Pediatric Dentists’ Behaviour Management
of Children with
Autism Spectrum Disorders

by

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Abstract

This study assessed which behaviour management techniques, BMTs, pediatric dentists are using, and find effective in treating patients with Autism Spectrum Disorders, ASD and identified influences which contributed to their use. Surveys were mailed and emailed to 1669 members of the American Academy of Pediatric Dentistry. Seven hundred eighty-nine (48.2%) completed surveys were returned. Nearly 60% of respondents treated children with ASD weekly or more frequently. Of the 23 listed BMTs, General Anaesthesia, Tell-Show-Do, Distraction, and Non-verbal Communication, were considered effective. Seventy percent of respondents were primarily users of classical BMTs. Pharmacological and classical techniques, are used frequently, but may not be effective. Time and costs limit the use of modern techniques. Cost efficiency and long-term patient management were the most influential factors in selecting a BMT; patient co-operation was the least influential. Pediatric dentists recognized a need for further education related to behaviour management of children with ASD.
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Introduction

Behaviour management techniques (BMTs) that facilitate the delivery of treatment in a safe, efficient and compassionate manner are an integral component in the practice of pediatric dentistry. Dental visits are a major source of anxiety and a significant stressor for many people. In those children with Autism Spectrum Disorders (ASD) this anxiety is exacerbated and is due, in part, to the inherent communicative dysfunction associated with the disorder (Klein and Nowak, 1999). Previous studies have pointed out the difficulties that can be encountered when attempting to treat children with ASD (Lindemann and Lowe, 1985), while others have focussed on predictors of their behaviour in the dental setting (Marshall et al., 2007). Research has also investigated parental attitudes towards the behaviour management of, and the access to dental care for, children with ASD (Marshall et al., 2008). Other investigators have described the oral condition of this patient population (Kopycka-Kedziewski and Auinger, 2008), or specific techniques that can be used to teach them oral hygiene procedures (Morisaki et al. 2008; Pilebro and Backman, 2005). However, to date there are no published studies that detail the various BMTs being used by pediatric dentists when providing care to this population. Nor is there any research which seeks to correlate pediatric dentists’ choice of BMTs to their specific demographic data and workplace environment. This study was designed to address both of these gaps in the pediatric dental literature.
History

Autism was first described as a distinct entity by Dr. Leo Kanner in 1943 (Kanner, 1943), but the term “autism” was used earlier by Swiss psychiatrist Eugen Bleuler to describe a withdrawal into fantasy or schizophrenia (Bleuler, 1913). Stemming from the Greek word for self ‘autos’, Autism was described by Kanner as a tetrad of social deficits including isolated play, unusual language traits, ritualized behaviours, and resistance to change observed in 11 patients that Kanner first treated in 1938 (Kanner, 1943). To differentiate it from schizophrenia, Kanner discerned that schizophrenic patients withdrew from a stressful world, while those with autism were withdrawn from the outset (Zager, 1999). Around the same time period, Hans Asperger described his now eponymous syndrome (Asperger, 1943), but his publication was not translated and disseminated in the English literature until the early 1990s. Bruno Bettelheim, postulated that autism was caused by an emotional detachment of the parents, specifically the mother, from the child (Bettelheim, 1967).

Diagnosis

Currently, autism is described as part of a spectrum of mental disorders collectively known as Autism Spectrum Disorders (APA, 2000). Also included within this spectrum are Asperger’s Disorder, Pervasive Developmental Disorder – Not Otherwise Specified, (PDD-NOS), Childhood Disintegrative Disorder and Rett’s Syndrome. A diagnosis of ‘autistic disorder’, or ‘classical autism’ or simply ‘autism’, is based on the child meeting a minimum of six individual criteria from three categories of social impairments; (1) qualitative impairment in social interaction, (2) qualitative
impairments in communication, and (3) restricted repetitive and stereotyped patterns of behaviour, interests, and activities. By the definition of ASD, the child must be of an age where his or her social skills would be expected to be developed enough that such impairments can be noted; typically this is around pre-school age of 3 or 4 years old. However, Ozonoff et al. (2010) argued that other social markers such as shared smiles and direct vocalizations can be used to discern children as young as 12 months of age, that are at risk for developing ASD. Gilberg (2000) reported that in some children, early signs of ASD can be noted at birth. For example, most children who are distressed and crying are comforted when held and cuddled. However, some children who eventually develop ASD display definite signs of agitation and distress when held. In some instances, these babies need to be fed while lying on their own, with the bottle held to their lips. Other early features which may be observed include limited reactions to sounds as if deaf, lack of smile or response to others, never needing or wanting to be attended to, suckling difficulties, holding their head at stiff or awkward positions, and a lack of initiative to explore their environment (Coleman, 1989). Le Couter et al. (1989) noted that unusual motor behaviours involving the hands and fingers, or whole body movements such as flapping, spinning, running or repetitive hopping are commonly displayed by individuals with ASD.

Many behavioural researchers studying ASD have noted that a hallmark of the disorder is the varied sensory experience of the world and an inability to distinguish between background and foreground stimuli (Bogdashina, 2003). The normally developed mind might tune out extraneous information that the autistic mind cannot, leading to increased sensory input that comes at the expense of the ability to receive all
the relevant information about foreground material. This helps explain why children with ASD are notoriously resistant to change. A child with ASD may not be able to overlook and accept changes in his or her expected environment; rather the child may become particularly defensive and obsessive about the variation (Bogdashina, 2003).

Bogdashina (2003) stated that the varied sensory experience of the child with ASD can be understood as either a hyper- or hypo- sensory experience relative to the unaffected population. Some researchers have proposed that people with ASD can hear beyond the normal range of the human ear making them sensitive to loud or high pitched sounds (Khalfa, et al., 2001; Lepisto et al., 2006; Moller et al., 2005; Tharpe et al., 2006). Similarly, a room lit by fluorescent lighting, flickering at 60 Hz is imperceptible to the general population; in comparison, a child with ASD may be irritated by this frequency of light. The feel of fabric on the skin may be so intense so that it may take days before a child with ASD is comfortable wearing a new article of clothing (Bogdashina, 2003). Conversely, examples of hypo-sensitivities are also common in the autism literature; a need to touch things because their vision limits them to outlines only; ignoring otherwise painful stimuli; clicking, humming, and rocking to try to fill auditory and kinaesthetic voids (Bogdashina, 2003). Understanding the world of a child with ASD this way helps explain the use of the terms sensory seeking and sensory avoiding patients. Liss et al. (2006) hypothesized that sensory over reactivity may be explained as a possible response to over arousal. This is supported by the finding that 43% of the subjects in their study displayed an over focused pattern of sensation and attention, comprising over reactivity, preservative behaviour and interests, over focused attention and exceptional memory.
Those with Asperger’s disorder have, by definition, average or above average cognitive abilities and acquire language by the preschool years; they may have advanced language and an unusually deep focus on any given task or preoccupation with an activity (Moldin and Rubenstein, 2006). The diagnosis of Asperger’s disorder is based on the presence of at least two of the following characteristics: impairment in use of nonverbal behaviours, failure to develop appropriate peer relationships, lack of seeking to share enjoyment or interests with other people and lack of social or emotional reciprocity; as well as one of: preoccupation with one activity or interest that is abnormal either in intensity or focus, inflexible adherence to specific, non-functional routines or rituals, repetitive and stereotyped motor mannerisms or persistent preoccupation with parts of objects (APA, 2000). PDD-NOS is a diagnosis of exclusion, referring to a significant level of impairment on functioning with sub-threshold symptomology or atypical presentation (Caronna et al., 2008).

