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SUCCESSFUL SOCIAL SKILLS

**Designing a way of learning non-verbal
communication skills**

**A thesis submitted for the degree of
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Massey University
Wellington
New Zealand**

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ABSTRACT

This research identifies, and respond to, the particular challenges of teaching social skills to children with autistic characteristics, specifically in this case Asperger's Syndrome (AS).

For most children the process of understanding and developing non-verbal communication begins early in childhood. For children with AS this is not the case and non-verbal communication needs to be taught to them.

This project provides support for the educators of children who require assistance in the social skills area. This has been achieved with a structured interactive computer prototype. This prototype has been designed with consideration for the unique cognitive attributes and sensory issues that AS individuals encounter.

A visual language has been used to identify the routine of an everyday event, and to introduce the concept of change within this routine. The result provides these individuals with the most productive environment for learning.

DEDICATION

I dedicate this thesis to my late husband, Richard A. Barker, as an acknowledgement of his absolute support and his contribution to this project.

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I wish to acknowledge support provided by Jacquie Naismith. Who supervised the initial proposal and early stages of this Masters Degree.

I also gratefully acknowledge Patricia Thomas who supervised the later assembly of this thesis.

I would like to acknowledge staff of The Correspondence School, Wellington, New Zealand. A number of staff members in the 'students with special needs' section of The Correspondence School helped this project by identifying potential target audience's they found lacking resource material.

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1. CENTRAL PROPOSITION

This research seeks to identify, and respond to, the particular challenges of teaching social skills to children with autistic characteristics, specifically Asperger's Syndrome.

The description Autistic covers several groups of people who suffer from developmental disorders. The Autistic spectrum is really a continuum of many different traits – for each group these traits vary in the degree they present themselves. However all the groups in the Autistic spectrum have problems with communication in social situations.

While this project will focus primarily on one group, those with the condition known as Asperger's Syndrome (AS)¹, it will also be informed by, and possibly relevant to, other groups within the Autistic spectrum. A comparison of the techniques used to support some of these groups will be used to aid the development of a conceptual prototype appropriate for individuals with AS. Those other groups may also benefit from the findings of this research.

Individuals with AS seem unable to decipher gestural and social actions. Hand and facial gestures or identifying speech intonation are not intuitively understood. For most children the process of understanding and developing non-verbal communication begins early in childhood. By the time a child reaches school age they normally have an intuitive understanding of this complex "unspoken" language. For children with AS this is not the case and non-verbal communication needs to be taught to them. The difficulty they have understanding these social gestures can be further complicated by teaching methods and spaces that are unsuitable for them. These types of issues indicate the need for a more specialised learning environment targeted to this group. The need for specialised education in the area of non-verbal social communication has been acknowledged by Attwood (1999) and Gray (2000a).

Up to 50 percent of students who suffer from non-verbal communication problems also suffer from sensory sensitivity (Irlen, 2003). These sensory issues are generally individualistic, and usually are not taken into

¹ Variations in the way this condition is named in the referenced periodicals also include Asperger Syndrome (AS) and Asperger Syndrome Disorder (ASD). For the purpose of this research I will refer to the disorder consistently as Asperger's Syndrome (AS).

consideration when constructing a classroom environment. It is important that this project take into consideration these sensory issues, which may be addressed by creating a learning environment where the learner is in control of the amount of stimulus experienced.

Recent studies undertaken with AS students indicate that a specially designed visual language might aid their understanding of non-verbal messages that are embedded in social interactions, (Attwood, 1999; Bauer, n.d.).

AS individuals require a very structured living environment. They thrive on routine and can become distressed and suffer from anxiety when routines are disrupted (Attwood, 1995). A review of the literature shows that due to their strong performance IQ, the AS student would learn more readily from a very structured, literal and concrete learning environment (Swanson, 2003).

This project will provide support for the educators of children who require assistance in the social skills area. It will look at utilising a structured format and environment as well as a visual language to provide these individuals with the most productive environment for learning. The concept for the prototype will focus on a common everyday event, "mealtime", and will introduce the user to a variety of options and changes that are possible within this routine. This concept may be used as a template for other daily activities, to help ease anxiety created from uncertainty and change.

2. DESIGN AIMS

The key aims of this research project are to:

- help students to visually identify different social settings, and equip them with strategies to cope in these situations
- create a resource for educators, therapists and parents of students who need to learn more about non-verbal communication
- create an interactive CD-Rom where the user is in control of the pace of learning
- develop a visual interface that will reduce sensory stimulus that may impact adversely on the learning experience.

The objectives of this project fall into two main categories as follows.

2.1 Computer-aided instruction

Many students in these socially impeded groups suffer from oversensitivity to external stimulus. This impairment hinders the students' ability to learn in the classroom setting. Computer-aided instruction allows the creation of a learning environment that can be adjusted to individual visual and audio needs. Such use of multimedia and interactive design will allow the individual to control the learning environment, thus reducing sensory stimulus that may cause overload. This controlled environment will allow the user to learn at their own pace. The final outcome will be an environment that is more productive, more enjoyable and safer for the student.

2.2 Visual aesthetics

Attention to a specific visual and graphical language suitable for the AS student will drive the overall aesthetic style. This includes consideration for the likely oversensitivity to stimulus, inability to readily accept changes to routines and strong folk physics² and performance IQ disposition. This will be delivered in a user controlled but architecturally structured learning environment.

² Clinical and parental descriptions of children with AS and High Functioning Autism (HFA) frequently refer to their fascination with machines (the paragon of non-intentional systems). Of course, a fascination with machines need not necessarily imply that the child understands the machine, but in fact most of these anecdotes also reveal that children with autism have a precocious understanding, too. The apparently precocious mechanical understanding suggests that they have a high folk physics understanding (Baron-Cohen, 2000). See glossary.

3. METHODOLOGY

3.1 Literature review

The first section of the literature review will cover the afflictions suffered by people who have difficulty learning non-verbal communication, especially these groups: AS, Autism, and High Functioning Autism (HFA). The first section will also review learning styles that are appropriate for the AS student and an investigation of sensory sensitivity and related problems.

The second section will contain a more theoretical review. An analysis of computer-aided instruction will determine whether the computer is an appropriate platform for the education of students with social skill and sensory problems. This section will also look at how current pedagogical theory applies to students with learning disabilities.

The literature review will identify what is known about the unique needs, strengths and the restrictions of individuals who have difficulty in learning social skills. This will inform the visual design process and the implementation of an interactive project for individuals with special needs in this area.

3.2 Precedent analysis

The research will include analysis of existing materials and procedures used in the education of social skills. This analysis will establish what has been done towards the development of a visual communicative style for students with special needs in this area. This will be used as a departure point for the establishment of a visual design aesthetic and the structural criteria of the project.

3.3 Expert interviews

Expert interviews will be employed to address the design aims. An expert in the field of special needs education will be interviewed, with the information gained being used to inform the design process in respect to the cognitive learning style and the visual appropriateness for the target audience. The interview method will also be used to elicit feedback on the design components and the systematic architectural structure of the interactive prototype. These interviews will be recorded and a summary of the transcription will be appended to this thesis. This interview process is in line

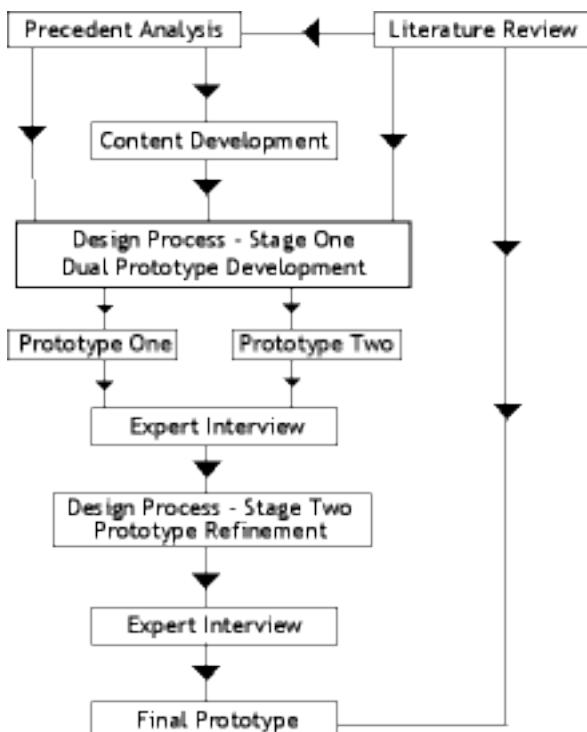
with Massey University ethical guidelines for research; the interview schedule will be submitted to the ethics committee for approval (see section 5 on Ethics).

4. DESIGN PROCESS

4.1 Iterative design process

This project will follow an iterative design process, which is a design methodology based on a cyclic process of prototyping, analysing and refinement of a work in progress. The integration of methodology and design process outlined in (Figure 1) clearly indicates the steps where research has informed the design and where feedback is used as a form of research to refine successive versions of a prototype. This process will allow design decisions to be based on users' experiences of the prototypes. After the initial literature review the development of the project continues through an ongoing dialogue between the expert, the designer and the design.

Figure 1. Iterative design flow chart.



Source: Tracey Blair

5. ETHICS

Assessment criteria will be established through interviewing an expert in the field. In the same way feedback will be sought on the perceived effectiveness of this project.

In accordance with the research regulations laid out by Massey University, the construction and completion of this research thesis will follow ethical principles.

The research undertaken will not involve direct testing or surveying of human or animal participants.

6. LITERATURE REVIEW

PART ONE: Afflictions of non-verbal learners

6.1 Introduction

The first part of this literature review clarifies the area of learning difficulties that are the focus of this thesis. Asperger's Syndrome (AS) is a relatively recently diagnosed condition, and as such there can be widely differing understandings of the associated labels, even within professional audiences.

This section outlines the difference and similarities between AS, Pervasive Developmental Disorders (PDD), Autism, High Functioning Autism (HFA) and Non-verbal Learning Disorder (NLD), with a particular focus on identifying learning techniques helpful for students with AS.

6.2 Autism and Asperger's Syndrome

The first symptomatic diagnosis of Autism was made in 1943 by Dr Leo Kanner (see Appendix A). At the same time an Austrian psychiatrist, Hans Asperger, independently recognised a pattern of abnormal behaviour in a group of adolescents. Asperger described a number of cases that resembled Kanner's Autistic description. However, Asperger's description differed from Kanner's in that speech was less commonly delayed, motor deficits were more common, and all the initial cases occurred in boys (Wing, 1981). Asperger also suggested that similar problems could be observed in family members, particularly fathers. Asperger regarded his group as "Autistic 'psychopathy' – that is an abnormality of personality" (Aarons & Gittens, 1992, p. 9). For many years Asperger's work remained unknown in English medical literature. In fact it wasn't until the 1980s that Digby Tantam wrote in the *National Autistic Society Publication* "a sub-group exists of autistic people who are sociable, highly clumsy, verbally skilled with highly developed special interests". He referred to this sub-group as having "Asperger's Syndrome" (Aarons & Gittens, 1992, p. 9). Debate arose over the distinction between AS and Autism. Psychiatrists, re-enforcing the impression that Autism is not a clear-cut disorder but a spectrum of difficulties with certain clusters of possible deficits, offered variations and modifications.

In 1981 an influential review and series of case reports by former medical research councillor Dr Lorna Wing identified the core symptoms in Autism as

being social in nature. Wing's work highlights three observable social impairments as central to the disorder:

- an impairment of social relationships
- an impairment of social communication
- an impairment of social understanding and imagination.

Contributing to the debate on the possibility of sub-groups within the Autistic spectrum and to the existence of AS, Wing described a sub-group of individuals who also:

- make naive and inappropriate social approaches
- have narrow circumscribed interests
- have poor motor coordination
- have long-winded repetitive speech
- have no commonsense.

Although the three social impairment areas are the same in both groups the way the impairment manifests itself is different. For example, Autistic children would happily amuse themselves rather than play with other children; in fact the Autistic child would appear happier alone (Lord, 2002). AS individuals are interested in interaction with others (Attwood, 1999; Lord, 2002); they are, however, unable to initiate or sustain relationships that could be meaningful.

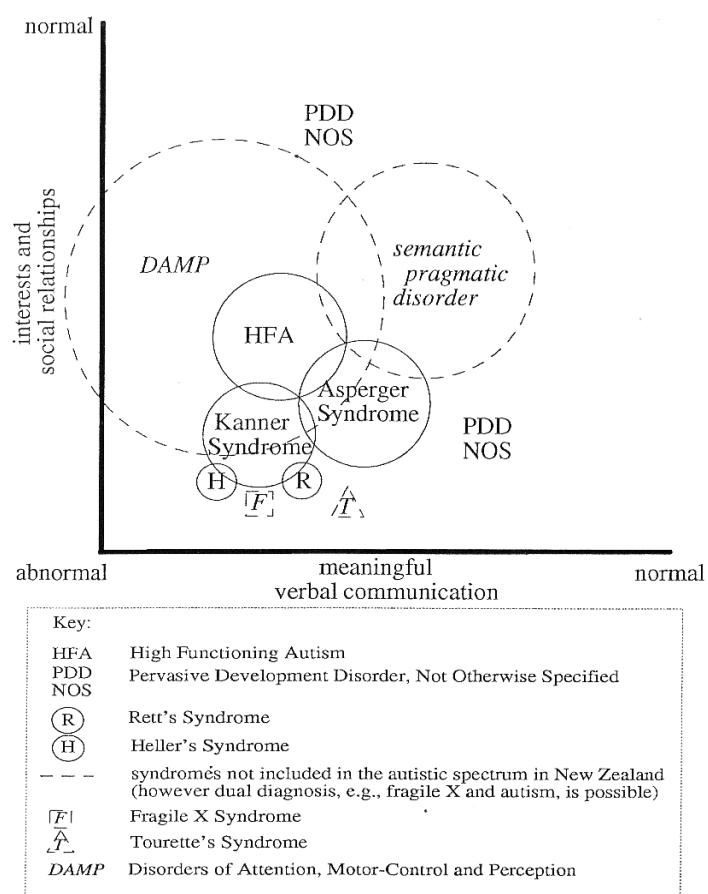
Since Wing's 1981 report there has been an increased interest in AS; the usage of the term in clinical practice and the number of cases reported has been steadily increasing (Gillberg, 1991). Prevalence rates of one to ten cases in 10,000 have been suggested (Gillberg, 1991; Wing, 1981). Although the syndrome was originally reported only in boys, reports of girls with the syndrome have now appeared; it does, however, appear that, as in Autism, males are significantly more likely to be affected (Volkmar, Szatmari & Sparrow, 1993; Wing, 1991).

6.2.1 Pervasive Developmental Disorders in general.

Diagnostic attitudes and practices for Autistic children vary considerably between cultures and countries; this makes defining the limits of the disorder difficult. There are two international publications that contain standardised classification systems for psychiatric diseases and disabilities. One is produced by the American Psychiatric Association and is called the *Diagnostic*

and Statistical Manual of Mental Disorders (DSM). The other is produced by the World Health Organisation and is titled *International Classification of Diseases* (ICD). During the 1990s, editions of both recognised a range of sub-groups of Autistic disorders that is wider than classic Autism and which both call 'Pervasive Developmental Disorders' (PDD). Although these disorders often share similar afflictions, the degree that one trait presents itself may vary greatly from that portrayed in another. These groups of individuals are often lumped together under the umbrella of Autistic or PDD. Aarons and Gittens admit to using the term Autistic to describe the wide range and diverse symptoms, including those suffered by AS individuals: – "we want to emphasize that we use the term 'autistic' in a contextual sense the common denominator will be the underlying social impairments which are on a continuum of severity" (1992, p. 27).

Figure. 2 Diagram of the inter-relationship of Pervasive Developmental Disorders.



Source: *A World He Can Live In: Exploring social stories as a method of improving social understanding and inclusion for children who have autistic spectrum impairments*. Littek, C. (2001)

Many of the readings covered in this literature review refer to a number of disorders that fall within the PDD spectrum - most of these groups share at

least some of the same afflictions suffered by AS individuals. Figure 2 shows the interrelationship of these disorders.

The following sections look at a number of these disorders with the intention of identifying similarities of affliction and to review the techniques used by professionals working with these individuals. This analysis will act as a departure point in the construction of an educational CD-Rom for AS students.

