow and mimic their actions and eventually (by reading the next section) you can begin to adapt your mimicry style to encourage engagement.

Excited and ready to play

This type of child is often easy to engage but might not be confident to make their own decisions. They are also likely, as experienced, to directly ask ‘why are you copying me?’. Here I would suggest responded by saying something like ‘you have great ideas’ or ‘this session is all about what you want to do, and I want to join you’. Most children will react positively to this, but if physically mimicry seems to overwhelm the child then maybe try mimicking the rhythm of their actions through sound. This child is also likely to want to make you laugh or make themselves laugh so look through the next section for how this might happen.

Disengaged but full of energy

Having worked with a child like this I can say that it might feel difficult to continue your actions for the first few weeks, if physically it becomes difficult then use sound to mimic their actions or verbally explain what they are doing through a calm voice or a little song. This type of child might run in circles for the full 20-minutes so protect yourself and manage your energy as you might have other sessions after or a full day of teaching. As they are hard to engage use the techniques below. It might take much longer than others, in my case it took over 10 sessions, before you feel mutual engagement, but stick with it, this type of child needs the sessions most.

6

How to encourage change

With the sessions below I am always talking about the need for an intuitive response to the child. Here change does not mean we move into a goal orientated approach, it is used to describe a change in pace, a change of focus and to move towards equal engagement between you and the child. The three approaches are to be applied in the mimicry format. So, in saying this, the three ways of changing your own mimicry, in the hope the child will notice, respond and engage, are as followed:

There are three simple steps to encourage change:

1. Slow things down

Here I am talking about your actions. If a child is moving quickly, in anyway, one way to get their attention and for them to have more awareness of what they might be doing, is to slow down your mimicry of them. This works particularly well for a child who you feel might not have noticed your mimicry in real time. If the child is doing big motion it works particularly well, a slow-motion fall to the ground and roll is very noticeable and often insights laughter. This then gives the child more agency and their actions tend to have more purpose… the purpose being to see how you might slow them down. This has also worked particularly well with a child who would sit and do very small hand gestures on the floor in front of them or their own lap. These smaller gestures might need a combination of slowing down whilst also slightly exaggerating the movement.

2. Speed things up

I don't think this one needs too much explanation. It is used with the same rationale as the idea to slow down. Surprisingly it is much harder as you might run out of things to mimic at any given time. But, this often gets a quicker response from the child, which might be what you are after, as your stopping might be abrupt and comical. Again, the child might challenge you here, do what you can and have fun with it. It is play after all.

3. Add sound

If the two above don't get the desired response, or are too demanding physically, then you can always add sound, hum the rhythm of their running, sing about their actions, and maybe sing aloud questions (that will likely go unanswered) about what the child will do next. You can also use your environment here, tap the floor, stamp your feet, scratch at the wall, find a prop, it is all engaging and new and you are using all of these techniques to find the child's interests and see what will work for them as an individual. Also, when using sound, you can also use this in combination with the two ideas above, drumming really fast or really show can harbour the same effect.

7

How to introduce technologies

By creating technological methods of interaction (visual displays and physical robots), play and comfortable interactions can be garnered from children with autism. There is a feeling of "safety" by having the main form of interaction occur with non-humans. Further, these devices allow the child, rather than a third party, to be in control of the interactions. This research has much potential.
(Hailpern, 2007: 48)

Within the practical research, the children are offered an opportunity to comprehend their effect on the social interaction as it plays out through visual means, whilst they have the choice to mimic the facilitator's digital image rather than engaging purely in human interaction, as this is so often avoided by many autistic individuals. In the MEDIATE approach this was done so through use of three pieces of equipment commonly found in the school environment:

1. An overhead projector with HDMI capacities
2. A camera with HDMI capacities
3. A HDMI cable

The idea was to create a digital mirror effect that would allow the child to experience both mimicry and self-referential ability, as these had been evidenced as key processes prevalent in social developments and language acquisition – both verbal and non-verbal.

I would advise having a play around with the set up a few times before beginning any work with children, to ensure you feel confident with how to the technologies work and where in the room you want to film, versus where you want to project the image. It is to be noted that you want the camera and the projector close together to create a 'no go zone' for the child to avoid any accidents, and ensure you have all wires taped to the floor.

In my work, this set up was extremely effective as it offered the digital mimicry I was aiming for, but additional factors were the level of humour it created, the more direct awareness of me in the room, and the increased spatial awareness seen by the children. If you want to embed the MEDIATE approach in its original format then to think about how you might set up the space to afford live feed interactions. But also think about your individual child and some of these options;

- If you pupil normally works on a tablet device in an isolated capacity could they film the session and watch it back after? I had done this with pupils and they are great at being commentator when showing others and explaining exactly what they were doing (great for self awareness).
- If you pupil likes music could they create their own song and record it then use it to move to in the sessions. This will allow them to create movement with more purpose as they have created the music and would be great for children who might be hard to engage in physical activity. Self motivation is key here.

Just remember, the purpose of the MEDIATE approach is to offer an understanding of how empathy, mimicry and touch can be applied as tools to support an autistic child's holistic development alongside computer technologies. Empathy, mimicry and touch are vital for autistic children's holistic development, especially in education, as they allow the child to continue experiencing such interactions that afford social and communicative skill to progress past the infantile years. When used together alongside technology it also allows the child to develop social experiential knowledge in their interactions with technology by removing the conventional solo user set up, whilst offering a digital mimicry by use of live feed footage. It also offers you the chance to question why technology is not more readily embedded into social and creative settings and why empathy, mimicry and touch are not more readily prioritised as important tools when interacting with the autistic child.

8

Suggested reading

Antle, A. N. (2013) Research opportunities: Embodied child-computer interaction.
International Journal of Child-Computer Interaction. Vol. 1. Pp: 30–36

Caldwell, P. (1997) 'Getting in touch' with people with severe learning disabilities.
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Frith, C. D. & Frith, U. (2012) Mechanisms of Social Cognition.
Annual Review of Psychology Vol. 63. Pp: 287–313

Goldman, A. (1995) Empathy, mind and morals.
In Davis & Stone (1995)
Folk Psychology. The Theory of Mind Debate. Oxford: Blackwell.

Hailpern, J. (2007) Encouraging Speech and Vocalization in Children with Autistic Spectrum Disorder.
Sigaccess Newsletter. Vol. 89. Pp: 47–52

Thompson, E. (2001) Empathy and Consciousness.
Journal of Consciousness Studies. Vol. 8, No. 5–7. Pp: 1–32

Written by Abigail Rose Jackson as part of her PhD thesis submitted to The University of Plymouth in partial fulfilment for the degree of Doctor of Philosophy (Ph.D.). Main thesis is titled:

Movement, Technological Mediation And Embodied Interactions, in the Education of children with autism.

Designed by Charlotte Frost.