Demographics

Data from as early as 1966 reported the prevalence of autism at 4.4 in 10 000 births (Lotter, 1966). Numerous other papers through the 1980’s (Bryson et al., 1988; Burd et al., 1987; Ritvo et al., 1989) reported figures of under 5 in 10 000, while a UK study by Wing and Gould in 1979, cited a figure of 20 in 10 000 live births. The prevalence of ASD increased 556% from 1991 to 1997. In addition, ASD is found globally and the worldwide incidence is increasing by 3.8% per year (Wing and Potter, 2002). Recent surveys (Bertrand et al., 2001; Chakrabarti and Fombonne, 2001) have indicated that the prevalence has increased dramatically to 60 per 10 000 children,
translating to roughly 425,000 children younger than age 18 years with ASD in the US. Fombonne (2003(a)) concluded that “recent rates for ASD are 3 to 4 times higher than 30 years ago”. Controversy exists over this increase in prevalence. Researchers have suggested that this observed increase reflects a broadening of the definition of ASD with more inclusive diagnostic criteria and improved methods of diagnosis in population surveys. Fombonne (2003(a)) recognized this to be the case, especially at the less severe end of the spectrum, given the changes in the defining criteria of ASD between DSM III and IV, and further stated that “unless comparisons also rigorously controlled for changing case definitions, interpretation of differences in prevalence rates over time and across surveys will be virtually impossible”. Another factor that may explain this reported increase relates to the funding available in a given region for patients who are diagnosed with ASD. Where there is significant funding for children with ASD the rate of diagnosis tends to increase whether by changes in diagnostic practices, improved identification or availability of ancillary services (Fombonne, 2003(a)).

ASD is a male dominated condition, with an overall predilection of 4:1 over females. However in the more severe forms of ASD, as measured by IQ score, males outnumber females by only 2:1, with the ratios approaching equality in the most severely affected individuals (Fombonne, 2003 (b)). It has been postulated that this variability can be explained by a feminine protective effect, whereby a female requires a greater autistic “genetic load” to actually be affected by the disorder than a male (Banach et al., 2009). Therefore at lesser genetic loads only boys are phenotypically affected by ASD, but at higher loads, and consequentially more severe symptomology, girls and boys are more equally affected.
**Etiology**

Given the wide heterogeneity associated with the condition it is unlikely that any one environmental or genetic factor will be identified as the cause for ASD. Rather its etiology will continue to be labelled as multi-factorial, with new co-factors continually being cited (Bonera *et al.*, 2006). Genetic studies of ASD populations have found certain genetic abnormalities such as deletions, translocations and inversions that have some degree of linkage to ASD. Sibling and monozygotic twin studies have suggested that the sibling recurrence risk - the probability that the younger sibling of a child with ASD will also have ASD - is 15% (Sutcliffe, 2008). In addition, ASD has been genetically linked to other genetic conditions, such as Angelman syndrome, Neurofibromatosis Type 1 and Tuberous Sclerosis (Caronna *et al.*, 2008).

The reported association rates of ASD with Fragile X syndrome are as high as 3%, and give ample reason to screen children with ASD for this chromosomal anomaly (Caronna *et al.*, 2008). Lowenthal *et al.* (2007) found the incidence of ASD amongst a sample of patients with Downs Syndrome to be 15.6%, which is far greater than the incidence for the general population. Furthermore, the commonly cited male predominance did not exist in this population, possibly suggestive of a male protective effect of Down’s Syndrome.

Multiple theories have been postulated regarding a neurological basis for the development of ASD. These have included: endogenous serotonin overload, peri-natal fetal and maternal infections, inborn errors of metabolism, and lead or mercury poisoning from environmental and medical sources (Anderson, 2002; Ciaranello and Ciaranello, 1995; Coleman and Blass, 1985; Wakefeild *et al.* 1998).
The two theories that have received the most attention from both the media and medical communities relate to the Measles-Mumps-Rubella, MMR, vaccine administered to most children in the developed world between 12 and 15 months of age; and to the total cumulative dose of the mercury-based, vaccine preservative, Thimerisol, received by children up to 24 months of age (Parker et al., 2004).

Wakefeild et al. (1998) presented 12 case reports of children in the UK who experienced a significant change in bowel function and behaviour shortly after exposure to the MMR vaccine. The authors hypothesized that a new disorder, later termed ‘autistic enterocolitis’, was linked to the MMR vaccine. The authors concluded that there was a clinically significant association between ASD and the gastrointestinal pathologies, but did not go so far as to implicate the MMR vaccine in development of ASD. The public’s concern surrounding this possible link between the triple vaccine and the development of ASD, led to a huge increase in the number of parents choosing not to have their children vaccinated. This resulted in a significant rise in the number of confirmed cases of measles in the UK, from 56 to 971 in 2007, including one death (Honey, 2008). Dozens of publications, but most notably a recent Cochrane Database review, concluded that there was no evidence to support the existence of a link between MMR vaccination and the development of ASD. (Demicheli et al., 2005). Most recently, the editor of The Lancet, the journal that published the Wakefield et al. article that began the controversy, published a complete retraction of the paper (Horton, 2010). The journal attempted to silence the issue when it stated that several elements of the research were “incorrect” and lacking in ethics approval. However, public scepticism about the safety of the vaccine persists (Balch, 2003; Blaylock, 2006; Edelson and Mitchell, 2003). In January 2011, an
investigative article was published in the British Medical Journal that brought to light evidence that Wakefield’s study was not only lacking in ethics approval but based on falsified medical records of the subjects (Deer, 2011). The 12 subjects in the study were specifically recruited for inclusion as their development would substantiate the hypothesis of a link between the MMR vaccine and ASD. Even then, some of the symptoms and behavioural histories were purposefully misidentified and timelines altered to fit the hypothesis. Deer also showed that Wakefield was paid over £400,000 for his work on a lawsuit against the manufacturer of the MMR vaccine in the two year period preceding the publication of the study (Deer, 2011).