6.2.2 High Functioning Autism and Asperger's Syndrome

There is some considerable overlap between AS and High Functioning Autism (HFA). Experimental studies by Stephen Baron-Cohen conclude that individuals with AS and HFA not only have intact folk physics, they have superior development in this domain, relative to their folk psychology and to their mental age (2000). Both of these groups tend to suffer at the lower end of the Autistic severity scale. They have an IQ of 70 or above, which is considerably higher than that achieved by the average Autistic individual. Although both these groups present an IQ that is within the normal range they have quite noticeable difficulties with cognitive understanding. Cognition has been recently discussed in relation to 'central coherence theory'. HFA and AS individuals are seen as having a weak central coherence. A weak central coherence would show as a heightened focus on detail but a lack of ability to understand the complexity of meanings derived from object association.

However, people with AS and people with HFA appear to process information quite differently. The right hemisphere of the brain is responsible for "thinking in patterns and pictures," it helps us "see things as a whole" but "does not help us to make deductions" (Heller, 1997). Research by Heller indicates that the right side of the brain is also specialised to process visuo-spatial information. The main areas of functionality that are affected with right hemisphere dysfunction are "cognitive, social and emotional functions". Ozbrayrak (1996) and Attwood agree that the AS individual has what they refer to as a strong performance IQ; a better description for performance IQ would be "visual reasoning" (T. Attwood, personal communication, January 2003). Studies indicate AS individuals have brain dysfunction stemming predominately from the right hemisphere (Volkmar, Szatmari & Sparrow, 1993; Gunter, Ghaziuddin & Ellis, 2002).

The left hemisphere of the brain controls the processing of verbal information, rationality, and the production of speech; it is considered the "dominant" hemisphere for most human information processing. The typical neuropsychological profile obtained for individuals with HFA indicates a greater left hemisphere dysfunction (Dawson, 1983; Rumsey, 1992). "This would suggest, based on neuropsychological profiles, there might be at least two types of conditions at the more functioning end of the Autistic spectrum of severe social disabilities: one type with predominantly left hemisphere involvement and the other with right hemisphere involvement" (Klin, Volkmar, Sparrow, Cicchetti & Rourke, 1995). Therefore even though HFA and AS individuals both exhibit a normal IQ, both suffer from a weak central coherence and both have a strong folk physics, they process information quite differently.

See Appendix B for further information presented by Ozbayrak on the differences between HFA and AS.

6.2.3 *Non-verbal Learning Disorders and Asperger's Syndrome*

Non-verbal learning disorder (NLD) is a syndrome described by Rourke (1989). Although no cause for this disorder has been definitely identified, it is known that deficits in the functioning of the right hemisphere of the brain play a significant role. Sometimes there is no known damage to the right hemisphere, but neuropsychological assessment suggests a dysfunction of the right hemisphere. Here we can identify a parallel with AS individuals who also exhibit right hemisphere dysfunction. Individuals with AS share some of the same characteristics as individuals with NLD especially the social, emotional, and cognitive characteristics. However, individuals with NLD tend to suffer greater motor co-ordination and attention issues.

The relationship between verbal IQ and right brain dysfunction is well noted in the literature, thanks primarily to the work of Byron Rourke. Rourke and his colleagues identified that the neuropsychological profile for individuals with NLD exhibited a greater right hemisphere dysfunction than those without NLD (1989). This is in alignment with Ozbayak's description of the brain dysfunction suffered by people with AS (1996). The process in the right hemisphere of the brain helps the interpretation of emotional information. The right hemisphere excels in the recognition, interpretation, and expression of emotion. These functions are interwoven with the visuo-spatial functions that are also

concentrated in the right hemisphere. It requires complex visuo-spatial processing to understand a facial expression or to decipher a series of complex gestures: “these kinds of tasks rely on a nonverbal affect lexicon, a knowledge base coming under the rubric of ‘cold cognition’, so-called because it involves judgments and knowledge about emotion that are independent of an emotional state or experience” (Heller, 1997). Individuals with right brain dysfunction generally have a proficient visual memory. According to Attwood, AS individuals have a photographic memory. However although they are able to readily recall the visual elements within a photograph they may not be able to understand the inter-relation of the objects or people (personal communication, January 2003).

Research into understanding the neuropsychological profile of individuals with NLD has produced some interventions and educational activities targeted for them. The phenomenological similarities between AS and NLD suggest these practices might have some theoretical utility for the education of AS students (Katz, Goldstein & Beers, 2001 p. 75).

6.3 The afflictions of Asperger's Syndrome

6.3.1 Understanding the Asperger's Syndrome cognition

AS individuals tend to make what appear to be unconnected cognitive associations. What we often identify as logical may draw a complete blank from these individuals. Their cognitive structures can seem randomly eclectic and idiosyncratic and do not conform to a culturally homogenous reflective database; they can make cognitive links, that may seem bizarre to others (Forder n.d.).

They are often seen as lacking emotional thought and response – this is most likely linked to the way they see the world, a view that is pragmatic, literal and concrete, which makes social understanding difficult. For example, for most people colour can be culturally understood, but for an individual with AS, social and cultural beliefs do not convey any meaning. They are not devoid of reaction to colour but the reaction will be based on something profoundly individual and relate directly to a personal experience. This lack of cultural understanding seems to extend into all areas of their lives. Karen Johnston, a special needs teacher, relates an experience with an AS student, they were

discussing areas around the student's school. The student would assign a colour to different areas and then verbalise a positive or negative response. One area was green and the student was emphatic that it was a bad place. Later Johnston was informed that the student had been bullied by a boy who had worn a green top and since then the student had referred to green as bad (personal communication, March 30, 2002). The cognitive association was that it was unpleasant or "bad" was made by the student's experience – the association itself is at odds with non-autistic cognition.

Cognitive distortion in terms of dysfunctional thinking and incorrect assumptions also hinders these students' ability to conceptualise and manage their emotions. These difficulties have been known to add to problems they have with social interaction and can escalate into secondary mood disorders. Daiute and Morse (1994) and Rieber (1995,1996) have proposed that computers can serve as a conduit to improving self -esteem for these students. They see many social and emotional benefits in the use of multimedia by young disadvantaged or disabled learners. The computer can deliver information in a consistent non-judgmental fashion – using the computer as a delivery mode for this project will reduce the possibility of the student suffering from unnecessary stress and anxiety that could create mood disorders or low self esteem.

6.3.2 *Theory Of The Mind: mind blindness*

Our ability to attribute beliefs and thoughts to others, by understanding that others have perspectives that are unique and different from our own makes us human. For those with AS this ability is significantly impaired. This impacts on the individual's ability to consider the effect of their actions on another and can hinder their understanding of any two-sided relationship. This inability is known as mind blindness (Edelson, 1999). For a child, mind blindness can also adversely affect their ability to pretend. As they see things in a very literal way, it is important to acknowledge this when creating a program for these individuals. For the purpose of this project, the prototype will need to make things as concrete as possible to avoid confusing the user.

6.3.3 *Social interaction*

Children with AS seem unable to read expressive gestures and are unable to give the right social and emotional responses. According to Lord they "tend to

make literal and concrete interpretations”, so metaphor, similes and other non-literal expressions have to be explained (Lord, 2002; also Attwood, 1998a; Tanguay, 2002). They have a great capacity to memorise and use phrases, although they may not use them in the right context. The body language and facial expressions of a child with AS can appear stiff. They may speak too loudly for a situation or in an overly formal manner or in a monotonous tone. “A child with Asperger Syndrome may have a good level of spoken language, however it is unlikely that their understanding of the content is at the same level. They appear often to talk 'at' rather than 'to' you, giving information rather than holding proper conversations” (Lord, 2002). They can often focus on small details and fail to see the overall picture of what is happening in any situation.

6.3.4 Narrow interests, pre-occupations, repetitive routines and inflexibility

One of the hallmarks of AS is their preoccupation (or obsession) with certain topics, often on themes of transport (trains in particular) or computers, dinosaurs, maps and the like. These preoccupations may change over time but not in intensity, and may be pursued to the exclusion of other activities (Lord, 2002). Of late these fixations are more directed towards technical areas, including computers, the internet, television, video, and playstation games.

Lord notes that individuals with AS impose rigid routines on themselves and those around them. The inflexibility they develop can be very frustrating for all concerned. As they mature they are perhaps a little easier to reason with (2002). This inflexibility can give rise to difficulties with imaginative and creative thinking.

6.3.5 Physical signs

Attwood notes that on appearance alone, AS individuals often do not present any distinctive physical traits. However, observation of their interactions with others will highlight unnatural movements; this is especially evident with bodily and facial gestures. Unnatural movement coupled with a highly focused area of interest often leads to their being seen as eccentric (1998a, p. 33).

6.3.6 Sensory issues

According to Edelson as many as 12-14 percent of the general population and

up to 50 percent of individuals with non-verbal communication problems suffer from perceptual processing disorders, which are also known as the Irlen Syndrome or scotopic sensitivity (1999). This is a sensitivity to sensory input; it may be visual, audio, tactile or a combination of these.

"For some individuals, lights, colours, patterns, or contrast are interpreted as stressful, causing perceptual overload...when the system is under stress, there is a biochemical change and adrenaline or other neurochemicals are released. This has a cascading effect, causing emotional, behavioural and physical symptoms, as well as anxiety, headaches, nausea, and dizziness" (Edelson, 1999).

Irlen notes that the sufferer may feel as if the environment is shifting, blurred or even disappearing; this creates problems with eye contact, motor coordination, the ability to interpret facial expressions, and ultimately, poor social skills. Sensory problems of this sort create issues with reading and learning, and distortions of the printed word are reported as common (2003).

These sensory issues are similar to the symptoms experienced by individuals with AS. "There is one large difference! Individuals with Autism [including those with AS] experience more severe perceptual problems" (Irlen, 2003). Research undertaken by Irlen into the use of colour to alleviate perceptual distortion, on the printed page and in the environment, began over 10 years ago. She discovered that colours could be used to eliminate visual misconceptions. Edelson stresses that using the correct colour is vital. If the wrong colour is used it can complicate issues and increase perceptual difficulties (1999). Visual information constitutes 70 percent of incoming sensory information and comes in the form of light frequencies. Certain sounds, tactile sensations, and light frequencies that make up vision take longer to process than others. Irlen filters are used to block out those light frequencies found to slow down visual processing.

The filters were originally colour overlays but later were replaced by glasses. After reading about Irlen's glasses in the book *Reading By The Colors*, author and Autistic sufferer Donna Williams contacted a certified Irlen diagnostician, feeling that the distortions described in Irlen's book were similar to the distortions she was experiencing. Williams was so impressed with the results she experienced wearing Irlen glasses she published an on-line account of it.

"For me, the effects of Irlen lenses were shattering. My two dimensional world, without depth, suddenly looked three-dimensional. It didn't look like a picture anymore, it looked like a place. My husband wasn't a collection of disconnected floating facial features; he was a whole connected face, taken in not bit-by-bit, but as a whole. Things weren't all there by coincidence anymore. Understanding wasn't a struggle.... I now am rarely meaning-blind and don't have to touch everything to know where I am in space. I feel more secure in my less fragmented environment and around what are now less fragmented people. I have more time to grasp my thoughts and feelings and my other senses; and since I no longer have to compensate for visual overload, I can also keep up better with processing sound, touch, or body connectedness" (Williams, D. 1995).

While this technique is not a cure for Autism, it can eliminate for some sufferers the sensory overload and physical symptoms that are caused by lighting and misperception (Edelson, 1999). Individuals with Autism and AS can be bothered by sensory problems in other areas as well, such as touch, smell, hearing, and sensitivities to food. Sensitivity in one area interacts and affects the other areas. Making it more comfortable to see, and to see accurately, may make sounds and other sensory input less overwhelming. As these issues may inhibit the learning process, taking sensory issues into consideration when creating an educational package for these students is of major importance. Because the computer screen consists predominantly of bright light, the screen is a potentially a hazard for anyone suffering from sensory issues. It will be important to factor into this project research by Irlen into the reduction of sensory overload.

6.3.7 Social Development

According to Attwood young children with AS usually speak fluently and by school age are often seen as being gifted (1998a). During their early schooling they usually exhibit average to above average intelligence, "in fact, the presence of normal basic language skills is now felt to be one of the criteria for the diagnosis of AS, although there are nearly always subtle difficulties with pragmatic/social language" (Bauer, n.d.). This early verbal ability is believed to be a result of their excellent rote memories.

As a child grows they pass through various stages of development, which can

be characterised by different concepts of friendships. Friendships at any stage can be tenuous. For the young AS individual, the development of friendships is difficult and they find social interaction a major hurdle. As they mature friendships can become even more problematic as they endeavour to find their own identity and friendship niche. The average teenager can find a lack of friendships difficult to cope with, and the AS teenager is especially vulnerable to this. They seem less able to make friends and maintain friendships, which are issues that can cause stress and depression (Aarons & Gittens, 1992; Attwood, 1998a; Attwood & Gray, 1999).

For most children it is between the ages of 9 to 13 years that they become aware of other people's opinions and how their words and actions affect the feelings of others. This is a crucial stage in the development of friendships. Friendship can be based on shared experience or common interests. This stage is of great concern for parents and educators of AS individual, as they are not as able as their peers to understand social gestures and nuances of interaction (Attwood, 1998a). This is the age group that will be targeted by this research. Traditional school curriculum pays little attention to the development of friendship skills, yet these skills are the foundation of abilities that are highly valued by adults in their professional and personal lives (Brown, 1987; Krehbiel, n.d.; Lawson, n.d.): teamwork skills, leadership and "the ability to manage conflict and having successful personal relationships" ... "[t]hese [AS] adults valued and desired friendships more than anything in their lives, yet few had the ability to maintain acquaintances, let alone friends" (Attwood & Gray, 1999).

See Appendix C for a list of traits portrayed by individuals with AS.

6.4 Introduction

The second part of this literature review focuses on the various strategies and physical resources used to assist students who do not learn well in standard classroom conditions. These are reviewed in terms of their relative value to students with AS.

The context is set initially with a brief review of current influential pedagogical styles. This is followed by an outline of specific strategies. The section is completed with a review of the use of computers and learning environments, that may be relevant to students with AS.

6.4.1 Recognition of the needs of students with Asperger's Syndrome

New Zealand schools allocate resources for 'special education' on the basis of the legislated definitions, which focus primarily on discrepancies in academic achievement. Emphasis that is on discrete cognitive processes; a low score in either verbal or performance IQ test usually is not recognised in this process.

There is a strong argument for greater emphasis in this assessment regime on issues children have in terms of discrete cognitive processes. Roman believes educational departments need to introduce theories of cognitive learning, feeling that, as neuropsychology grows as a discipline, the need to become more aware of the complexity of human learning and its associated problems will also grow (1998).

Individuals with AS need to be actively taught how to communicate with other individuals. To say the activities of interaction and the development of relationships are not learnt in schools would be a mistake, as they are part of the social interaction that occurs within the classroom and on the playground. AS children are unable to learn as intuitively as other children can. According to Attwood and Gray, "The Asperger child may not conform to the traditional sequence of steps in acquiring scholastic abilities. It is important for the teacher to source different techniques" (1999). The practical outcome of this thesis is to create a prototype that would provide a specialized resource to help these individuals cope with a specific social event. This project will take into account the unique cognitive style of the AS individual in order to achieve

this. For a list of AS cognitive abilities and weakness see Appendix D.

6.5 Pedagogical context

Educational strategies exist within a wider context of pedagogical style. This section briefly reviews current theories of how students are best taught, noting how these different styles can help or hinder students with AS. The current vogue appears to be to focus on enhancing problem-solving skills and meta-cognitive thought.

6.5.1 Constructivism

Emerging pedagogical consensus seems to be dominantly focused around constructivism. On the surface constructivism did not appear to suit individuals with AS, but due to its dominate use in the educational arena I felt it important to fully explore the possibility that constructivism might hold a key to the education of AS students. Constructivist pedagogy, in essence, is about constructing meaning from experience. “The emphasis is on what we may wish students to be, rather than what we may wish them to know” (Tafe, 2000). The constructivist’s style of learning does not say that factual knowledge is worthless; rather they feel that concept understanding should precede the learning of facts.