The “thimerisol theory” postulated that there is a link between the development of ASD and exposure to ethylmercury which is used in the vaccine preservative thimerisol. This theory is distinct from the MMR vaccine theory because the MMR vaccine never contained thimerisol as it would inactivate the live MMR vaccine (Fombonne et al., 2006). These concerns surrounding thimerisol led to a review of the US immunization schedule (Stratton et al., 2001). The review concluded that based on the current vaccination schedule in the US and the content of the vaccines, children at two years of age exceeded the US Food and Drug Administration and Environmental Protection Agency recommended safety limits for mercury exposure. However, Fombonne et al. (2006) found that in several birth cohorts in Montreal, whose exposure to thimerisol varied including no exposure, the prevalence of PDD in thimerosal-free birth cohorts was significantly higher than that in thimerosal-exposed cohorts. A statistically significant chronological increase in PDD prevalence was noted during the study period. The authors attributed this finding to a broadening of diagnostic concepts and criteria, improved
access to services, and increased awareness and better identification of children with
PDD. In fact, additional cohort, epidemiological, ecological and biological investigations
have also failed to demonstrate any such correlation between the development of ASD
and exposure to ethylmercury (Andrews et al., 2004; Heron and Golding; 2004; Madsen
et al., 2003).

Schultz et al. (2008) studied the possibility that concurrent use of Acetaminophen
to deal with the common side effects of pain and fever associated with the administration
of the MMR vaccine may be a contributing factor. Parents of 83 children with ASD and
80 healthy children participated in an internet based survey where it was found that 75%
of the children with ASD received acetaminophen after the vaccination compared to only
55% of the control children, a statistically significant difference. Acetaminophen use
after MMR vaccination was associated with a six-fold increase in the likelihood of
developing ASD when considering children 1 to 5 years of age, and marginally
significant (p = 0.059) when considering children from 1- 18 years of age (Schultz et al.,
2008). They also postulated that since children with ASD have previously been shown to
be relatively deficient in plasma sulphate, an enzyme which drives the metabolism of
Acetaminophen in children below the ages of 10 – 12 years, the incomplete detoxification
of the drug combined with the MMR vaccine may act as a triggering event in children
that are genetically susceptible to developing ASD (Schultz et al., 2008).

Treatment and Therapies

Given the vast range of expressions of ASD throughout the spectrum and the lack
of a definitive etiology, it is not surprising to note that no consistent “gold standard”
treatment for ASD exists. Therapy will vary depending on the treating professional’s education and perspective. These can be behavioural, pharmacological, nutritional, or psychological; and may or may not be scientifically evidence-based. It is widely accepted that there are no definitive cures for ASD (Broadstock et al., 2007), despite the claims of some online and print media sources (Alarcon, 2010; Notaro, 2008; Seroussi, 2000). Therefore, treatments and goals are wide ranging, focussing on many aspects of development from language to socialization and behavioural skills. Developing treatment models to address these variable goals is a difficult task, and distinctly different from therapies for almost any other condition (Rogers and Ozonoff, 2006).

Dietary

Among the non pharmacological approaches to ASD treatment is dietary modification. One such approach involves limiting, or even eliminating, the child’s intake of casein and gluten, dairy and grain proteins respectively, found ubiquitously in the Western diet. It has been proposed that these proteins have an opioid-like effect on those sensitive to them, specifically, children with ASD, producing the associated behavioural, emotional and perceptive changes commonly observed in ASD (Reichelt et al., 1991). This theory is supported by the observation of “withdrawn-like” symptoms when the children initially start the diet, before making subsequent improvements. Whiteley et al. (2000) suggested that the penchant displayed by many people with ASD for these foods might be suggestive of an addiction. However, a Cochrane review could only find one trial with a small sample that demonstrated the efficacy of this diet. The authors concluded that there is insufficient scientific evidence to advocate the casein and gluten free diet as a means for treating autism spectrum disorders (Millward et al., 2008).
Several other explanations have been proposed to explain the food faddism observed in some children with ASD. The most plausible of these theories centres on the child’s need for routine and sameness in their life, so they cannot tolerate the introduction of new foods. Smell, taste and texture aversions, or gastro-intestinal and digestive difficulties that manifest as stomach aches may also explain reported food faddism so severe that one child only ate french fries and water for several years on end, before being admitted to hospital for malnourishment (Gillberg, 2000).

Pharmacological

The pharmacological treatment of ASD can be discussed in terms of the specific behavioural symptom being targeted. Some of the behaviours that these medications seek to manage include: aggression, agitation, hyperactivity, inattention, irritability, repetitive behaviours and self-injury (Broadstock et al., 2007). To this end, a wide range of medications such as typical, or first generation, anti-psychotics (eg. haloperidol), atypical, or second generation, anti-psychotics (eg. risperidone), tricyclic antidepressants (eg. clomipramine), selective serotonin reuptake inhibitors (eg. fluvoxamine), monoamine-oxidase inhibitors (eg. bupropion), and lithium have been employed (Broadstock et al., 2007). Valproic acid (Depakene/Valproate), carbamazapine (Tegretol), and lamotrigine (Lamictal) are the most common anticonvulsant agents used for patients with concurrent seizure disorders and also have mood-stabilizing properties which are helpful in ASD (Loo et al., 2008). There is no gold standard for the pharmacological treatment of ASD; however risperidone (Risperdal), methylphenidate (Concerta), and fluoxetine (Prozac) are some of the medications most commonly prescribed for patients with ASD. Risperidone, is the only FDA approved drug to treat
ASD, and is most effective at reducing irritability and hyperactivity (McDougle et al., 2008). It is the most commonly prescribed antipsychotic medication, despite the side effects of weight gain and drooling. (Loo et al., 2008). Many of these medications have adverse orofacial side effects due to their anticholinergic properties, including xerostomia, sialorrhea, dysphagia, sialadenitis, dysgeusia, stomatitis, gingivitis, gingival enlargement, glossitis, bruxism, edema and discoloration of the tongue (Loo et al., 2008).

Melatonin, an endogenous hormone produced by the pineal gland, is instrumental in controlling human circadian rhythms (Tordjman et al., 2005). Decreased levels of melatonin have been demonstrated in the ASD population with associated insomnia and irregular sleep wake cycles (Tordjman et al., 2005). As such, exogenous melatonin has been studied as an aid for these patients. Anderson et al. (2008) found in their sample of 107 subjects that 85% experienced improvement in their circadian rhythms when melatonin was administered in doses as low as 3mg/day. Rossignol and Rossignol (2006) reviewed the use of hyperbaric oxygen chamber therapy on children with ASD based on the belief that ASD is a “neurodegenerative disease characterized by cerebral hypoperfusion [and] neuroinflammation”. Hyperbaric oxygen therapy can increase cerebral oxygen perfusion, has potent anti-inflammatory effects and can mobilize stem cells, thus negating the effects of ASD and improving symptomology. Despite a very small sample size of six patients, improvements in behaviour and socialization scores were noted especially in patients below the age of five years. The authors could not directly associate the hyperbaric oxygen therapy to the observed behavioural improvements due to flaws in the study design (Rossignol and Rossignol, 2006).

Secretin, an endogenous neuropeptide which is secreted by the upper intestinal tract in
response to food entering the stomach, has previously been linked to positive behavioural changes in children with ASD (Horvath et al., 1998). Ratcliffe–Schaub et al. (2005) reported using secretin via a transdermal patch to address some of the behavioural issues seen in people with ASD but found no significant differences in the symptoms between the control and treatment groups (Ratcliffe–Schaub et al., 2005).

**Behavioural**

A multitude of behavioural therapies have been developed for the treatment of ASD (Rogers and Ozonoff, 2006). Intensive Behavioural Intervention, IBI, therapy, involves one-on-one sessions using highly structured teaching techniques and operant conditioning for 25 to 40 hours per week for 2 to 3 years by specially trained therapists (Hayes, 2008). The goals of treatment include reducing self-stimulatory and aggressive behaviours, teaching expressive and abstract language, appropriate social interactions with peers, and the development of appropriate emotional expression. Successful completion of a task in the therapy setting is rewarded with a positive reinforcer, while non-compliance or no response receives a neutral reaction from the therapist. Initially, food rewards are used, but they are gradually replaced with social rewards, such as praise, hugs, or smiles. Parental involvement is integral to the success of the therapy and they are often taught to continue the training at home where they act as the primary therapist (Hayes, 2008). Lovass, who first developed and reported on this therapy, specified its use for “children less than 40 months if mute and less than 46 months if echolalic,” (Lovass, 1987). Though the treatment group for this original work was only 19 children, Lovass reported that subjects had an average gain of 30 IQ points while the IQ levels of the 40 control group subjects were unchanged. Contemporary educational
and behavioural models such as Early Start Denver Model begin therapy as early as 18–30 months of age, and have reported increased improved IQ scores of 17 points, notable improvements in adaptive behaviours and changes in diagnosis from autism to PDD-NOS. (Dawson et al., 2010).

A slightly modified version of IBI was developed at the University of North Carolina at Chapel Hill in the 1970’s known as TEACCH, Treatment and Education of Autistic and related Communication – handicapped CHildren (Mesibov et al., 2005). The program focuses on individualizing the treatment for each child and setting out a structured physical environment where visual supports are matched to individual tasks and activities of daily living, which are both predictable and understandable to the child. Based on the view that children with ASD have limited verbal skills, but can still be taught to express themselves using other forms of communication, Buffington et al. (1998) devised a therapeutic program that teaches appropriate gestural communication skills. The subject children were trained in three specific gestural categories that would be appropriate for requesting or describing items, and directing the behaviour of others. They were scored by outside observers, watching their interaction with the therapist. Full marks were given for each interaction episode only if the sought after response was given within 5 seconds of the therapist presenting the stimulus such as “Do you want a pencil?” and the child would shake his or her head and respond “No Way”. After approximately 20 sessions all four of the subjects had acquired a significant ability to express themselves with age appropriate gestures. These skills were subsequently shown to be generalizable to other stimuli, such as prompting “Check out this little helicopter,” to
which the child would have to respond in a socially appropriate manner. (Buffington et al., 1998).

Vorgarft (2007) reported on the treatment of 23 children with PDD-NOS provided by a therapeutic program known as Mifne treatment. In this therapy the child spends many hours in a structured environment with both the therapist and family progressing through Reciprocal Play Therapy, consisting of three “play stages” from tempted to sensory to cognitive play. Within this setting the therapist begins by merely responding to the child’s displayed preferences for play toys and seeks to establish eye contact. Once this interaction is achieved, the therapist will place some of the desired toys just outside the child’s reach encouraging verbal requests for the item rather than pointing, grabbing or other physical gestures. Sensory play can then begin where tactile sensations such as finger painting or physical contact such as hugging, is introduced by the therapist who has now established a solid relationship with the child. The final stage of cognitive play involves memory games and building blocks, to introduce concepts such as the social rules of turn taking. Scores on two different valid social scales improved significantly, often more than one standard deviation, after 3 weeks and 6 months, although the magnitude of the changes was modest (Vorgraf, 2007). All programs require the families to play a significant interactive role within the life of the child with ASD, and insist on positive reinforcers rather than negative or punitive punishment, and generally require 10 – 40 hours per week of therapy (Seigel, 1996). Other variants of play therapy which have been described, but are yet to be subjected to rigorous scientific investigation include, dance, art, dolphin, pony riding therapies, as well as auditory integration, and facilitated communication (Gilberg, 2000). Moreover, certain specific toys such as
LEGO™ building blocks have also been shown to be especially effective at increasing the socialization skills of children with ASD (LeGoff, 2004). The author reported on the use of LEGO™ Therapy for 47 children with ASD divided into 7 groups. Using strategies and social structures including, “group building”, “engineer and builder” “LEGO™ points”, and “role based fantasy play” that were continually adapted and modified over the course of the therapy, LeGoff found improvements in social competence in terms of (1) initiation of social contact with peers; (2) duration of social interaction; and (3) decreases in autistic aloofness and rigidity. The improvements were measured by direct observation of the subjects in an unstructured environment and the Social Interaction subscale of the Gilliam Autism Rating Scale.

Environmental

Much has been made about the environment in which this intensive learning therapy takes place. One suggested environment is based on the Dutch concept of “Snoezelen” that uses a mostly white room, filled with light and sound elements, scents and music designed to calm, comfort and deliver a multi-sensory experience to the subjects (Flaghouse, 2010). Shapiro et al. (2009) looked at the ability of both normal children and children with ASD to undergo dental treatment in just such an environment. The adapted environment included substituting floor based lighting for overhead fluorescent lights, a head-mounted LED light for the clinician, a “solar projector” displaying slow moving repetitive visual colour effects, and calming nature based music played through bass speakers within the dental chair to produce further soma-sensory tactile sensations. Both the control group of typical children (n = 19) and the affected group of children with ASD (n = 16) were scored on (1) the basis of their movements and
duration of their disruptive behaviours during treatment and (2) their autonomic sympathetic activity as measured by palmar electrodermal conductivity. All children demonstrated improved tolerance to dental treatment in the Snoezelen environment, but the children with ASD derived statistically greater benefit, where disruptive behaviour scores were reduced from 13.56 minutes to 5.26 minutes, and electrodermal activity scores increased (meaning less sympathetic arousal) 64% in the adapted environment during treatment. The authors concluded that this environment allowed for better patient co-operation in the dental setting and could be used in certain instances in place of pharmacological agents (Shapiro et al., 2009).