Becker, Wong & Ravitz have developed what they call the constructivist “Model of Instructional Reform”, where meaning is the central attribute of constructivist theories of learning. To make concepts meaningful requires that tasks be rich in variety and detail, regarded as important and interesting by the learner and related to other ideas that the learner holds. The reform stresses that teachers should pose intellectually challenging problems and encourage students to arrive at their own conclusions through thinking and through discussion with others. This reform theory emphasises that the process of learning is achieved by deducing or constructing knowledge and this process is as important as learning the content itself. In the constructivist view, “the student’s personal construction of knowledge is essential for true understanding” (Becker, Wong, and Ravitz, 1999). Constructivist activities include reflective writing, divergent thinking, problem solving, and project-based activities. These activities are designed to engage students in the type of knowledge construction or learning described by reform models.

Contextual learning may be problematic for AS students as they are unable to conceptualise anything that is not literal or concrete. AS students are unable to conceive that others have different opinions and feelings to their own. They do not conform to social and cultural understandings. As Attwood points out they seem unable to apply experiential behaviours to new situations naturally (1998a).

At the beginning of this section I noted my doubts about this form of pedagogy for AS individuals. The cognitive profile of the AS student hinders their ability to form assumptions. They are unable to create meaning from a collective viewpoint and meaning is not contextualised via cultural or social understanding. Although constructivism is favoured in many educational institutions I feel that this approach would put too much pressure on their weak central coherence and therefore would not be a good choice for this group.

Brooks and Brooks (1993) list five important principles for constructivist learning – these can be found in Appendix E.

6.5.2 *Instructional technology*

With increased access to computers and the internet, instructional technology has created new opportunities as well as challenges for teaching and learning.

Sullivan notes that more flexible delivery of instruction is achievable with information technology. This can shift the roles adopted by education institutions, by making the learning environment more learner-centred and less institution or instructor-centred (1997). The role of the instructor shifts from expert to that of guide, and learners will need to assume greater responsibility for their own learning while faculty need to relinquish control over the learning experience (Bogdanov, 1999).

Traditional methods of learning use media that is based on one-way communication such as textbooks and lectures. As these methods are linear and follow a step-by-step format they promote passive learning. On the surface such passive learning may appear to suit students with AS, as it might create less anxiety than a method where they need to think and respond quickly. However, as AS students can repeat verbatim with little or no understanding of the context, a more in-depth method is required for them.

“Adoption of instructional technology depends more on pedagogical paradigm shifts than on the technology itself. Instructional technology provides contemporary teachers with more assistance than ever before” (Baker, 1999). For AS students the computer’s ability to transcend the limitations of the physical classroom environment is also a major benefit.

6.5.3 Rote learning

Many of the new learning theories dismiss the use of rote learning. However I have decided to include it as a relevant pedagogical style, as review of the literature undertaken for this project suggests that AS students learn best in rote style educational practice, whereas constructing meaning is not cognitively their area of strength (Bauer, n.d.; Heller, 1997).

The basis of criticism of rote learning is that factual information becomes automatic and students learn to respond in a certain way or with a specific answer. These automatic styles of response do not promote meta-cognitive thought. Rieber suggests, “children are wired to learn through their own play, that play is children's 'work' and that the transmission model³ of teaching where the teacher is the omniscient conduit of a generally recognised and approved body of information, is no longer appropriate. It is inappropriate because information is no longer a stable commodity” (1996 p. 45).

Some of the disadvantages of rote learning can be overcome through the use of information technology. If the main reason, as Rieber suggests, that the transmission model (or rote style) is ineffective, is because information is no longer static, then the ability of the computer to incorporate dynamic media can combat this issue. The computer has the added benefit that it can deliver information in such a way that it remains constant, repeating information as often as needed by the user, without becoming bored or frustrated.

The computer can allow for the integration of different and controlled modes of delivery and is capable of being reflective of real life situations. The ability to incorporate different types of media gives the user choice in terms of type of media most appropriate for the individual, as well as reducing sensory issues.

This helps to inject interest and diversity into the learning process.

The suggestion that a pedagogically and technically sophisticated drill and practice programme might use alternative methods of approaching a problem could easily be achieved via the computer. If computers are used with pedagogical innovation they can remove the drudgery of routine and practical skills. (Coburn, Kelman, Roberts, Synder, Watt, & Weiner, 1982).

6.6 Strategies for ‘students with learning disabilities’

Many students, including those with AS, can be grouped together under the general heading of ‘students with learning disabilities’. These students may or may not share the same afflictions. However, they often share the same learning difficulties. There are educational strategies that have been developed to assist this group as a whole, and these are reviewed here. Strategies developed specifically to assist students with AS are reviewed in the following section.

In most teaching situations it is important to give consideration to the different learning characteristics of students, to provide support when needed, and to build on the individual student’s many strengths. When educating students with special needs, the attention paid to their individual learning characteristics is even more important. Swanson feels that “while many strategies have been developed it is still unclear which teaching strategies best help these children”. He continues, arguing “a review of past literature reveals few systematic analyses of instructional approaches for students who have learning disabilities. This lack of clear direction creates confusion about how best to educate these students” (2003).

One way of helping students with learning disabilities would be by “equipping them with a repertoire of strategies for learning – ways to organize themselves and new material; techniques to use while reading, writing, and doing math or other subjects; and systematic steps to follow when working through a learning task or reflecting upon their own learning” (Sturomski, 1997). Sturomski’s concept is supported by a number of theories found in the literature which encourage the combination of multiple strategies, often called strategy

³ For more information see Rieber 1996, p. 45.

interventions or strategy instruction. The intention is to make learners highly aware of the steps they take while learning. This is believed to make their approach to completing specific tasks more purposeful, systematic and according to the research findings, more effective (Ellis & Cramer, 1995; Forder n.d.; Swanson, 1999).

Learning strategy instruction appears to hold great educational potential, especially for students who have learning disabilities. This is because strategy training emphasises helping students learn how to learn and how to use strategies found to be effective in promoting successful performance of academic, social, or job-related tasks. Students need these skills not only to cope with immediate academic demands but also to address similar tasks in different settings under different conditions throughout life.

In contrast, Ellis believes students with learning disabilities develop skills most readily when the teacher models skills using a directive instruction approach and then interacts with the student. She feels when the student is actively responding to the teacher or is engaged in the skill then real learning is taking place. Once students gain knowledge by directive instruction some meta-cognitive strategies such as feedback may be useful. The feedback provider should give hints, questions and/or cues to help the student spot the problem and formulate their own solutions. This promotes meta-cognitive processing and is a constructivist approach – one where the student begins to construct meaning and ideas derived from their own understanding.

“It is critical to understand that although this may be the preferred mode of feedback provided by educators invested in constructivism, this form of feedback is effective only if the questions, hints, and or cues result in students relatively quickly gaining insight into the problem and either correcting it or inventing alternative ways of addressing the problem that are more effective. If they do not gain this insight and improve performance, then this form of ‘constructivist’ feedback is relatively worthless” (Ellis, 2002a).

In these instances, directive feedback is a crucial teaching technique. The feedback provider explicitly identifies for the student the problem, recommends solutions, and then provides modelling and coaching as needed. This technique may also be useful in areas where the student has limited

background knowledge (ibid).

In terms of how these approaches would suit students with AS, their cognitive profile demonstrates strength in visual and memorisation skills, an excellent rote memory and the ability to closely follow step-by-step instructions – attributes that would make using a directive strategy seem a viable option. However, students with AS require a programme that will not just teach “academic fact” but teach strategies and skills that will assist future learning, in academic and social situations as well as developing the student’s self control and self discipline.

For a more detailed look at this subject please see Appendix F.

6.7 Strategies for students with Asperger’s Syndrome

Educators need to teach AS students skills that other children acquire naturally (Attwood 1998a: Gray 1999). Presently there is little resource material in this area. This section reviews a number of strategies suggested by clinicians and special education experts to specifically address these gaps.

6.7.1 Non-verbal Learning Disorder strategy

Klin (1994) suggested that strategies used for individuals with Non-verbal Learning Disorders (NLD) might be useful in the education of AS students. Individuals with NLD learn best with a visual language, and the use of images, written word, and visual prompts is highly recommended. Attwood, Gary, and Hodgdon agree that a visual language would be of benefit to the AS student. However, NLD strategies also focus on the individual seeing a lesson in as much context as possible (Tanguay, 2002). The fact that people with AS suffer from a weak central coherence and mind blindness, tends to suggest that contextual learning would not necessarily be the most appropriate style for these students. Note the contrast with Gray’s Social Stories (see Case Study I), which focus on one aspect being taught at a time.

6.7.2 Special interest strategy

The fixations of autistic children are believed to be a way of helping them to cope with excessive stimuli – focusing on one thing at a time, helps to reduce

arousal in an overactive nervous system (Grandin, 1995. p. 109). The idea of using their fixation in some way has been alluded to in most of the literature either as a type of incentive, or as a strategy to be incorporated the lesson.

6.7.3 *Role play strategy*

Some approaches that have been successful with AS students have utilised direct modelling and role play at a concrete level. By rehearsing and practising how to handle various social situations, the child can hopefully learn to generalise the skills to their own settings. It is often useful to use a buddy approach, where the child is paired with another student to carry out such structured encounters. The use of a "buddy system" can be very useful, since these children relate best one on one (Bauer, n.d.). As noted earlier, the AS individual finds difficulty in successfully applying learnt social skills to the different situations.

6.7.4 *Visual strategy*

Attwood commented "Asperger's Syndrome students have a photographic memory – however they are unable to identify the semiotic messages" (personal communication, January 2003). Images with iconic representations are best if they are concrete representations. Research by Hurlburt, Happ and Firth compared a group of individuals with AS and a control group. The results showed "that when prompted to record their thoughts the control group predominately described a range of thoughts verbally. The Asperger group predominately reported their thoughts in the form of images". This led Hurlburt et al. to conclude, "that people with Asperger's appear to have a predominantly visual style of thinking" (1994, p. 125). They continued to make the point that schools are not suitably resourced for the education of AS individuals: "schools are represented in verbal not visual (language), the Asperger child is more likely to see a problem than to verbalise them" (ibid).

This theory is backed up by the experience of Temple Grandin a woman who was diagnosed in the 1950s as Autistic but later reassessed as having AS. Grandin is testament to the fact that people with AS can achieve a high level of education and have skills to offer the wider community. Grandin has co-authored two books, written many online resources and invented a holding pen for the humane slaughter of stock (the area of her fixation). Grandin comments "I think in pictures. Words are a second language to me. I translate

both spoken and written words into full colour movies, complete with sound, which run like a VCR tape in my head. When someone speaks to me, his words are instantly translated into pictures ... visual thinking is a tremendous advantage" (Grandin, 1995 p. 1). She carries on to say that she feels "an art-centred curriculum would have encouraged me to learn" (*ibid*, pp. 37-38).

Experiments undertaken by Bryon Rouke tested the folk physics of a group on the Autistic spectrum, including children with AS. These took the form of visual testing. The first experiment used a picture-sequencing paradigm and the results were that children with Autism performed significantly better than their peers. The second studied the children's ability to identify visual situations. This indicated that children with Autism were able to identify objects and elements in a picture even though the placement and construction of the elements were unlikely to be found in reality (1995).

Occupational therapists use visual representations, rather than seeking verbal explanation, to quantify a response in experience or expression of mood. These visual representations can take the form of a visual indicator that shows a linear progression; an example might be a bar graph or an incremental scale. Using prompts such as schedules, charts, lists, pictures can also help (Jackel, 1996). Attwood often uses "a pictorial dictionary to help the student to express their emotions and feelings" (personal communication, January 2003).

Since there is no mode of treatment available to reduce symptoms of AS teachers, educators and parents must resort to alleviating symptoms. Some of the early developmental deficits improve to some degree over time. However, the primary neuropsychological deficits do not resolve completely. "The most effective plans for intervention focus on helping individuals compensate for their deficits" (Roman, 1998).

This research will accept the suggestion by Kiln, Volkmar, Sparrow, Cicchetti and Rourke (1995); Attwood and Gray (1999); and Tanguay (2002) that the education of AS students would benefit from a visually enhanced curriculum style. Appendix G lists further practices that may prove to be of some benefit when educating the AS student.

6.8 Computer aided instruction

6.8.1 Introduction

The Institute of Educational Sciences (USA) produced statistics in 2003 clearly indicating that educational departments throughout the world are rapidly increasing their use of the computer as an educational tool. Advancements over the past 10 years in software applications make the utilisation of the computer appealing to a variety of academic fields. Many of the articles and much of the research on the use of computers in education portrays their use optimistically. This section reviews some of the issues that exist for the utilisation of mixed and multimedia computer environments within education.

Many of the early attempts at computer-aided learning focused on rote tasks. Iland notes that many students were often reluctant to undertake these tasks as they become bored with the repetitiveness. Changes were made in an endeavour to encourage the students by incorporating rewards in the form of games to stimulate student interest. Unfortunately, students enjoyed the process by which they were being educated, not the material that they were learning (Iland, n.d.). Now that computers have become more prevalent in every aspect of our daily lives, they are less of a novelty and are more accepted by students as an educational tool. Computers can now be used to encourage learning, and are not dependant on a "reward" system. Multimedia has been incorporated into the content itself, making the actual process of learning engaging. Users' interest can be directed to the content not the function.

The educational system has been heavily reliant on print media as its dominant form of communication. Research indicates that students have the ability to learn in a variety of ways. In fact many students with disabilities are disadvantaged by print media presentations. The Education Development Centre Inc (EDC) noted that when "Using multimedia, they [students] can engage with non-print activities that capitalize on their strengths" (1994). Multimedia can support writing in a number of ways. It can help students deepen conceptual understanding, engage prior knowledge and help form mental images.

It seems feasible that students engage with multimedia presentations more actively, as they reflect a close relationship to the students' everyday

environment and external media interests such as television, PlayStation, and other computer games. With the use of demonstrations the computer can create a number of scenarios that would be difficult to re-create in the physical classroom. Like demonstrations, simulations can create the illusion of experience, but “the real power of simulations is derived from the advanced thinking and problem solving skills required by solving a realistic problem in a rich learning environment, one that with the use of interactivity and a computer can create a number of variables” (Coburn, Kelman, Roberts, Synder, Watt, and Weiner, 1982). Simulations and demonstrations have the ability to create possible future scenarios, where students can be introduced to materials that may not otherwise be available. They can also examine events that could not otherwise be examined due to danger, expense, time, or historical distance.

Support for the use of the computer is consistent across many educational disciplines. Goldman and Pellegrino (1987) and Okolo, Bahr and Reith (1993) have found that computer-aided instruction has proven to be an effective tool for mathematics instruction. “Students who use appropriate technology persist longer, enjoy learning more and make gains in math performance” (Goldman and Pellegrino). “The potential of hypermedia to improve mathematical performance is being realized in today's software design. There seems to be many good reasons to celebrate technology's use” (Babbitt and Miller, 1997).

Although there is some dispute over the computer's suitability in the learning environment, research agrees that students learn better when they are engaged in the material that they are learning (Goldman and Pellegrino, 1987; Babbitt and Miller, 1997). Access to information is made easier with the use of computers. The speed at which information can be accessed, and the accessibility of related material, encourage students to explore the topics in which they are most interested. Computers allow customisation and individualisation of learning.

These points indicate that the computer would be an appropriate tool for the education of AS students. The use of multimedia that includes colour, graphics, animation, sound and interactivity, can capture and hold the attention of the student; this form of engagement will aid students to persist in educational tasks. Software can use these same features to present concepts in imaginative and dynamic ways. When modifiable, it can support learning at the child's pace and on the child's level and give feedback as required. These

factors make the use of computers an exciting prospect for the educators of all students but also an ideal platform for the education of AS students.

For the value of computers in regard to specific pedagogical styles, see sections 6.5.2 and 6.5.3.

6.9 The learning environment

There are some particular environmental issues that need to be considered to allow the AS student a more productive learning environment. Structuring the physical environment to facilitate learning and minimise frustration by taking care with lighting, sound, and other external sensory disturbances is essential in creating a learning space where these students can feel safe. Attwood notes that children with AS respond to a quiet, well-ordered class with an atmosphere of encouragement rather than criticism (2000). It is extremely important to take the AS individuals' susceptibility to sensory overload into account when designing an educational space for these students.