**Oral Health**

Several studies have looked specifically at the dental needs of the ASD population. Shapira et al. (1989) found that the caries rates amongst non-institutionalized children with ASD in Israel were similar to the Israeli national average, but significant periodontal issues were noted, especially within the group of institutionalized patients with ASD. Moreover, the institutionalized group had oral health scores below the national average. However, it could be argued that these findings are merely reflective of the structured living environment provided by an institutional setting, rather than a true representation of the independent oral health of the children with ASD. Lindemann and Lowe (1985) similarly found that children with ASD have a lower oral hygiene level than healthy peers, yet comparable caries rates. The 2003 National Survey of Children’s Health in the UK queried parents of children with ASD about their sense of their child’s oral health (Kopycka-Kedzierawski and Auinger, 2008). The authors reported that
overall, parents of children with ASD were more likely to rate their child’s oral health as “fair” or “poor” than parents of healthy children. This finding held true even after adjusting for socio-economic factors that are known to impact oral health status.

Likewise, the parents that rated their children’s teeth as “good” or “excellent” were more likely to be parents of healthy children (Kopycka-Kedzierawski and Auinger, 2008).

Marshall et al. (2010) reported on the validity of using a diagnosis of ASD as an indicator of high risk status on the American Academy of Pediatric Dentistry’s (AAPD) Caries Assessment Tool. It was found that a diagnosis of ASD should be viewed as an indicator of high caries risk, in light of the fact that children with ASD, especially those under 7 years old, had similar or higher rates of new caries than the general pediatric population.

DeMattei et al. (2007) examined 55 children from ASD specific programs and schools and found that 85% of children with ASD had visible plaque, 62% had gingivitis, and 21% had clinically evident carious lesions. Previous restorations were found in 15% of the subjects, and 44% had clinical evidence of bruxism, while 26% had suffered a dental trauma. Furthermore, Lindemann and Lowe (1985) reported that, based on an initial oral examination, children with ASD had a higher caries index in the primary dentition than did normally developed patients; but at recall examination the rates were similar. The caries indices in the permanent dentition were similar in the two groups at both initial and recall examinations.

In contrast, Loo et al. (2008) studied the charts of 395 children with ASD at a Boston area children’s hospital and reported that caries prevalence and severity were significantly lower in the ASD group than in a matched control group of 386 unaffected children. Through logistic regression analysis it was determined that patients with ASD
were 70.5% less likely to have a positive caries history the control group of peers. The results were even more significant when only considering children in the primary dentition; patients with ASD were 83.4% less likely to have a positive caries history. Although, the children in the ASD group that displayed “negative” and “definitely negative” behaviours were more likely to require general anaesthesia, GA, to complete their dental care, than those in the unaffected group (Loo et al., 2008). This study was particularly robust because of the large number of subjects who were all patients of the hospital dental clinic, and because many extraneous variables such as primary diagnosis, age, sex, residence (home versus institution or group home), other diagnoses, medications, caries severity and behaviour were all collected and entered into the regression analysis. The contrasting literature on the subject of the oral health of patients with ASD serves to highlight that ASD is a spectrum of disorders, rather than a single condition with clearly defined clinical findings.

**Behaviour in the Dental Operatory**

Klein and Nowak (1999) stated that the difficulty in treating children with ASD is an “impairment in communication and …difficulty to relate to others”. Marshall et al. (2007) expanded on this concept proposing six characteristics of ASD that may impact a child’s ability to cope with dental treatment: (1) language and social limitations; (2) concurrent diagnoses; (3) medications used to treat behavioural symptoms; (4) learning disabilities/ mental retardation; (5) heightened sensory perceptions; and (6) an inability to generalize previously learned behaviours. Marshall et al. (2007) examined 26 possible predictors of behaviour of children with ASD in the dental setting under the following
five categories: (1) demographic characteristics; (2) appointment description; (3) life skills; (4) personal hygiene skills; and (5) medical history. The behaviour was evaluated based on the Frankel scale, in which a patient’s behaviour is described on a four point scale ranging from (- -) definitely negative, to (+++) definitely positive. Over one third of the children in the study were found to be well behaved based on the score noted in the treatment records. No demographic traits were found to be correlated to behaviour, nor was the practice type a factor, as behaviour was reported to be similar in hospital, dental school and private practice settings. However, the type of appointment was determined to be a significant factor in predicting behaviour. All emergency visits, 68% of initial examinations, 62% of recall examinations, and 33% of restorative appointments, resulted in negative scores. Life skills were found to have a significant impact on behaviour; specifically (1) nonverbal or minimal use of language; (2) echolalic language; (3) inability to understand language at an age-appropriate level; (4) inability to follow multistep instructions; (5) inability to read at 6 years old; (6) attending special education; and (7) attending a specialized classroom, each resulted in lower behaviour scores. Being toilet trained and being able to brush their own teeth were also predictive of the child’s positive chair side co-operation. Patients with concurrent diagnoses such as mental retardation, developmental delay, epilepsy, obsessive compulsive disorder or Fragile X Syndrome, exhibited significantly poorer behaviours at the dental visits, than those with ASD alone. Overall, five risk factors for poor behaviour amongst children with ASD were discovered: 1) age less than 7 years old; (2) lack of literacy skills; (3) not being toilet trained; (4) concurrent diagnoses and (5) lack of expressive language. Notably absent from this list is previous visits to the dental office. In fact, it is stated that “even
with repeated dental visits, returning patients were not significantly more cooperative than new patients… repeated familiarity (generally 2x/year) with the office and staff may not provide increased cooperation for autistic children” (Marshall et al., 2007).

Conversely, Luscre and Center (1996) relied on familiarity in attempting to teach appropriate dental office behaviour using a mock operatory and successive approximation. On average, 20 visits to the mock dental office were required to allow patients with ASD to progress from entering the office to opening their mouth for an examination to allowing simple oral hygiene procedures.

**Predicting Behaviour in the Dental Operatory**

Marshall et al. (2008) looked at both the attitudes of parents of children with ASD towards behaviour management techniques, (BMTs), and their ability to predict the child’s behaviour in the dental office. It was found that in 88% of cases parents were able to correctly predict if their child would allow an exam in the dental chair, and were able to correctly predict if intra-oral radiographs could be taken in 84% of cases. However, in general the parents overestimated the willingness of their child to co-operate, and could only correctly predict their child’s behaviour for a prophylaxis and fluoride application, via a unspecified technique, in 54% of cases. The best behaviours were observed in patients who were treated regularly by the same dental staff, with the parents present in the operatory. The parents in this study were accepting of all the BMTs used but were least in favour of restraint and protective stabilization by dental staff. General anaesthesia was preferred to all techniques that involved physical contact with the child including any restraint, mouth props, or parents holding the child’s hand (Marshall et al., 2008).
Conversely, Brandes et al. (1995), reported that parents of children with disabilities are more accepting of protective stabilization than other parents, but had similar attitudes with regards to most other techniques. This discrepancy might be explained by the 13 year time difference in publication of these two studies, or that Brandes et al. (1995) considered children with all special health care needs while Marshall et al. (2008) focussed specifically on children with ASD. Eaton et al. (2005) found that parental acceptance of a given BMT was not dependant on parental age, gender, education level, or social status. Multiple different pharmacological and verbal techniques were all acceptable to the parents, and only the hand-over-mouth technique was widely agreed upon as being unacceptable. Pharmacologic techniques in this study were considered more favourable than in past investigations of the same subject.

A thorough review of the medical, dental and social history of a child with ASD can be used to estimate the level of co-operation that can be expected from that child. In a retrospective chart review conducted in a children’s hospital, Loo et al. (2009) found that specific ASD diagnosis and other concurrent medical diagnoses were correlated to decreased Frankel behaviour scores. Other medical diagnoses such as cerebral palsy, or seizure disorder contributed to a 50% decrease in positive behaviours. It was also determined that for every year increase in age there was a concurrent 8% increase in co-operation; but this was significantly less than the 26% increase noted in the healthy population. The rate of use of general anaesthesia the most common advanced technique, was similar for both the ASD and unaffected populations within the youngest age groups, but tailed off with increased age in the unaffected population while remaining steady in the ASD group. A decrease of one level on the Frankel scale led to a 264% increase in
the likelihood of treatment being completed under general anaesthesia. Protective stabilization was found to be the second most common advanced technique, while oral sedation with or without inhalation sedation was only used in four percent of cases (Loo et al., 2009).

**Behaviour Management in Other Settings**

Many of the modern BMTs proposed for use with the ASD population in the dental setting stem from successful studies in other fields such as education, behaviour modification, neuropsychology and cognitive psychology (Gilberg, 2000). Baharav and Darling (2008) used an audio-visual trainer to improve a child with ASD’s attention span and socialization. Twice daily viewings of the training video over a period of 8 weeks led to a significantly increased attention span and improved social skills. Additionally, several different studies (Charlop and Milstein, 1989; Charlop-Christy, 1993; Charlop-Christy et al., 2000) have demonstrated the effectiveness of using video modelling to teach specific behaviours to children with ASD. Specifically it was shown that the subjects rapidly acquired conversational, social, recreational, emotional, academic and even oral hygiene skills after observing the modeling procedure (Charlop-Christy et al., 2000). The generalization across children and settings was maintained at a 15-month follow-up. Charlop-Christy et al. (2000) reported that video modelling was superior to in vivo modelling in that the skills were acquired faster, and the associated costs were less and would decrease further with a larger subject pool, because the video could be shown repeatedly at no additional expense. It was proposed that the video modelling was more effective because the camera can zoom in on and highlight the relevant aspect of the
behaviours being modelled, rather than allow the child to become distracted by other miscellaneous cues seen with a live model (Charlop-Christy et al., 2000). With the introduction of televisions into dental offices the integration of such a training video into the BMT of a child with ASD can be more easily accomplished.

Similar to the previously mentioned TEACCH method, is the PECS, or Picture Exchange Communication System. In this therapy a static picture of an object or situation is introduced to the child in an attempt to develop familiarity. This is directly followed by presenting the real item, or immersion into the real situation (Liddle, 2001). Bowler (2008) noted that in contrast to the unaffected child, the child with ASD will show a preference for the image rather than the real item. This establishes a viable link between a way that a child with ASD might communicate and interact with the physical world around them such as the dental operatory, and they can then be better prepared for it.

Pilebro and Backman (2005) conducted a study on 14 Swedish children with ASD between the ages of 5 and 13 years old. These children had previous experience learning skills by using visual pedadgogy and all had demonstrable plaque on their anterior teeth and had difficulty with at home oral hygiene procedures. Their parents placed a series of 13 picture cue cards representing the steps in brushing all the surfaces of all the teeth in both arches in their bathrooms at home. The parents were contacted at least twice over the following 18 months and invited to communicate with the therapists as often as they liked to optimize the success for their child. After 18 months of training, the parents of all but two of the subjects reported that their child had adopted the program and now allowed for, or performed on their own, oral hygiene at home. Some had even progressed to the point where the images were no longer needed. A similar learning method was
applied to a dental restorative appointment by Morisaki et al. (2008). The child subject had been using a series of pictorial cues depicting the steps involved in brushing his teeth each day at home. Restorative dental treatment was completed by substituting the images of a toothbrush and toothpaste for a rubber dam, mirror and the other necessary armamentaria required for the completion of the restoration. The authors argued that the success of the treatment modality indicated the potential for other children with ASD to “be treated in an environment of decreased fear and anxiety by utilising the structured visual guide intervention” (Morisaki et al., 2008).

Self-injurious behaviours in the ASD population have also been described in the literature; over 70% of children with ASD may exhibit factitious behaviours at some time in their lives (Medina et al., 2003). Gilberg (2000) proposed that there may be a biochemical basis to self injurious behaviour; specifically a defect in purine metabolism, which once corrected may allow the behaviours to subside. The author cited one case of a patient displaying ocular self injury that was diagnosed with hypocalinuria, treated with a calcium rich diet and supplements and the factitious injuries diminished. Medina et al. (2003) reported that non-contingent reinforcement alone may be sufficient to stem some of these behaviours. Meanwhile, Lindemann and Henson (1983) described a sliding scale of increasingly invasive management techniques to deal with this behaviour, ranging from passively ignoring, it to active physical restraint. This is especially true for the physical pressure seeking individuals for whom the restraints can be a positive reinforcement.
Behaviour Management of the Healthy Child