7. CASE STUDIES

7.1 CASE STUDY I: Social Stories by Carol Gray

7.1.1 *Introduction*

Children with AS have problems with Theory of Mind skills; they are, however, as earlier noted, excellent rote learners. This unusual disposition means the individual is able to be taught how to act in a certain situations but is often unable to understand the context behind their actions, or the effect of these actions on another. Also, once a behaviour has been learnt the individual may not be able to apply it appropriately to another situation. According to Attwood and Gray, tuition that uses a step-by-step process to acquire one task at a time is well suited to AS students (1998). One strategy for achieving this has been through Social Stories, a system developed by Carol Gray.

7.1.2 *The creation of Social Stories*

This case study investigates the ideological process behind the creation of a resource for individuals with AS.

Carol Gray is a teacher and author who, for over 20 years, has worked directly with children who have AS and Autism. During this time she discovered that if children were able to develop an understanding of different social situations, they seemed better able to cope when faced with social challenges. This discovery inspired Gray to create short stories that reflected specific social situations. In 1991, she defined a format for creating helpful stories that she has trademarked as Social Stories.

It is the structured format underlying the story that makes them successful. This format can be used to individualise the story. According to Gray, “Each story is a product that represents a process. This process requires consideration of, and respect for, the perspective of the person with autistic spectrum disorder” (1999). A Social Story is a short story defined by specific guidelines and characteristics – they are used to describe, more than give direction, by simplifying social information and addressing the most relevant and/or socially meaningful cues and factors of a topic. In this way, irrelevant information is omitted and an explanation of relevant information is enforced. By describing a situation, skill, or concept in terms of relevant social clues, perspectives and common responses, the Social Story endeavours to create an understanding of what both parties in a given interaction or situation may

be thinking. Social Stories can also be used to acknowledge achievement. In fact, Gray notes, “A child’s first Social Story should describe the skill or situation that is typically successful and problem-free for them” (2003). By instigating a positive Social Story experience during the first story, anxiety that may lead to unwanted behavioural problems can be reduced.

A Social Story is composed of four basic types of sentences. These are: descriptive, perspective, directive, and affirmative sentences. *Descriptive sentences* identify the most relevant factors in a situation. They often contain the answers to the important “WH” questions: where a situation occurs, who is involved, what they’re doing, and why. These sentences are accurate assumption-free statements of facts. *Perspective sentences* are statements that refer to, or describe, an individual’s personal thoughts, feelings, beliefs, opinions, motivation, or physical condition. “Only on rare occasions are perspective sentences used that describe or refer to the internal state of the person with ASD [autistic spectrum disorder]; most frequently they are used to refer to the internal state of other people” (Gray, 1999). *Directive sentences* identify a suggested response or choice of responses to a situation or concept. These sentences gently direct a student’s behaviour. It is important to consider the possibility of literal interpretation, for example beginning a direct sentence with “I will” or “I can” may mislead the individual, as they may believe the response must be completed exactly as written to be correct. Instead directive sentences often begin with “I will try to”, “I will work on...” or “one thing I may try to (do)...”. Gray notes “Directive sentences are the most misused and misrepresentative and misunderstood sentences in stories” (2000a). *Affirmative sentences* can follow a descriptive, perspective, or directive sentence; they are used to enhance the meaning of surrounding statements, often expressing a commonly shared value or opinion. When these sentences are combined in specific portions they define what Gray has named the Basic Social Story Ratio. This ratio is maintained regardless of the length of the Social Story and ensures its descriptive quality.

After the introduction and implementation of the Basic Social Story, Gray advocates using partial sentences. Partial sentences are similar to “fill in the blank statements”. Gray uses these sentences to encourage students to: predict what may happen next; make a guess regarding the response of another person; make a guess regarding their own response; and/or demonstrate understanding of a new concept (2000). Any of the four sentence types might be written as a

partial sentence, with a portion of the sentence left as a blank space.

Two additional types of sentences can also be used in Social Stories, control sentences and cooperative sentences. *Control sentences* are written by the student to identify personal strategies they can use to recall and apply information. The idea is to read the whole Basic Social Story to the student then ask if there is a sentence they could add to help them remember, or to personalise the story for them. *Cooperative sentences* identify what others will do to assist the student. A cooperative sentence may be written as a partial sentence to help the student to identify others who may assist or support them as they learn a new skill. These sentences are used by Gray but are credited to Dr Demetrious Haracopos.

Social Stories are widely used throughout the Autistic community with positive results. Gray has noticed “an improvement in the response of the person with ASD [autistic spectrum disorder] to a concept, event, or a skill described in the story; and renewed sensitivity of the author to the experience of the person with ASD”. Swaggart et al. (1995) and Attwood (1998b) also acknowledge that using Social Stories directly helps students on the Autistic spectrum.

The Social Story Guidelines, developed by Gray, can be found in Appendix H.

7.1.3 Conclusion

Carol Gray’s Social Stories help students to identify what is happening in specific situations. Developing a ‘Social Story’ involves creating a short story that describes the situation and includes appropriate actions and expressions to help the child to understand what may happen in a certain situation. The individual’s attention is drawn to a specific cue or opportunity and verbal prompts and instruction given as to what to do. They are used to inform students about their environments and help to make them aware that others have feelings and emotions separate from their own.

There are similarities between Gray’s Social Stories and the prototype development as part of this project. The aim of which is to make the AS individual aware of the routine involved around meal time, a routine that happens in their own environment, and to introduce them to the possibilities that the roles people have in the execution of a meal may change. Additionally

the prototype will introduce the concept that the roles that others have at mealtime at a friend's home, or in a restaurant situation, may differ and that a similar but different routine happens in different environments. The anticipated outcome is that the student will be more accepting towards the possibility of change, and be able to participate confidently in social situations.

The prototype acknowledges the concept of structured sentences used by Gray; these sentences allow the student to identify the routine in their life. The prototype will utilise Gray's basic idea of identifying a routine and then building on this using a visual style appropriate for the target audience.

7.2 CASE STUDY II: Comic Strip Conversations by Carol Gray

7.2.1 Introduction

Although Comic Strip Conversations were first developed for children who have AS, they are useful for all individuals with social skill problems. AS individuals have a tendency towards a weak central coherence, which presents itself as a difficulty in interpreting others' thoughts. Comic Strip Conversations were developed by Gray to utilise the AS individual's strong visual memory, and help them to understand another person's perspective.

7.2.2 How Comic Strip Conversations work

The Comic Strip Conversations format is primarily a visual one, where two or more participants draw an image of themselves and their conversation. The Comic Strip concept is based on the rationale that visual supports may improve AS individuals' understanding and comprehension of ongoing communication. The use of quick sketchy figures de-emphasizes the need for creative ability, which might create anxiety, and focuses the individual's attention on the communicative relationship. The idea that visual imagery has proved useful in teaching students with AS is highly regarded in the literature (Attwood, 1998b; Grandin, 1992, 1995; Gray, 1993; Schopler, Mesibov & Hearsey, 1995; Twachtman, 1992; Quill 1991, 1992).

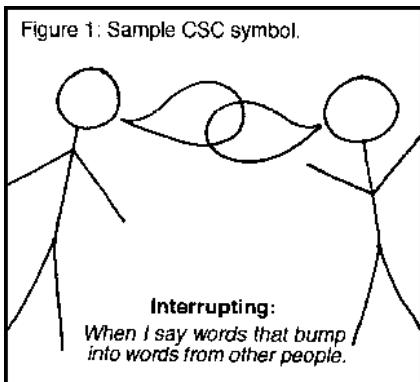
Comic Strip Conversations can be created in a group or in a one-to-one situation. The individuals share information by creating simple symbols, stick figure drawings and colour. Often a person with AS cannot respond in a verbal conversation, as it takes too long to process the incoming information. These drawings serve to illustrate an ongoing conversation and provide support to students who struggle to comprehend the quick exchange of information that occurs in a conversation. By slowing down and visually displaying an interaction, a student can gain a sense of control and competence. These simple stick figures present a conversation in a less transient and more concrete fashion. The drawings can include symbols, illustrations and written words. The attention of the individuals involved with the conversation is focused on the drawing surface.

Gray (1995) claims the use of these visual supports is threefold:

- they reduce anxiety by placing emphasis on the conversation not the student's artistic ability

- they lower the cognitive load in comparison to deciphering a verbal conversation, thus the conversation becomes less transient and more concrete
- they emphasise the communicative relationship between individuals.

Figure 3. An example of a Comic Strip Conversation.



Source: *Comic Strip Conversations*. Gray, C. (1994)

The images show the progression of a conversation by acknowledging one moment of the conversation and comparing it to the next. This gives a visual representation of exactly what is taking place, who is talking and if someone is interrupting (Figure 3). The use of colour is applied to indicate the feelings of the individual. Feelings may change over the period of the conversation depending on what is said and the duration of the conversation. In this way colour is used to symbolise emotion. The AS individual usually cannot recognise social and culture colour coding naturally. Often they will associate an emotion with a colour but this is derived from their personal experience and is unrelated to generalised colour codes. Gray has developed a colour chart that could be used to represent the emotional content of statements, thoughts and feelings. However, emotion/colour selection should be identified before the conversation begins, and regulated to suit the individual's colour interpretation.

The process starts by identifying where and when the situation takes place. This can be created by drawing simple symbols, such as a set of swings to represent a playground; who is there, what is done and what is said can also be covered. Once the situation is established the Comic Strip Conversation focuses on what people in the situation may be thinking. This is done with the use of thought bubbles. These can display the verbal content, or they can identify appropriate conversational skills, or they can be used to visually explain concepts of conversation including interrupting or talking over

someone. Colours can then be added, to help express these thoughts.

The whole process slows down interactions, and gives students a chance to "see" how their statements impact on other people. Finally, the conversation is summarised and if necessary concluded with the identification of a new solution.

7.2.3 Conclusion

Comic Strip Conversations were designed by Gray to help students who have problems understanding social behaviour, including etiquette of conversation, interpretation of gesture, and speech intonation; they focus on the inter-communicative relationship between individuals. Gray uses imagery to support the student's visual cognitive processing style. She feels a visual language promotes and supports understanding and comprehension for AS students (1995).

This case study reinforces the research findings that AS students learn more effectively when they are presented with information in a visual fashion. Based on the belief that this heightens understanding, Gray advocates that the students participate in the drawing process. Interestingly, this study indicates that the student could identify with a simple hand drawn image used to represent themselves. The time involved in constructing the drawing also allows the student to process the information.

In the prototype development for this project, students could add photographs or create imagery to represent themselves or members of their households. The gathering of visual material by the student for inclusion within the prototype could be used to involve the student and increase interest; the student could make decisions about how they or members of their family might be portrayed.

7.3 CASE STUDY III: Visual strategies for improving communication and behaviour by Linda Hodgdon

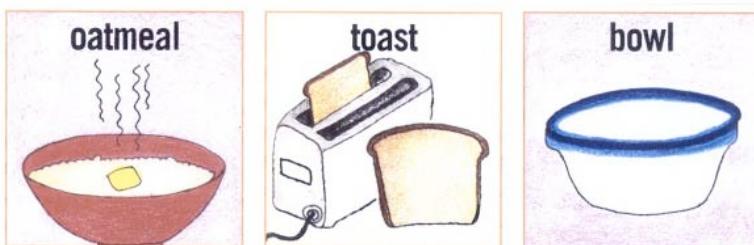
7.3.1 Introduction

Linda Hodgdon is a speech pathologist known for her work incorporating visual strategies to support students on the Autistic spectrum. Acknowledging that students have different learning styles aided her discovery that most students on the Autistic spectrum are visual learners (2001). Visual supports have proven to significantly improve both receptive and expressive communication, educational participation and over all behaviour (Attwood 1998a; Hodgdon, 2001).

7.3.2 How visual strategies work

Hodgdon's visual strategies, like Gray's Comic Strip Conversations (1995), use visual information such as objects, pictures and written language. Hodgdon feels it is important that the message remain present long enough to provide an opportunity for the student to engage their attention. She acknowledges that the fast pace of verbal communication is inappropriate for students with Autistic spectrum disorders. She believes "using visual supports builds on a student's strengths rather than placing more demands on the area of greatest difficulty". Attwood (1998b), Gray (1995) and Hodgdon (2001) agree that when visual tools are used to give AS students information and directions, their comprehension can increase significantly.

Figure 4. A sample of a picture card set, the food set.



Source: <http://www.usevisualstrategies.com/products.html>

Hodgdon's visual strategies encompass a number of different visual products that she has designed to help students with communication problems. They include pictures and picture cards, schedules, calendars, and sequential illustrations. They are designed to help guide a student through a social situation by supporting changes and transitions. The purpose of using these aids is to enhance the student's understanding by creating an environment

that is more predictable and understandable.

Whether the student uses Hodgdon's prepared imagery or constructs their own, the idea behind the strategy remains the same: to enhance the student's ability to communicate. Visual strategies attempt to do this in three ways;

- mediate communication between environments that the student may experience
- stimulate and expand functional communication, by helping the student remember activities and develop verbal skills
- allows the student to express his personal experiences; when the activity focuses on the student's personal experience his level of engagement is elevated.

Figure 5. Hygiene picture cards.

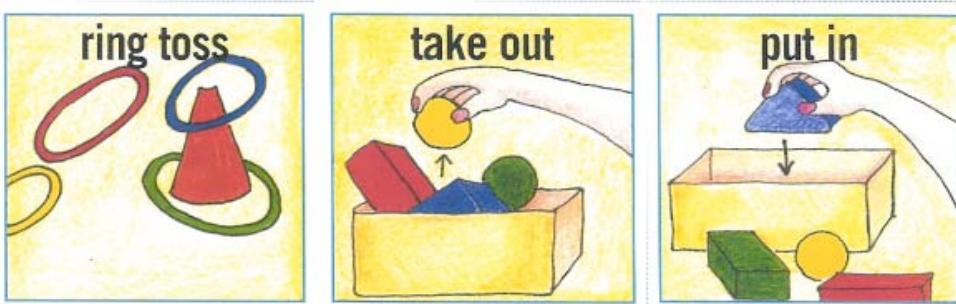


Source: <http://www.usevisualstrategies.com/products.html>

7.3.3 Visual style

Hodgdon's visual strategies can use pictures, line drawings or real objects. According to Hodgdon there is only one rule – use something the student will understand quickly and easily. This should be determined by age and skill level. Picture cards can be used to establish a routine and help the student remember the steps involved (Figure 5).

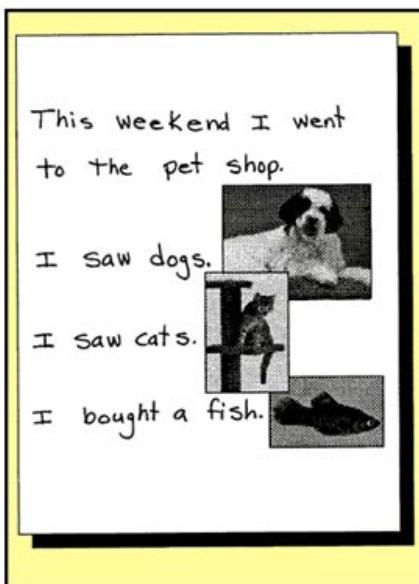
Figure 6. Interactive picture cards.



Source: <http://www.usevisualstrategies.com/products.html>

Interactive cards (Figure 6) have a subtle background colour. The style of the images are simple line drawings with solid colour. A simple phrase or single word is used to describe the action. Individual cards could be numbered to help avoid confusing the sequence.

Figure 7. An example of a daily photographic schedule.