In order to better appreciate the array of BMTs that can be used with children with ASD, the behaviour management of the healthy child must also be considered. The AAPD defines behaviour management, or guidance as “a clinical art form and a skill built on a foundation of science” whose goals “are to establish communication, alleviate fear and anxiety, deliver quality dental care, build a trusting relationship between dentist and child, and promote the child’s positive attitude toward oral/dental health and oral health care” (AAPD, 2008). Crossley and Joshi (2002) claimed that “establishing rapport between the child and dentist has been shown to influence cooperation and compliance with preventive advice.” In a study of members of the British Society of Paediatric Dentistry Crossley and Joshi found that more recently graduated members were less accepting of parental presence in the operatory, though 80% still supported the practice, in regards to their general patient population. Only a minority (22%) of respondents felt pressured by parental expectations of how smoothly their child’s treatment would progress. With respect to specific BMTs, 87% listed Tell-Show-Do as their primary management strategy. Voice control was ranked by 40% as their secondary BMT, while nitrous oxide was the secondary choice for only 15%, and 11% chose live modelling. Respondents were also asked to indicate their level of comfort with the given techniques. Sixty four percent felt “totally comfortable” or “comfortable” with the use of live modelling, while less than half (45%) felt the same for general anaesthesia. Over 60% of respondents felt uncomfortable using active or passive restraint such as a papoose board. Just over half (53%) felt that there was sufficient current information on techniques for managing children’s anxiety. (Crossley and Joshi, 2002). A 2004 AAPD conference on
behaviour management concluded that although communication is the key to any BMT, the true value of a given technique is mostly dependant on the patient (Adair, 2004), so in the case of communication disorders such as ASD, new non-pharmacologic approaches should be studied. Concurrently, Adair et al. (2004(a); 2004(b), 2004(c)) conducted three surveys of BMT as applied to the healthy pediatric population, which were sent to undergraduate and graduate pediatric dental programs as well as practicing pediatric dentists. None of the surveys however considered any of the modern BMT skills, instead the scope of the questions was limited to communicative management, restraint, hand-over-mouth, and sedation/ general anaesthesia. The pediatric dental departments surveyed reported that 12% of their didactic time, less than 5 hours, was dedicated to teaching behaviour management skills at the undergraduate level. The schools did not indicate any intention to alter the amount of time spent, or the material taught, on behaviour management, although 25% suggested an upcoming increase in time will be allocated to teach conscious sedation in a revised curriculum (Adair et al., 2004(a)). A similar proportion of time was spent teaching BMT in the postgraduate level pediatric dental programs (Adair et al., 2004 (b)) with no intention to alter the curriculum. Adair et al. (2004(a); 2004 (b)) concluded that there has been little change in the time devoted to teaching most behaviour management techniques, especially with regards to the communicative techniques.

These results demonstrated that over the last three decades there has been a significant shift in the choice of BMTs amongst pediatric dentists. For example the widespread use of hand-over-mouth technique in the 70’s has since declined to record lows (Adair, 2004). The use of active restraint is following a parallel decline in
utilization. These findings illustrate that nearly a generation may be required to remove a technique from the repertoire of the specialty as a whole. Therefore it has been postulated that at least as much, if not more, time would be required to introduce new techniques into the routine practice of the specialty as seen in the case of some of the more modern techniques (Adair, 2004). The authors also found that there was a decline in the use of conscious sedation, with only 62% of the respondents reportedly using this modality to manage patient behaviour. This finding continues a trend seen in previous studies which collectively described a decline in the use of conscious sedation (ADP, 1972; ADP, 1981; Carr et al., 1999). It appears that the use of conscious sedation is concentrated amongst the older cohort of pediatric dentists. In contrast, there is now an increase in the use of general anaesthesia after several decades of declining use. With respect to non-pharmacologic BMTs, the majority of respondents foresaw no changes in their frequency of use over the next 2 to 3 years (Adair et al., 2004 (c)).

Allen et al. (1990) surveyed pediatric dentists’ use of BMTs for healthy but non-compliant children. Using the categories ‘traditional’ and ‘non-traditional’ to describe BMTs they found a significant preference for the use of the traditional techniques including sedation over contemporary choices such as relaxation, live modeling, filmed modeling, contingent distraction, or contingent rewards. More than 60% of the respondents reported an interest in learning safer, cost-effective, alternative strategies for managing behaviour in young disruptive children. Factors which could influence the acceptance of a new technique into general use were also considered; time investment was rated the primary influence while associated cost was ranked lowest. The authors also reported that attendance at BMT-specific continuing education courses was low;
respondents felt that most courses they had attended did not offer any new insights and only featured techniques that were already known to them. Allen et al. (1990) advocated for further studies of the costs associated with the new techniques to determine the financial feasibility of their being integrated into a pediatric dental practice.

**Survey Design**

Recent advances in technology now allow for a variety of distribution methods for survey research. Postal distribution has long been the standard, however email and web-based surveys have now become more widely used because of their ease, speed, and low cost of use (Greenlaw and Brown-Welty, 2009). In a comparison of postal, email, and fax survey methods amongst pediatricians in Georgia, USA, McMahon et al. (2007) demonstrated that fax, followed closely by postal responses, were the most popular method by which to respond after initial and secondary contacts, with email responses being the least popular. After altering the delivery method for the third contact, the total response rate was increased from 39% to 53%. It was concluded that mixed mode distribution provided a significant advantage in increasing the response rate, and further critical appraisal was required before email can be considered an ideal mode for the distribution of surveys. Bebee et al. (2007) surveyed physicians at the Mayo Clinic using mixed modes; post then email, or email then post. While key outcome variables were unaffected by the collection method employed, post followed by email offered a marginally higher response rate. Other researchers have also noted the need to include mixed modalities of distribution to reach those that would only reply to one mode (Schleyer and Forrest, 2000). Web-based only surveys have been met with mixed
response rates; certain studies indicate better responses with postal distribution, others suggest no difference between the two distributions, and still others report response rates in excess of 70% over the web (Truell, 2003). A systematic review of 12 web-based surveys of health care practitioners yielded an average response rate of 52%, with a range of 9% – 94% (Braithwaite et al., 2003). Williams et al. (2004), in describing techniques that can be used to maximize the response rates, advised “sending the questionnaires by first class mail, using short questionnaires, using coloured ink, personalising the letters (addressed to a named person and signed personally), using follow-up reminders and then sending a second copy of the questionnaire to non-respondents, and keeping questions of a sensitive nature to a minimum.” Web-based only surveys suffer from the inability to accurately control the sample size, as email inboxes can be full, emails can be rejected by web mailer programs, and email addresses can expire or become invalid. While postal addresses can have parallel problems, postal services have more formalized process to deal with them that allow the researcher to accurately adjust the sample size for statistical analysis. Greenlaw and Brown-Welty (2009) specifically looked at the response rate and cost efficiency of mail compared to email or mixed mode survey distribution amongst a highly educated population, analogous to other professional groups. The results demonstrated a significant difference in response rates and costs between the three modes of administration, with the mixed-mode survey administration producing the greatest response rate (60.27%) but at a considerably greater cost ($3.61 USD/response). The web based administration produced greater results (52.46%) than did the mail based administration (42.03%) overall and was substantially less costly to administer ($0.64 USD/response, $4.78 USD respectively). Furthermore, within the mixed mode
distribution, more than two thirds of the responses were received on line, suggesting a preference for the web based administration amongst subjects when given a choice. An additional 149 responses were received by the mixed mode group as compared to the web based group, but costs increased by $2,356 USD, or $15.81USD/response. The authors therefore concluded that web based administration is the clear choice for overall cost efficiency while still producing a very respectable response rate (Greenlaw and Brown-Welty, 2009). However, Chapple (2003) disputed the value being placed on maximizing response rates, pointing out that there “remains no evidence base for specific thresholds for response rates in questionnaire studies” and that each paper must be “judged on its merit by expert reviewers.”