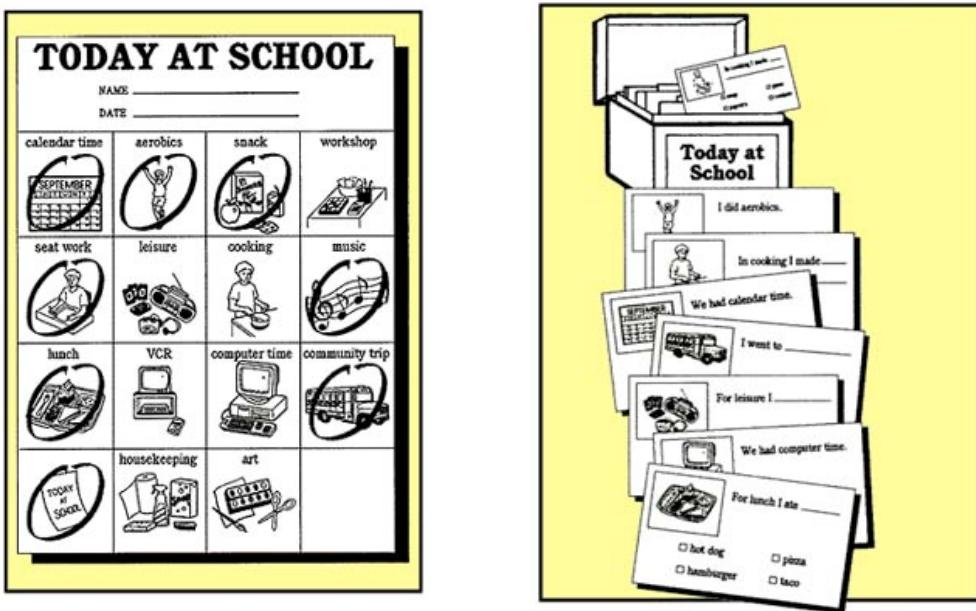


Source: <http://www.usevisualstrategies.com/products.html>

AS students have difficulty performing self-management and organisational tasks. Visual strategies can also be used to create calendars and schedules. These can be used to give general information for day-to-day events or on a weekly basis. Hodgdon feels that for young students, using photographs or the real objects is more successful, as this reduces the possibility of confusion

(Figure 7). For older students computer-generated schedules, calendars, daily event planners, and Palm Pilots can be helpful (Figure 8).

Figures 8. Examples of daily event schedules.



Source: <http://www.usevisualstrategies.com/products.html>

Visual strategies can be used to represent what the student has completed in one environment to help them remember when they are in another, for example what happened at school or while on holiday. Acting as a visual memory prompt, they help the student by reducing their need to recall information indirectly.

7.3.4 Conclusion

Most of the research into teaching strategies that would benefit AS students indicates that they learn more effectively with visually supported language. Hodgdon has designed a number of products to help achieve this. She encourages the use of imagery found in the environment – for example icons, logos, signage etc. The imagery created on her products is an eclectic array of styles. The majority are placed on a solid light-coloured background, which would help reduce eyestrain and be appropriate for any users with sensory issues. Imagery could be created by a parent, sibling or even by the student themselves; this would help to personalise the imagery for the student.

Attwood, Gray and Hodgdon all indicate that photographic imagery is a reliable

medium for AS students. They also acknowledge the need to express or include personal experience as a way to increase user interest. They also agree that it is imperative when using a visual language that it is suitable for the age of the user.

Hodgdon's aim is to help reduce anxiety for these students by creating structure and routine in their daily lives. To help the user establish a routine she uses a step-by-step procedure, sometimes incorporating schedules and planners to show the steps taken in each activity. By using a similar step-by-step construction the prototype development for this project will lead the viewer through scenarios that take place every day in their own home.

As with Hodgdon's visual strategies, photographs will be used in the form of a database. The user may add photographs to the database. They may also create imagery on the computer or scan other forms of images in to be used. Allowing the user control over creating their own images will allow a deeper personal interest in the activities and a more positive view of the outcome.

7.4 CASE STUDY IV: Mind Reading

7.4.1 Introduction

Mind Reading: *The interactive guide to emotions* was created by researchers at the Autism Research Centre, under the supervision of Professor Simon Baron-Cohen. Professor Baron-Cohen is the Director of the Autism Research Centre and Professor of Developmental Psychopathology at the University of Cambridge. His research spans the developmental neurophysiology of Autism, early diagnosis, psychological intervention and neuro-imaging in Autism.

Mind Reading is available on CD-Rom or DVD. It was launched in September 2002, and is advertised as being of benefit to everyone interested in emotions. “It has been designed with awareness of the needs of children and adults who may want to improve their ability to recognise emotions in others... and people working in the dramatic arts” (Baron-Cohen, 2002).

7.4.2 How Mind Reading works

Mind Reading is an interactive computer program that contains visual and audio information on human emotions. The program contains six levels of difficulty, and claims to be suitable for all from four years upwards. It contains 412 different emotions, some with video references. Each emotion is represented by photographs of facial expressions: a variety of actors of different ages, genders and nationalities help to give an example of variables within each emotion. Close-up videos of facial expressions are used to help focus on the relevant gestures. There are also verbal expressions of the emotion that can be played audibly; this explains the emotion in a narrative fashion and helps to provide context.

The program is organised into three sections: Emotions Library, Learning Centre and Games Zone.

Emotions Library

Videos of actors have been used to capture the different facial movements of each emotion. The user can replay each video as often as required.

Accompanying audio clips express the speech intonation associated with each emotion. There are definitions and stories for each emotion, a search facility, and a scrapbook where the user can create and organise their own collections.

Figure 9. Emotions (CD) library screen.

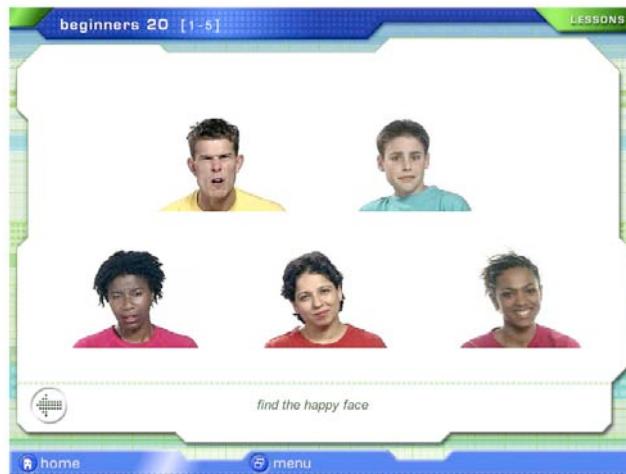


Source: <http://www.jkp.com/mindreading/demo/index.php>

Learning Centre

This section provides a systematic approach to identifying emotions and improving emotion recognition. Lessons and quizzes are provided to present emotions in a more structured fashion and then to test recognition. Some of these lessons can be adjusted to suit different levels of ability. Rewards are also used here to help motivate users.

Figure 10. Emotions (CD) learning centre screen.



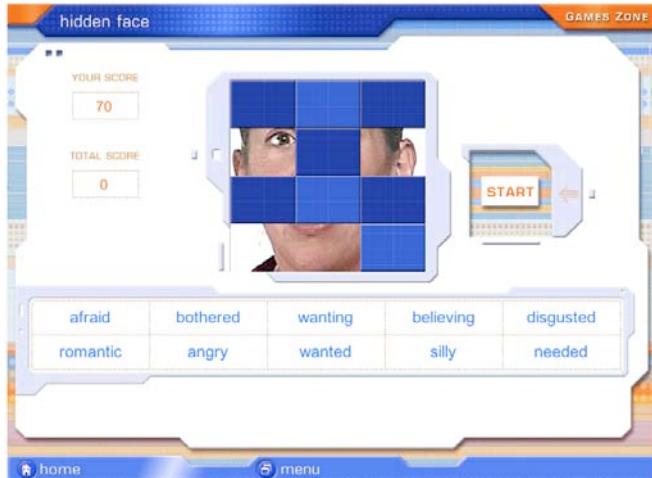
Source: <http://www.jkp.com/mindreading/demo/index.php>

Games Zone

The Games Zone encourages informal learning about emotions in a less structured setting. Games can help increase user interest and add an entertainment element to the program. This section is aimed at the younger audience. It still focuses on creating and learning about emotions. For

example the user can control a range of facial expression from angry to friendly using a slider, or try to guess what emotion a hidden face is portraying within a time frame (Figure 11).

Figure 11. Emotions (CD): a screen shot from the games zone.

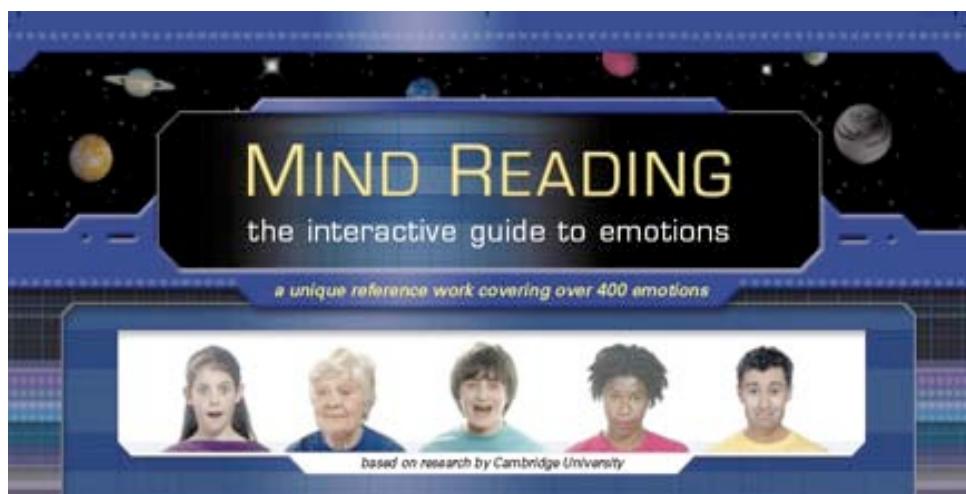


Source: <http://www.jkp.com/mindreading/demo/index.php>

7.4.3 Visual style

Please note that I have only used the on-line trial of this program, although I was privy to a demonstration by Tony Attwood and have seen numerous screen dumps of various areas.

Figure 12. Introductory screen.



Source: Media release brochure 2001

A blue hue is used throughout the program; this helps create a calm atmosphere and also creates the impression of "outer space". The use of graphic elements – mainly stripes, lines and squares in the background – help enhance the feeling of

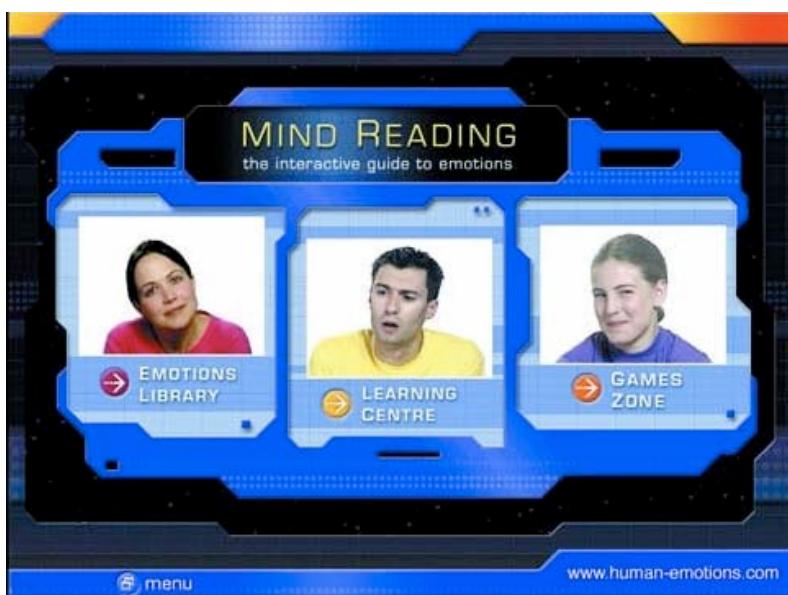
space. In some areas the use of planets and stars in the background are also used, adding to the illusion and helping to create visual depth (Figure 12).

The backgrounds within the different areas change in tonality but the elements used to construct them remain consistent. On top of the background are boxes of varying sizes. Although the feeling of floating in space is evident, the layout remains relatively flat with just the hint of a third dimension (this is implied rather than visually portrayed). The boxes are not square but rather represent shapes reminiscent of space navigational panels, not unlike the ones seen on the television series Star Trek or Stargate. These boxes contain information and navigation. Overall the visual aesthetic of the interface seems to be influenced by television or computer programs from the 1980s; you get the feeling that sliders will scroll closed with a loud clang.

7.4.4 Navigation and user interface style

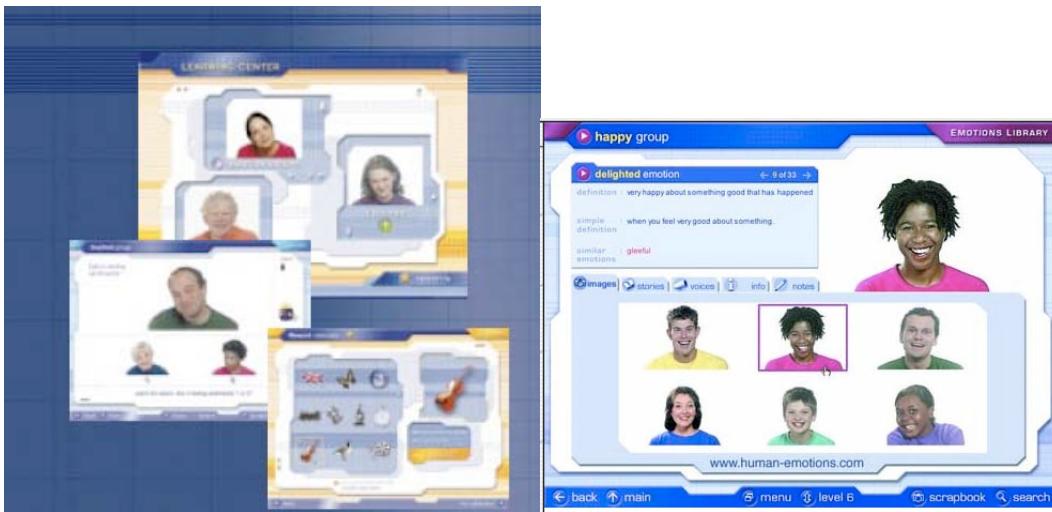
The navigational page for the three main sections (Figure 13) shows each section has a similar graphic style though colour has been used to subtly differentiate the sections. Large push buttons and the use of a simple arrow for entry into a section makes choosing where to go simple; these are well placed. The secondary navigation buttons are located along the baseline of the screen; these combine basic illustrative icons and text to clarify. However, a back or return button is not so easily detected in some areas.

Figure 13. Main navigation screen.



Source: <http://www.jkp.com/mindreading/demo/index.php>

Figure 14. Examples of internal screens from the emotions CD.



Source: Media release brochure 2001

Once inside the program the visual style and general layout remains consistent, although the dark background colour becomes lighter. Colour has been used within the layout to help the viewer identify the different sections. The use of colour coding is a standard interactive feature; it aids the user by visually separating areas of information and reminding users where they are within the program. As you move further into the program the colour palette changes further. The use of strong blues and dark greys are replaced with more restricted colours. Lemons, creams and whites are used for the backgrounds and the boxes contain light blue and white. The general idea of the reduction of colour is appropriate for the AS user; however the white background would create glare and sensory overload for many. There is a reduced amount of text in these sections and the user can navigate primarily via images.

7.4.5 Use of media

Video

The video clips show actors from the shoulders up. They are shot on a white background. The actors are dressed in coloured t-shirts – these colours do not create a colour code or relate to the colours used to differentiate the sections. In some of the videos the expressive facial gestures are almost extreme in their portrayal. I am unsure as to the reliability of some of these and feel supervision and explanation of these would be necessary for my target audience. Some of the emotions are expressed by interactions between two actors; these I believe are less successful. The one I was most concerned with

was where a young man gave a young lady a rose: if the user was unaware of the social implications of giving of a rose and the symbolism of the rose itself then the meaning of the gesture would be lost on them. Students with AS do not understand social or culturally imbedded messages, and they need to be taught the meaning behind such interactions.

Audio

The audio tracks are clear and precise. They add understanding to the expression. The volume setting can be adjusted on the computer itself, but not within the program.

Typography

Headings are given hierarchical treatment, shown by larger point size and use of upper case. These are pale yellow with drop shadows and 3D effects with highlights. Generally the text is centrally situated within each box. Readability is slightly impaired with the use of a fine stroke weight. This is most problematic where the white highlights diffuse into the white backgrounds. The choice of a slightly condensed font in a large point size adds a technological feel that enhances the overall feeling of space flight created by the graphic elements. The typeface is of a size that legibility is satisfactory.

Figure 15. Typographic example from emotions CD.



Source: <http://www.jkp.com/mindreading/demo/index.php>

Subheads are in lower case only; these boast large counter forms and good point size. They are coloured white and also contain white highlights; this does hinder their legibility on screen.

The body copy also boasts a large counter; the colour chosen is white and is placed on a near black background. The combination of these colours is known to create eye strain for the screen reader (Götz, 2003).

7.4.5 Conclusion

As Mind Reading was designed specifically for use by my target audience I felt it a valuable item to critique. I am predominantly interested in the interactive and aesthetic design of the program.

The program is designed for a single user. It does not have interactive turn taking; it could be used with or without the aid of a helper. In comparison the prototype for this project will be able to be used either way.

The reduction of elements within two of the three main sections shows consideration for the user. This reduction of elements would help the AS student to focus on what is important and not become side-tracked by the technology.

The three main sections allow the user to move through them at their own pace; however within the games section there is a counter that reduces the user's score as time ticks by, and I found this made me rush my decision. In the other sections there are no prompts or cues to encourage the user. This has informed the design of the prototype for this project so that it will not include prompts. Decisions should be informed and not hurried.

Research by Stephenson, Babbitt and Ilard indicates that student engagement helps to increase their interest. Mind Reading by its very nature as an interactive program creates some engagement. However, a deeper level involvement could be achieved with a more personalised database (Stephenson, 2001; Babbitt, n.d.; Ilard, n.d.).

The placement of navigation is consistent and kept to the minimum number of options. This allows the user to go back and forth between a section and the main navigation screen but not across sections themselves. This is a slight variation to normal navigational design, where the main navigational sections are usually always accessible. This would prevent the user from becoming disorientated if they accidentally clicked a wrong button, and is well worth consideration for the prototype.

The navigation buttons are well designed for the target audience. They are broken into two hierarchical groups. The main navigation consists primarily of

a home and a menu button using both text and iconic imagery. These are positioned consistently on a coloured boarder. Secondary navigation consists of simple forward and backward arrows; these are larger in size than the primary navigation and aesthetically have a different style. They are extremely easy to identify and again their consistent placement helps makes progress through the sections easy.

The number and placement of elements within the design is especially interesting. The introductory scenes are slightly heavier laden with design fluff – stars and planets – although this sets the visual feel and would likely appeal to the target audience's heightened awareness of space and technology. Overall I feel a number of elements are a little redundant and also dated.

The positioning and design of mid-ground boxes that contain content is well considered; these make maximum use of the screen space yet are interestingly shaped. The shape allows a hint of the background to show through and adds interest to a basic landscape format.

The Emotions Library section contains multiple boxes: one with images; one with textual description and a third with multi-tabs that contain images, text and audio. The text in this section is on the small side and the user is unable to enlarge it. In addition the designer has used lined backgrounds with text of a similar colour on top in several areas. Here the small point size, condensed typeface and linear aspect impairs readability. Further into the program the layout simplifies – this would be more suited for the AS student.

8. THE DESIGN PROCESS

8.1 *The brief*

8.1.1 *Target audience*

The target audience for this project is children aged between 9 and 14 years who suffer from AS. Attwood has identified this group as needing help developing personal relationships and learning social etiquette (1999). While the impairments of this group have been specifically addressed in the design process, it is worth noting the product of this project may be of benefit to all individuals with social skill problems.

The lifestyle of an AS individual is often marked by a repetitive adherence to procedures and routines, some of which may be compulsive. These individuals can become distressed if a specific routine they follow is interrupted or changed (Baron-Cohen and Bolton, 1993). One of the key aims of this study is to assist an individual to gain greater understanding of the routine involved around mealtime. In particular the goal is to introduce the concept that roles people take in preparing, cooking, serving and clearing a meal are not absolute. This awareness will help reduce the possibility of anxiety, confusion, and mood disorders. The research undertaken for this project has informed the development of a computer program prototype that can be used to introduce the concept that mealtime roles may not always be the same.

There are several specific traits that impede learning for individuals with AS. The design process needed to consider these in order to create a useful education aid for students with AS. These traits and the influence they had on setting the design criteria are discussed in turn.

8.1.2 *Social implications*

All groups that fall under the Pervasive Developmental Disorders (PDD) umbrella suffer from social skill problems. The possibility of a mood disorder increases if these individuals are allowed periods of unstructured free time or if a situation becomes unpredictable. However, if they have been coached to expect changes to a routine they are more likely to cope. Carol Gray's Social Stories are an example of a process that can introduce the concept of change. The prototype designed in this project builds on and extends Gray's basic concept, creating a more personalised experience, resulting in a more enjoyable and productive environment.

8.1.3 Learning environment

AS individuals can suffer from sensory overload – lights, sounds, colours and movement can all affect their ability to learn. Using a computer to reduce many of these sensory issues will create a more productive learning experience for these individuals (Dauite and Morse, 1994). The single user computer environment is a non-competitive space, where the user feels safe to learn. The computer also has the ability to repeat information in a consistent non-judgmental tone as often as necessary, which makes it an attractive educational tool for this group. Navigation for the prototype uses a simple linear structure, similar to web site design and adheres to norms already established in the web environment. The structured interface, where the user can progress step-by-step, is designed to allow the user to work at their own pace.

The prototype has been designed so the user can work through the stages on their own. However, a parent, therapist or teacher can accompany the user, expanding the concept by addressing more personalised issues.

8.1.4 Cognitive learning style

Individuals with AS have a unique cognitive perspective. Using educational strategies that are known to help lower the cognitive load for these individuals may also reduce the possibility of mood disorders, and will increase the student's chances of learning. The prototype will address the AS cognitive profile by:

- using a visual language
- providing a controlled learning environment
- adopting a rote style of learning
- using concrete and literal terminology.

The literature shows that individuals with AS have a weak short-term working memory. This has been addressed in a number of ways:

- use of visual elements to show the steps needing to be completed
- use of a navigation system that contains a word for the destination of the button rather than icons or symbols that may carry socially embedded messages
- breakdown of instructions into accessible and achievable amounts
- a drop down selection panel for often used names.

The interface was designed to be predominantly visual. Attwood (2002) and Grandin (2003) felt a visual language was more appropriate for the education of AS individuals. This will also help to reduce the possibility of cognitive overload. In addition, giving the user the choice to create their own images or to use photographs will help to create a strong concrete visual language suitable for the AS individual.

8.1.5 Typographic selection

There are two main considerations when choosing typefaces for the computer:

- the low screen resolution
- the nature of the screen, which is constructed from light.

There are two main typeface groups, serif and san serif. San serif faces are more legible and easier to read on screen than serif faces. There are a number of san serif faces that have been designed specifically for the screen environment. These are often referred to as screen fonts, and a number of these are platform defaults. There are also a number of bitmap faces that have been produced specifically to fit the pixel format of the screen.

There are certain attributes to a typeface that make it more presentable on screen. These attributes are:

- a uniform weight and or boldness to the construction of the letters
- a large x-height
- generous spacing between the letters so that letters don't clump together
- large punch or counter holes – this is the space inside letters
- individual shape of characters help create good character recognition
- consistent structure, either horizontal or vertical.

The choice of the final typeface needed to provide a face that is highly legible on screen and one that creates an impression suitable to the overall aesthetic style. A number of other parameters can also be adjusted to enhance typeface readability. They included:

- letter spacing
- line spacing
- line length
- size

- alignment.

The choices made about typography used within the prototype were influenced not only by the desire to produce an overall impression that is pleasing to the eye, but also the need to have a text that is easy to read. Good readability depends on the right combination of the above parameters.

8.1.6 Colour selection

Another point taken into consideration was the choice of colour. On screen, colours are generated by means of light. The colour system supported by the screen is known as the additive colour system. This system generates all colours from the three primary colours of red, green and blue (RGB). When 100 per cent of red, green and blue are combined they create white. On paper white, or negative space, is used to rest the eye. In the screen environment white is intense bright light. The intensity of this light is stronger than its paper equivalent. On paper, black text on a white background is the preferred combination; however, on screen the intensity of a white background can easily cause eye strain. Colours with the same intensity as white may make the screen appear to flicker; this can also result in eye strain.

The overall impression or “aesthetic look” also needs to be considered. Colour has the ability to convey emotions and feelings; some of these evolve from cultural understandings, social cues or historic reference. The target audience may not understand these messages, as they are often socially embedded, and not literal. This type of colour use would then be lost on the target audience. Therefore it was decided colours that reflect their appreciation of the machine environment and acknowledgement of their sensory issues would be a better choice

8.1.7 Sensory issues

Research by Irlen provides the most influential information on sensory issues for individuals on the Autistic spectrum. Her findings have been practically applied on the Irlen website, where the user is able to change the background colour to a value that would reduce eye strain. This helped informed the choice of a colour palette for the prototype.

For the early prototypes the user has a choice of colour palettes that are know

to reduce eye strain, these have been adopted from Iren's website. Investigation into colour that would reflect the target audiences' appreciation of the machine environment, was also taken into consideration. Hence the prototype will focus on the use of cool greys and blues.

Using the above criteria two separate prototypes and concepts were developed.

8.2 STAGE ONE: Dual prototype development

8.2.1 Prototype 1

One of the concerns that had to be addressed in this project was how to represent an everyday situation that occurs in the user's home without actually showing their immediate environment. The AS individual can be pedantic about routines, and a very strong preference for having things presented in a concrete and literal fashion. This issue of representation for the first prototype was resolved by using a fictitious scenario and character. By looking at a fictional character (Tim) and what usually happens at Tim's home during mealtime the student can identify things that are similar to their own routines, and compare each activity with what happens in their home. As well as identifying the routine involved in making and serving a meal, the intention is to make the student aware that many people are often involved and changes of roles can occur within the routine. The prototype could also be used to introduce possible changes to the routine at a restaurant, café or friend's house.

Four stages were identified as activities involved at mealtime:

- who prepares the meal
- who cooks the meal
- who serves the meal
- who clears the dishes from the table.

Once this structure was settled on, attention turned to the actual computer environment provided for the user – who, as someone with AS, has particular preferences and challenges. The introduction page asks the user if they would like to adjust the sensory preferences (Figure 16). This allows the user to adjust the size of the text for ease of readability, select a background colour that is appropriate for the individual, and to play instructions on audio.

Figure 16. Prototype one: steps to sensory preferences.



Source: Tracey Blair

The correct colour for the user will help to reduce eye strain. In full production the user could select from a wider range of colours, possibly using a sliding colour bar to achieve the exact colour suited to the individual. At this prototype stage three colour palettes are available. However, only one is fully working throughout the project. After selecting their individual preferences the user is introduced to Tim and his family.

Figure 17. Layout examples of prototype one.



Source: Tracey Blair

This prototype contains limited textual instruction and relies on a visual style to deliver information, via a mock TV screen (Figure 17). The user is invited to consider who performs the key roles in the mealtime routine. The user can click on a small photograph or the name of the family member this loads a

video of them into the main TV screen and they can watch, read (or listen) to the answer whether that person performs that role. If they do, the viewer can watch a short video clip of them doing so. After observing the family members the user can click through to the next stage. The final screen gives information on who participates in each activity, and to what extent.

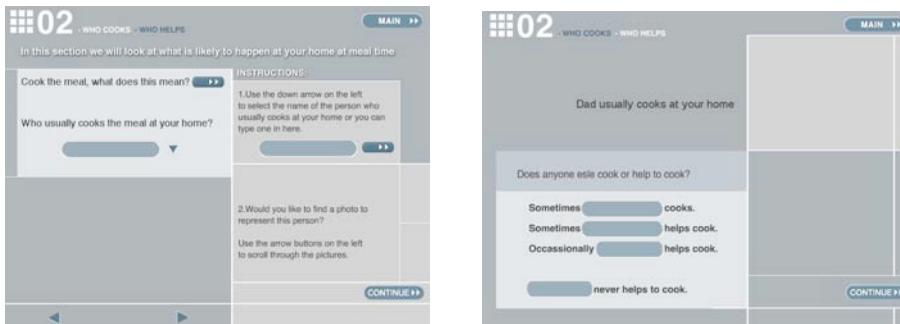
The variety of media – text, photography, video and audio provides the user with a selection of ways to understand the information given. The user is in control of how long each piece of information is on the screen.

8.2.2 Prototype 2

The second prototype aims to make a more personal connection with the user and their family. As with the first prototype the user can select from the same variables to overcome sensory issues, and the four mealtime stages are also the same. The main difference is that the second prototype explores the story of what happens at the individual user's home. It has the ability to incorporate imagery created by the user or photographs of them and their families. There is a database of stock images but if the user chooses to use their own, they can. This requires some basic understanding of file structure, and downloading and uploading of photography images. This needs to be set up before beginning the program and can be done by anyone with basic computer skills.

The user works through the scenario of what usually happens around mealtime in their home. They can select names or images of family or friends to participate in the different stages.

Figure 18: Interactive screens from prototype two.



Source: Tracey Blair

In the next screen, the student has the option of adding information about

people who also perform the role but do so less often. This information is retained and presented back to the user at the end of the program.

8.3 STAGE ONE: Expert feedback

8.3.1 Feedback from first interview with Diane Strugnell

A couple of aspects of the design decisions for the prototype are explained first to provide context to the feedback.

User controlled preferences

On entering the program the user can set personalised preferences. The inclusion of these sensory preferences in the development of the initial prototypes addressed the sensory issues for users with AS. It was felt by Stugnell *that the preferences were appropriate for the target group*. These preferences were used for both initial prototypes and will be used on the final prototype.

Navigation

Navigation is by simple rectangular buttons with round corners, which have a word or words placed on top to describe the button's destination (Figure 19). This makes the navigation literal; one exception to this is the audio button that uses a speaker symbol (Figure 20).

Figure 19. Example of navigational button.



Source: Tracey Blair

Figure 20. Sound button.



Source: Tracey Blair

This sound icon is used in many situations, on car radios, TVs, videos, computers, and web pages and is introduced to the user in the introduction of the program. Some areas scroll open and closed, or fade in and out – these areas contain secondary information or the second part of a sequence. These areas are used to help the flow of information, create a contemporary feel and attract the user's attention.

8.3.2 Prototype 1 feedback

It was felt that although the buttons looked a good size on the screen they seemed difficult to activate. This was easily resolved by enlarging the hotspot area around the button. There was also some confusion about pressing and holding buttons. The program had been trialed on several users prior to the interview and none of these users had this problem. It is felt that the issue was likely more to do with the interviewed user operating an unfamiliar computer and platform, rather than a glitch with the program.

The text colour used in the prototype was chosen specifically for the target audience, and not necessarily designed for the average eye. However, Strugnell felt that the text in one area was a little difficult to see and felt a text colour closer to white might be a better choice. Research indicates the high contrast of white on the screen is difficult to read (Irlen 2003, Gotz 2003). The grey in question was reassessed and in the end a darker shade was chosen.

Strugnell commented *that this first prototype was easier to navigate as there was not so much information and there were more visuals to help prompt the user. She felt that this would have merits for 5-8 year olds in terms of learning keyboard skills, because when you clicked on a button or image you are rewarded by something happening, although the students would learn about meal times she would find more use for it as a keyboard tool*⁴.

She felt that although *the TV screens were “gimmicky” they would appeal to the target audience. She commented that the videos were of merit, and would improve the learning experience. However, she felt that watching someone else participate in an activity does not draw a connection to oneself.*

8.3.3 Prototype 2 feedback

Strugnell felt that *from an educational perspective this was more appropriate for the target audience: the user would get more out of this concept as there is more to think about, rather than merely watching as in prototype 1. There is more of a connection created with options and more interactivity. In terms of the ability to add a photo to represent the person doing the activity Strugnell felt giving the student the choice to use a photograph or choose not to, was*

⁴ Italics have been used throughout this section to indicate comments made by interviewee.

the best option. She did feel that it would be a benefit to use a photograph of themselves or a family member but this would need to be an individual choice. It was decided to add another choice, a “no photo” button. The question of “how do you know when you have chosen a photo?” arose. In the next production phase this will be addressed by not having a photo automatically load on opening.

The word “close” was used to close down a section where information on the activity could be found. Strugnell felt that *using the term “back” would be more appropriate as the user may get confused and think “close” might close the whole program.*

Strugnell agreed that the boxy layout worked well to separate the areas of information. She would *like to see the TV screen used in the “what does [activity] mean” section. Also video clips should show the activity not the person.*

In this prototype the user can select a name from a list or use another panel to add a name of their choice. It was decided that it would be better if the user could add a name to the list directly, rather than in a separate area.

Strugnell felt *having the ability to print a copy, as a reference for what happens in the routine, would extend the use of the program and help the user remember it.* This function was noted for inclusion in the final prototype.

8.3.4 Feedback conclusions

After trying both prototypes Strugnell felt that *the aims set out in the project were feasible for the target audience and the sensory preferences were appropriate. She felt the more areas where the user could interact or add information the better as this makes the user think about the questions and makes it more personal for them.* She also commented that *the more personalised it was, the more it would promote ownership for the user – using their own name, for example on the print page. The program needs to consider what happens if they insert I or me – can this be grammatically corrected? This would help if they were to print their results to discuss with someone else. It would also help reduce the possibility of confusion, and add an element of surprise for the user.*

Overall Strugnell felt that *the concept was very good and she could see a wide range of applications for the resource*.

8.4 STAGE TWO: Prototype refinement

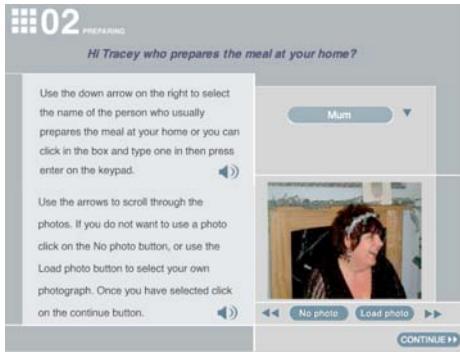
Design elements from both the initial prototypes were incorporated into a final aesthetic. Visual appeal was retained with use of the TV screen, and additional visual elements were added to increase engagement. The boxy aesthetic used in the second prototype was used to visually separate information into sections.

Figure 21. TV screen.



Source: Tracey Blair

Figure 22. Example of box format.



Source: Tracey Blair

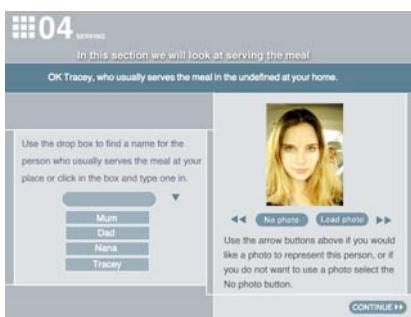
Each box contains an element that the student needs to address. Although visual appeal is important to create interest for the user, the cognitive profile of the AS individual also needed to be considered. The amount of information in each box has been carefully considered so as not to create cognitive overload.

Figure 23. Choice panel.



Source: Tracey Blair

Figure 24. Example of drop menus.



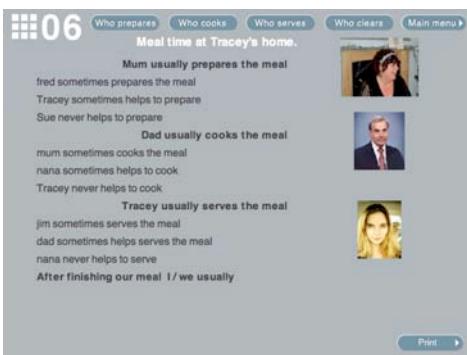
Source: Tracey Blair

The user is asked to enter their name at the beginning of the program. This is the only input that the user “needs” to make. Other input boxes give the user a

choice to participate or not, without upsetting the end result or hindering their progress.

The format style utilises a very linear progression through each section, and allows the user to control the pace of learning. At the end of each section the user has the opportunity to continue on to the next section, or print their work so far.

Figure 25. Print page.



Source: Tracey Blair

Once printed they can choose to return to the beginning of the program or proceed to the another section.

8.4.1 Feedback from second interview

Strugnell was very impressed with the final design and concept. She felt *a lot had been accomplished from the first interview*. She felt that *the concept could be utilised in many social situations to help students overcome issues of anxiety caused by unpredictable changes in routines*.

There were a couple of little coding bugs that cropped up during the final session with Strugnell. These are easily fixed in the code and will be finalised before handing in the project.

From the second interview it became apparent that there were a few additions needed to the video areas to make them more interactive. A *pause button would allow greater discussion and involvement when the program was used in a one-to-one or one-to-many situation, allowing the users time to think, consider and discuss alternative options*. A progress bar was added to each video screen so user's had a visual clue to how long the video would last.

Information of what to do at the end of each movie would also clarify the next step in navigation of the program.

Strugnell felt that the order within the final section “clearing” could be adjusted. She felt that *from a social skill learning position the order of the event was important. The order is part of the process and therefore clearing should come before what you do after you have finished your meal.*

From the print page it was felt that it would be best if the user had the options of going back over the sections they had completed, or progress to the next section, or return to the main introduction page. This would prevent the user from jumping ahead and missing a section.

All the suggestions made by Strugnell in the final interview were implemented.

Strugnell offered to introduce me to the secretary of Cloud 9, a production company who also operate an organisation to help people with Asperger's Syndrome and their families. This organisation is named Cloud 9 Children's Foundation. She felt that the project and especially the concept had a lot of merit and that Cloud 9 might be interested in the program.

9. CONCLUSION

This research project set out to create a resource specifically designed to provide support for the educators of children with difficulties in learning social skills, especially individuals with Asperger's Syndrome (AS). This has been achieved with the development of a structured interactive computer prototype. The prototype has taken into consideration the unique cognitive attributes and sensory issues that can hinder the progress of learning and communicating for this group. Effective communication requires the ability to rapidly establish and shift attention, take in and process information and formulate responses appropriate for the situation. Individuals with AS experience difficulty accomplishing these skills at the speed necessary to participate effectively in communicative interactions.

The computer was selected as a delivery medium as it allowed information to be delivered consistently, as often as needed and without deviation of tone. To deliver information in such a consistent, repetitive manner can be difficult for a human to accomplish; it is however just the style of delivery that is of benefit for the AS group. By default the computer interface is a very structured environment, it has established routines and layouts. Its general functionality is sequential and lends itself to a rote style of learning. A step-by-step rote learning style has been implemented in the prototype to aid the learning process. This more simplistic learning style will help to reduce the possibility of cognitive overload. This style makes learning easier for the AS individual as it assimilates closer to their cognitive profile.

The prototype can be used in a variety of environments. The individual can work in their own home, in a classroom or a therapist's office, they can use the prototype any time of day. Users can work through the prototype on their own or with a helper. Thus giving more flexibility to the individual and also the educator. The prototype has been designed specifically for its ability to control media. This allows the user time to think about the situation and respond at their pace, without feeling rushed or creating anxiety. The interface between the user and the software does not involve the complexities of body language that so easily confuses and frustrates individuals with AS. The ability to control and reduce many sensory elements within the prototype allows the individual to personalise the learning experience. The prototype allows the individual to take control of the pace of learning and the style in which they learn – whether

visually, audibly or a combination of both. The prototype encourages the user to add their own imagery making the experience more personal, and therefore creating a more enjoyable and successful learning environment.

The prototype provides these individuals with the most productive environment for learning. The outcome enables the AS individual to visually identify different social settings; it will help them to engage more successfully in social environments, and equip them with strategies to cope in new situations.

The underlying concept of this interactive prototype can be applied to any structured routine. The applications that this could be applied to are endless and would assist educators, parents or individuals in their quest to help individuals with social skills problems to function more easily in everyday situations.

APPENDICES

APPENDIX A: Kanner's criteria for diagnosis of Autism

(Source: Kanner 1943)

These criteria had to be present:

- a profound lack of affective (emotional) contact with other people
- intense insistence on sameness in routines
- muteness or abnormality of speech
- fascination with manipulating objects
- high levels of visuo-spatial skills or rote memory but major learning difficulties in other areas
- an attractive, alert, intelligent appearance.

APPENDIX B: Asperger's Syndrome and High Functioning Autism

According to Ozbayrak (1996) the differences between AS and High Functioning Autism show that in AS:

- onset is usually later
- outcome is usually more positive
- social and communication deficits are less severe
- circumscribed interests are more prominent
- verbal IQ is usually higher than performance IQ (in HFA and Autism, the case is usually the reverse)
- clumsiness is more frequently seen
- family history is more frequently positive
- neurological disorders are less common
- individuals are more able to express their ideas.

APPENDIX C: Traits portrayed by AS individuals

The following traits are commonly identified in people with AS.

Adapted from Attwood, (1998b); Grandin, (1999); Moreno & O'Neal, (n.d.), Williams, (1995).

Severe impairment in reciprocal social interaction may result in:

- social clumsiness
- an inability to look another person in the eye
- giving wrong gestures or signals
- inability to interact with peers
- a lack of appreciation of social cues
- social and emotionally inappropriate behaviour.

Communication and speech and language problems:

- well developed vocabulary
- superficially perfect expressive language
- impaired understanding of how communication works
- monotonous voice
- formal, pedantic language
- repetitive content and words
- impairment of comprehension including misinterpretations of literal/implied meanings.

Non-verbal communication problems:

- poor, lack or limited use of gestures
- clumsy/gauche body language
- limited or lacking facial expression
- inappropriate expression
- peculiar, stiff gaze.

Imagination and inflexibility of thinking:

- limited play skills
- difficulty distinguishing between reality and fiction
- likes mechanical activities – collecting, assembling, and dismantling
- dislikes change
- likes routines, rituals
- likes sameness

- usually develops strong interest in a narrow field to the exclusion of other activities
- cannot see others' point of view

Strengths:

- good at rote memory
- extraordinary focused although on a narrow field of interest
- extensive vocab
- good at defining words – literally
- advanced knowledge and skills in areas of technology
- high performance IQ skills and visual perception – shape matching, jigsaw puzzles
- good at 3D graphic skills.

Cognitive and learning disabilities:

- unable to learn from mistakes
- unable to apply prior learning
- one-track mind – not flexible in thinking
- learn by intellectual analysis and instruction not by natural intuition
- cannot prioritise thoughts or work.

APPENDIX D: Abilities and weakness

From the literature reviewed (Williams, 1995; Attwood, 1998a; Klin and Volkmar, 1997) I have composed a list of cognitive abilities and academic weakness experienced by students with AS:

- average to above average intelligence
- competent with expressive speech and numbers
- competent with puzzles
- copes well in a structured predictable environment with clear and simple rules stated in concrete terms
- precocious visual and auditory memory, where the child notices and recalls things other people may not
- literal interpretations of speech
- weak in reading comprehension especially if requires inferential thinking, problem-solving, and organizational skills
- pedantic, literal in speech and understanding
- holistic approach to tasks and does not cope with approximations
- lack of spontaneity in exploring new situations
- interested in books and factual information
- clumsy and uncoordinated
- very egocentric
- learns from direct instruction, not intuitive perception
- weakness in abstract thought and social cognition
- may have splinter skills (eg hyperlexic but lacks comprehension; hyperverbal, extensive factual knowledge about subject of interest)
- consistent unawareness of non-verbal feedback (including consequences of actions)
- weakness in executive functioning, cognitive flexibility
- spends more time involved with objects and physical systems than with people
- view of what is relevant and important in a situation may not coincide with others
- may be fascinated by patterned material.

The list could be expanded but these features are sufficient to illustrate that children with AS have a unique cognitive profile.

APPENDIX E: Principles for constructivist learning

Brooks and Brooks (1993) identified these five principles of constructivist learning as important:

- posing problems of emerging relevance to students – at some point, the children must view the problem as relevant to them
- structuring learning around primary concepts – concentrating on the pieces is likely to result in the misapplication of isolated facts or algorithms because the student cannot "see the forest for the trees"
- seeking and valuing students' points of view
- adapting curriculum to address students' suppositions
- assessing student learning in the context of teaching.

These principles can be met by:

- learning goals that are clear, and clearly related to specific learning activities and methods of assessment
- ample social interaction between instructor and learners, and among learners
- activities that are designed to meet the needs of a variety of learners (technical, intellectual, social, pedagogical needs)
- learners and instructors receiving reliable support and regular feedback.

APPENDIX F: Intervention strategies for the learning disabled

Ellis & Lenz (1996) believe “the steps of an effective strategy cue students to use specific cognitive strategies. Effective learning strategies often are ‘strategy systems’ incorporating many cognitive strategies such as activating background knowledge, generating questions, summarizing, imaging and so forth”.

The idea of using multiple strategies reinforces the need to acknowledge the unique cognitive style of AS. In the educational environment distinctions have been made between cognitive and meta-cognitive strategies. “Cognitive strategies help a person process and manipulate information. Examples include taking notes, asking questions, or filling out a chart. Cognitive strategies tend to be very task-specific, meaning that certain cognitive strategies are useful when learning or performing certain tasks. Meta-cognitive strategies are more executive in nature. They are the strategies that a student uses when planning, monitoring, and evaluating learning or strategy performance. For this reason, they are often referred to as self-regulatory strategies” (Bauer, n.d.).

Idol (1987) believes that self-regulated learning is at the core of successful and life-long learning. She notes, “Just as students can be helped to develop their use of cognitive, task-specific strategies, so can they be helped to use self-regulatory, meta-cognitive ones as well. In fact, the most effective strategy interventions combine the use of cognitive and meta-cognitive strategies”.

It is felt that self-evaluating techniques should include questioning the student's understanding of a passage of text or summarising in their own words the material they have read. One suggestion put forward is that “While reading a story, they might try to predict what will happen next... learning to make predictions helps reading comprehension” (Elbaum & Vaughn, n.d.). This is especially necessary for the AS student, who can repeat verbatim, but lacks understanding. Wong and Jones (1982) developed a self-questioning strategy, which focused primarily on identifying and questioning the main idea or summary of a paragraph. They first taught junior high students with learning disabilities the concept of a main idea. A self-questioning strategy was then explained. Students then practiced the self-questioning strategy, with cue card assistance, on individual paragraphs. Following the practice, students were provided with immediate feedback.

A story mapping strategy developed by Idol (1987) is used to help students understand the content of the story, getting students to “generate a map of its events and ideas and then answer questions. In order to fill in the map, students had to identify the setting, characters, time and place of the story, the problem, the goal, the action that took place, and the outcome”. Idol modelled for students how to fill in the map, and then gave them extensive opportunities to practice the mapping technique for themselves and receive corrective feedback. She stated, “If comprehension instruction provides a framework for understanding, conceptualising, and remembering important story events, students will improve their comprehension of necessary information”. Idol further recognised that “comprehension improves only through direct teacher instruction on the use of the strategy, high expectation of strategy use, and a move toward students independently using the strategy”.

Whether the literature refers to these strategies as cognitive and meta-cognitive or as direct teacher instruction and strategy instruction, the wider viewpoint is the combination of them creates the most effective strategy for students with learning disabilities (LD). Swanson (2003) felt the main instructional components of a combined model should include:

- sequencing (eg breaking down the task, providing step-by-step prompts)
- drill-repetition-practice (eg daily testing, repeated practice, sequenced review)
- segmentation (eg breaking down skills into parts and then synthesising the parts into a whole)
- directed questioning and responses (teacher asks process or content questions of students)
- control of task difficulty
- use of technology (eg computers, presentation media)
- teacher-modelled problem solving
- small-group instruction
- strategy cues (eg reminders to use strategies, think-aloud models).

When comparing the success of interventions for LD and non-LD students Swanson reported “Children with learning disabilities perform closer to non-disabled (age-related peers) children when treatment includes strategy instruction. Not surprisingly, non-disabled students generally outperform learning-disabled students. Importantly, however, there was less difference between the performance of the two groups when learning-disabled students were exposed to

treatments that included strategy instruction compared to competing treatments like direct instruction" (2003).

A review of the literature between the years of 1963 and 1997 by Gersten & Baker (1999) investigated whether "studies that use direct and/or strategy instruction produce better effects on problem-solving skills than those that do not?" The findings concluded that:

- in contrast to other methods, interventions were more effective when studies included derivatives of cognitive and/or direct instruction
- effective instruction can be either a bottom-up or a top-down approach, as long as certain components are included in the intervention
- no statistical advantages of the direct instruction or strategy instruction were apparent
- a clear orientation to task, drill-repetition-practice, sequencing, teacher modelling, and systematic probing may supersede effects related to distinctive qualities of either the strategy or direct instruction methods.

APPENDIX G: Beneficial educational practices

The literature review identified a number education practices found that have proven beneficial for the AS student (Swanson, 2003; Jackel, 1996; Kiln and Volkmar, 1996) these include:

- being brief and precise when giving instructions
- presenting new concepts in a concrete manner
- checking the student has understood the direction and/or information – don't assume that repeating the instruction means that the student has understood
- stating clearly what is expected and allowing time for the student to process the information
- being absolutely consistent and not giving options if there are no options
- avoiding language that may be misunderstood by the child with AS, such as sarcasm, confusing figurative speech, and idioms
- breaking tasks up into manageable segments and training the student to schedule and plan
- teaching the student to ask for help and appropriate methods of doing so
- using activity-based learning where possible
- using the obsessive or preferred activity as a reward.

APPENDIX H: Social Story guidelines

(Source: Gray 1995, 1999)

Step one

Picture the goal: an author must form a clear, specific, and accurate picture of the goal/desired outcome of the Social Story. The general goal of a Social Story is to share accurate social information: to describe more than to direct. Therefore, while the result of a Social Story may be a change in behaviour, the goal is always to improve understanding of the challenging skill or situation.

Step two

Gather information: once a clear picture of the goal is established, information is gathered regarding the individual student and situation. Information about the student's learning style, reading ability, attention span, and interests is collected. In addition an author needs to identify a location where the situation occurs, who is involved, how long it lasts, how it begins and ends, what occurs and why.

Step three

Tailor the text: it is important to customise the text to adhere to the learning style of students with AS and acknowledge the specific needs and abilities of the student. As a result, a Basic Social Story will have the following characteristics:

- an introduction, body and conclusion
- aim for answer to the 'WH' questions
- written from the first or occasionally third person perspective
- contains positive language and positively stated responses and behaviours
- uses the Basic Social Story Ratio
- contains language that is not concrete
- is consistent
- illustrations (if needed) reflect the student's age and personal learning characteristics
- a style and format that is motivating, or reflects the interest of the student.

For young children, concrete, easy-to-understand text enhanced by visual supports can be used to help translate abstract concepts into tangible concepts. For older more advanced students, a Social Story may take the format similar to a newspaper article, with advanced text and corresponding tables or graphs that enhance the meaning of the text.

Step four

Each Social Story should use a title that states the ‘gist’ or overall goal of the story, reinforcing the most important information. References to any behaviours – positive or negative – are rarely a part of a Social Story title. Sometimes titles are best stated as questions, with the story answering the question. Whether a statement or question, the title identifies and reinforces the most important information in the story.

APPENDIX I: First interview transcription

The interview sought response to a resource tool designed to promote successful social skills.

Interviewer: Tracey Blair
Interviewee: Diane Strugnell
Date of interview: 22 December 2006

Learning requirements

As an educator of the target audience Diane Strugnell was asked to comment on:

Q1. Whether the aims of the project are feasible and appropriate for the target audience?

A1. Yes.

Q2. If the information is presented in a way that the student would be able to identify what is expected of them?

A2. *Yes, the second prototype especially; it is more effective because it offers more options / more interactive (re importing photos).*

Q3. If the choice of language is appropriate for the target audience?

A3. *Grammatical improvements required but otherwise all good.*

Recommendations made by Strugnell:

- *More options to insert name titles, eg the opportunity to type in ‘Papa’.*
- *‘Back’ would be better than ‘Close’*
- *The answer to the question “who usually cooks at **your** home?” needs to read “[name] cooks at **my** home”, because it would promote ownership by making the work personal, plus make it clear to other readers who it was written by; the option to answer “...my home...” would be better than a sentence without a possessive noun.*
- *In addition to “[name] usually cooks at my home”, ‘sometimes [name]...’ could be included as an option, as well as ‘I help to cook’. (‘I / me’ could perhaps automatically change to the respondent’s name, to make the answer grammatically correct and add an element of surprise for the participant).*
- *A video clip of someone cooking would incorporate elements of both prototypes and improve the learning experience.*

Pace of learning

The user's pace of learning has been considered by creating bite-size chunks of information and activities.

Q4. In your opinion is the information presented in consumable chunks?

A4. Yes.

Q5. Do you feel the CD has been systematically constructed in a way that promotes the user's control over the pace of learning?

A5. Yes.

Interface design

Develop a visual interface that will reduce sensory stimulus that may impact on the learning experience.

Q6. The incorporating of different media aims to add interest and diversity to the learning experience. Do you consider the ability to control this media an important factor in creating a learning environment for the target audience?

A6. *Yes. There is a difficulty because the image window closes when you keep your finger held on the mouse. (Apparently you must click on it [and immediately release] to keep the window active but this is confusing.) An 8 year old could cope with the requirements and would appreciate the freedom to create their own images (Strugnell suggested a browse feature to import images). Strugnell was unclear that you needed to choose a photo for the person to be shown cooking.*

Strugnell preferred the boxed layout (second one) but thought the target age may prefer the first one with the TV screens because it was 'gimmicky'. The option to change size, colour and size of text in the boxes was good.

Q7. Sensory considerations have been addressed by allowing the user to set a background colour, set a readable text size and play audio tracks of instructions. Are these components appropriate for students with sensory issues?

A7. *Yes; the option to choose preferences would increase the appropriateness. The backgrounds are fine.*

- Q8. The literature shows that individuals with Asperger's Syndrome have weak short-term working memory. This has been addressed with a number of visual reminders that have been incorporated to reiterate the user's choices.

Please comment on whether you feel these visual clues would help to reduce the cognitive load for the Asperger's Syndrome individual?

- A8. *Not answered.*

- Q9. Navigational devices have been designed to allow a visual indication of where the user is within each stage and how far they have to go to complete the stage. In your opinion would these devices enhance the learning experience/ empower the user by showing the user a visual indication of expectations?

- A9. *Strugnell thought the second one was more likely to improve mouse control skills and cognitive development because the child has a higher level of input. She also felt that the audio, video element of the devices would make it seem more like a game and thus enhance the learning experience. However, she thought that 9–14 year olds might benefit more from the first prototype.*

Final comment

Having a choice of images makes the scenarios realistic and the video images bring the activity to life. Strugnell can see a breadth of applications for the resource.

Further suggestions?

No, it's perfectly suitable as a prototype.

APPENDIX J: Second interview transcription

Interviewer: Tracey Blair
Interviewee: Diane Strugnell
Date of Interview: 22 December 2006

Design layout

As an educator of the target audience Diane Strugnell was asked to comment on:

- Q1. The layout design for the final prototype incorporates elements from both the initial stage one prototypes. Do you think the new layout presents information in a way that will help the user to identify what is required of them at each step?
- A1. *I like the boxy format, I think this is useful as it puts clearly which instruction is what – this text box is around the instructions of what is happening, and this box is around who I'm going to choose.*
- Q2. Do you think the incorporation of more visual elements makes the programme more appealing to the target group?
- A2. *Yes. I am really impressed you have pulled the two together which makes it really good. I like the addition of a title in the movie sequence.*
- Q3. In your opinion would the changes to the visuals in the final prototype enhance the learning experience?
- A3. *Definitely – no question about that. The movie is appropriate to what is happening. There is enough time to absorb each movie, and they are interesting to watch. If you're sitting with someone there is enough time to talk about it. It would be good to have a pause button this could be used in a group situation as well and could be expanded with the visuals on screen and everyone adding to it.*

Navigation design

- Q4. Is the navigation of the prototype intuitive and easy to negotiate?
- A4. *Yes, I think so. The buttons are clear, and it is easy to see what to do.*
- Q5. The prototype uses literal and concrete terms to help reduce confusion for the user. In your opinion are these suitable for the target audience?

- A5i. *Yes I think there is nothing in terms of the language that made me think they needed to be changed. I wouldn't change the use of language. The instructions are suitable and not confusing.*
- A5ii. *The visual similarities within each section help let the user know where and what to do but the slight changes help by not making it too obvious – this makes you think about the questions I thought that was very appropriate.*

Q6. Do you think the prototype would benefit individuals on the Autistic spectrum?

A6. *Yes definitely.*

Q7. Why?

A7. *This could be used in many different ways – independently, one on one, with a tutor, or in a group, where you could talk about what happens at different homes and different people can put in different information. I like that you can print out results. Students can take it home and talk about it further with Mum and Dad. I also like that it can be adapted to different situations and could apply the concept to other situations as well. If I think about the children I deal with, they could definitely use it and I can see it being used in this format as an idea and concept. I really like it.*

Unanswered question from first interview

The literature shows that individuals with AS have weak short-term working memory; this has been addressed with a number of visual reminders that have been incorporated to reiterate the user's choices.

Q8. Please comment on whether you feel these visual clues would help to reduce the cognitive load for the AS individual?

A8. *I think it is appropriate for the target audience. AS is a spectrum and there is a huge variation.*

Additional question that arose

When Strugnell worked through the program she tended to rush a couple of times. This caused her to get to a place where she could not proceed and had to go back and read the instructions thoroughly.

- Q9. I noticed that as you were working through the program you happened to rush ahead. Do you think this is a fault of the program?
- A9. *No, this was the user. I had used the earlier prototype and I was predicting it to be the same. This is really the person not reading the instruction, not the program. Some students tend to rush things but like I did they would get stuck and have to go back. I think the mix you have here is at the right level for the target group. I think you have worked it well, I don't think you could truly foolproof it fully, and they maybe too confident or not paying attention – if that happens the program is not going to work for them.*

PROJECT TITLE: SUCCESSFUL SOCIAL SKILLS

CONSENT FORM

I have read the cover letter and have had the details of the study explained to me.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researcher on the understanding that my name will not be used without my permission. (*The information will be used for this research and publications arising from this project*).

I agree to the interviews being audio taped. I also understand I have the right to ask for the audiotape to be turned off at any time during the interview.

I agree to participate in this study under the conditions set out in the covering letter.

Signed: 

Name: Diane Strugnell

Date: 22-3-07

GLOSSARY

Autism: A type of pervasive developmental disorder characterised by:

- qualitative impairment in social interactions
- qualitative impairment in communication
- restricted, repetitive, and stereotyped patterns of behaviour, interests, and activities.

Autism Spectrum Disorder (ASD): Autism is often referred to as a "spectrum disorder", meaning that the symptoms and characteristics of autism can present themselves in a variety of combinations, ranging from extremely mild to quite severe.

Asperger's Syndrome/Asperger Syndrome (AS): A life-long neurological condition that causes problems in communication and social interaction and difficulty understanding the minds of others. The essential features according to the DSM IV Diagnostic Criteria for Asperger's Syndrome (Diagnostic and Statistical Manual of Mental Disorder, Fourth edition, American Psychological Association, Washington, D.C., 1994) are:

- severe and sustained impairment in social interaction
- the development of restricted repetitive patterns of behaviour, interests and activities
- the disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning
- there is no clinically significant impairment or general delay in language
- there is no clinically significant delay in cognitive development or in the development of age appropriate self-help skills or adaptive behaviours
- criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia.

Brain Hemispheres: The brain is divided into two hemispheres, the right and left, which typically complement each other in functioning but are suited for different types of processing. The left hemisphere processes spoken language, and visual or nonverbal information is processed by the right hemisphere. Direct damage to the right hemisphere through trauma, tumors and/or seizures can cause compromise in right hemisphere functioning.

Central coherence theory: The ability to put together different types of information to get a “big-picture” understanding of a situation. It requires the ability to see the relevance of different types of knowledge to a given problem.

Cognition: The term cognition is used to describe the process in the brain such as memory, attention, perception, action, problem solving and mental imagery that manipulates mental prototypes.

Cognitive ability: Skills associated with the mind including thought, perception, recognition, association, information processing, problem solving and memory.

Cold cognition: The brain conducts two types of cognitions: “cold cognition” and “hot cognition”. The cold cognition is conducted by the basic cognitive system and the executive cognitive system, eg factual information, problem solving, learning, decision-making. The hot cognition is conducted by the emotional system.

Constructivism: Constructivism was an art movement centred in Moscow in the 1920s, which emphasised the constructed character of the world. Subsequently, constructivism has come to indicate a very broad school of psychology, which asserts that meaning is “constructed” by the individual out of material provided by the external world, rather than “discovered”.

Folk physics: Naturally occurring and spontaneous understanding of the physical world. For Autistic individuals, there are reasons to suspect that not only is their folk physics intact, but that it may even be *superior*, relative to normally developing children. Typical examples include extreme fascinations with electricity pylons, burglar alarms, vacuum cleaners, washing machines, video players, trains, planes, computers and clocks.

Folk psychology: Naturally occurring and spontaneous understanding of how people work. Contemporary discussion of folk psychology in philosophy and cognitive science has focused largely on the portion of folk psychology that guides the prediction and explanation of actions. A large measure of the interest in this portion of folk psychology derives from the central role it plays in our everyday lives. Folk psychological prediction and explanation abound in our lives. We engage in it for mundane chores, like trying to figure out what the baby wants or what your peers believe about your work. A deficit in folk psychology is thought

to underlie the difficulties some children have in social and communicative development (Baron-Cohen, 1988), and the development of imagination (Baron-Cohen, 1987).

High Functioning Autism: High Functioning Autism is defined by children who are Autistic by definition yet are able to communicate. Their IQ ratings are near normal, normal, or even high, this is in opposition to other Autistic children who present a low IQ rating.

Hotspots: The area over an interactive button or element on a computer screen where the user can press to activate an action.

Irlen Syndrome: The experience of visual discomfort caused by a strong visual contrast, such as black text on white paper. It can make the text blur or appear unstable. This can make reading for any length of time difficult because it prevents comfortable scanning. Coloured lenses and overlays can be used to reduce the contrast, and coloured or off-white paper can also help.

See scotopic sensitivity.

Letter spacing: The amount of spacing between letters. For ease of reading text on the screen should be more widely spaced than in print.

Line spacing: The amount of space between lines of text. By default computer programmes create line spacing at 120 percent. While this produces good results for printed text it is not sufficient for the presentation of text on screen. The spacing between lines should be larger on screen than on paper.

Metacognition: Thinking about how you think; higher order thinking which involves active control over the cognitive processes engaged in learning.

Mind blindness: A term coined by Simon Baron-Cohen, to express the difficulty those with AS have in understanding that other people have thoughts, feelings and wishes of their own. (See Theory of the Mind.)

Neuropsychology: Relating to the functioning and structure of the brain and nervous system. It is a branch of psychology that attempts to test different specific components of cognition by examining cognitive elements such as memory, visuo-perceptual function and reaction time. The neuropsychologist is

interested in determining the site and mechanism of damage to specific functions.

Non-verbal communication: Information expressed by an individual in a form other than words. It may include gesture, body language, facial expression and eye contact.

Performance IQ: Intelligence tests can be used to determine the strength of an individual's performance or visual reasoning. This is achieved by having the individual perform a variety of activities involving spatial reasoning, pattern recognition and other types of activities that do not involve language.

Pervasive Developmental Disorders (PDD): Characterised by severe and pervasive impairment in several areas of development: reciprocal social interaction skills, communication skills, or the presence of stereotyped behaviour, interests and activities. The qualitative impairments that define these conditions are distinctively deviant relative to the individual's developmental level or mental age. These disorders include Autistic Disorder, Rett Syndrome, Childhood Disintegrative Disorder, Asperger's Syndrome, and Pervasive Developmental Disorder Not Otherwise Specified (PDD NOS).

Rote learning: Learning in a mechanical fashion through repetition (eg memorization, practice drills). Related terms: surface level processing, non-reflective learning.

Scotopic sensitivity: A problem with decoding visual information, especially high -contrast imagery such as text. It is not a problem with the eye itself; rather it is a deficiency in the brain's ability to compensate when viewing moving objects. An expression coined by Helen Irlen. Also known as Irlen Syndrome.

Social Stories: A technique developed by Carol Gray, used to help individuals with deficits in social cognition gain the ability to think in ways necessary for appropriate social interactions (eg assuming the perspective of another person). Social stories help individuals "read" and understand social situations. These (often individualized) stories seek to answer who, what, when, where and why in social situations.

Strategy instruction: A method of teaching students how to learn by teaching

them:

- the tools and techniques that efficient learners use to understand and learn new material or skills
- to integrate this new information with what is already known in a way that makes sense
- to recall the information or skill later, even in a different situation or place.

Theory of Mind: The ability to conceptualise and appreciate the thoughts, wishes and feelings of another person. The lack of a Theory of Mind is considered to be a core difficulty in those with AS.

Verbal IQ: Intelligence tests often report two kinds of scores, a verbal score and a non-verbal (or performance) score. The verbal IQ score is produced from a variety of verbal tasks involving such things as general work knowledge, vocabulary knowledge, and comprehension of written material. Tests may include such things as: Vocabulary (your ability to define words) or abstract verbal reasoning (your ability to solve problems you hear using logic and common sense).

Visuo-spatial: Pertaining to the ability to understand visual representations and their spatial relationships.

Weak central coherence: Lacking the ability to piece different types of information to get a “big-picture” understanding of a situation. See central coherence theory.

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