Truell (2003), further defended the use of web-based surveys stating, “Web surveys were significantly more complete than mail surveys”. Two incontestable improvements of a web based survey over a postal survey are the speed of responses, since they can be returned almost instantly, and costs, which can be up to 38% less, (Schleyer and Forrest, 2000) as email surveys have no postage, printing, copying or other office supply costs associated with them. Conversely, web based surveys are subject to specific manipulations and responder biases not found with traditional survey methods. Unless the questionnaire is password protected, and sometimes even then, a given responder can enter multiple responses (Wyatt, 2000). A hard copy survey can be similarly manipulated, but only with significantly more effort. Furthermore, a responder bias exists since only those subjects who are computer literate and are reasonably internet savvy can participate. Non responder bias is an additional major concern with any type of distribution method. While it is best controlled by maximizing response rates its effect
must always be considered. Locker (1993) and Parashos et al. (2005) both reported that the results based on the first response to a mailed questionnaire differed only marginally from those obtained from secondary and tertiary contacts, indicative of minor late responder bias.

**Summary**

Despite numerous reports which cited the difficulties in providing dental care for children with ASD, an interested practitioner would have a difficult time discerning from the current body of literature “best practice guidelines” on how to meet this challenge. Many papers presented here have described the oral findings of children with ASD, or their behaviours in the dental setting. Moreover, the dental literature is rife with studies, surveys and opinions on behaviour management of the obstreperous but healthy child. Historically, pediatric dentistry has extended the use of many of these time honoured techniques to manage children with special needs as well. When these approaches have proven ineffective with this population, pharmacologic restraint, in the form of conscious sedation or general anaesthesia was commonly used. Research outside of dentistry details teaching tools that have been used with varying degrees of success to aid children with ASD to interact appropriately with the world around them. Yet despite limited success with traditional approaches, pediatric dentistry has been reluctant to adopt these new techniques. This review has demonstrated that there is no consensus on how to best manage children with this increasingly common and complex condition, and that further investigation is warranted to help develop best practice guidelines.
The use of surveys as a tool for conducting research is well accepted in the literature. Many different styles and techniques are presented here as are the strengths and shortcomings of each design. Mixed modality surveys which use both mail and email based distribution give potential respondents the most opportunity to respond in the manner most convenient to them and have been shown by some authors to increase response rates over mail or email distribution methods alone.
Statement of the Problem

Children with Autism Spectrum Disorders present a unique behavioural challenge to the pediatric dentist due in part to the intrinsic communicative disability and altered sensitivities to various stimuli (Klein and Nowak, 1999). Many of the classical and pharmacological approaches to pediatric behaviour management are unsuccessful in treating these children on a daily basis. Yet, pediatric dentistry has been remiss to adopt, or largely attempt, many of the modern behaviour management approaches described in the current literature (Adair, 2004). A dental appointment is a considerable encroachment on one’s personal space and a sensory overload; the positioning in the dental chair, the overhead lights, dental office smells, to say nothing of the procedures that may need to be done, in an area of the body which is highly innervated, and obscured from the person’s view. Receiving dental treatment can undoubtedly be a challenge for anybody, and all the more so for the child with ASD. Given the reported rise in the prevalence of ASD over the last 20 years, (Fombonne, 2003(a)) pediatric dentists can expect to be faced with the challenge of providing oral care for an increasing number of children with ASD.

Traditional behaviour management techniques were developed initially to deal with healthy, normal functioning, uncooperative or pre-cooperative children. These techniques have been adapted and continually used for people with special health care needs, with varying degrees of success (Waldman and Perlman, 2002). Many of the techniques are dependant on the ability of the dentist to establish open communication with the patient, which is precisely the problem in the case of communicative disorders such as ASD. Alternatively, pharmacological means such as conscious sedation and general anaesthesia have been used to treat patients in place of, or where behaviour
shaping techniques have proven inadequate (Klein and Nowak, 1999). However, a growing body of literature from outside the dental field suggests that children with ASD can be taught to cope with and function in many situations previously thought to be beyond their abilities (Baharav, 2008; Charlop-Christy, 1993; Charlop-Christy et al., 2000; Gilberg, 2000). Pediatric dentistry may consider changing its approach to the management of this group accordingly. It is incumbent on today’s pediatric dentist to be well versed in all the behaviour management techniques available for the child with ASD in order to select the best method to provide timely, efficient, safe and effective oral health care.
Aims

The aim of this study is to examine which behaviour management techniques are currently being used by pediatric dentists to treat children with ASD; to describe their perceived success; and to detail the variables that lead to the decision to use one set of techniques over another. Furthermore, the collected data should highlight specific personal background and circumstance variables which contribute to skills in advanced behaviour management. This work will test the theory that pediatric dentists’ behaviour management techniques for children with ASD vary based on experience, education and environment.

Objectives

• To assess whether pediatric dentists are well versed in, and actively using, contemporary methods of managing the specific behaviours of children with ASD; or if they are relying on classical methods.

• To highlight specific influences which contribute to skills and familiarity with various behaviour management techniques.

• To highlight modern behaviour management skills in the dental and health care literature, and their perceived effectiveness with regards to managing children with autism spectrum disorder.
Methods

Canadian and American pediatric dentists were surveyed about their personal background, as well as their use of, and opinions on behaviour management techniques with respect to patients with Autism Spectrum Disorders. This survey was developed at the University Of Toronto, Faculty of Dentistry in November 2007. It was based on similar surveys in the area of behaviour management and incorporated ASD specific techniques developed and used, both in dentistry and other fields (Adair et al., 2004(a); 2004(b); 2004 (c); Adair et al., 2007; Allen et al., 1990; Baharav, 2008; Charlop-Christy, 1993; Charlop-Christy et al., 2000; Gilberg, 2000; Morisaki et al., 2008; Pilebro, 2005). Pre-testing was done by dental faculty at the University of Toronto and The Hospital for Sick Children, Toronto, Canada, none of whom were involved in the original development of the instrument. Changes were made to the survey to improve clarity and validity based on comments and critiques from the pre-testers. A web based version of the survey (surveymonkey.com) was developed to increase the response rate. The survey tool and research proposal were submitted to, and approved by the Research Ethics Board at the University of Toronto, in June 2008 (Appendix 2 – Survey).

This survey consisted of two major sections, Personal and Professional Background; and the Behaviour Management Technique Rating Scale, BMTRS. Background questions dealt with the respondents’ educational background, their practice location, their population base and their access to hospital facilities. Other topics included attendance at and interest in, continuing education in the area of behaviour management, and the frequency of interaction with patients with ASD. The various listed BMTs in the BMTRS included techniques from published behaviour management studies (Adair et al.,
This was augmented with input from faculty and committee members well respected in the area of behaviour management. The listed BMTs could be classified into the three different styles of classical, pharmacological and modern, but this division was not given in the survey to better ensure accurate responses. The BMTRS employed two scales of numbers from 1 – 5 and asked the respondent to circle a number that corresponded to their frequency of use, and perceived effectiveness of the listed behaviour management technique. For the frequency of use scale, 1 = never; 2 = rarely; 3 = sometimes; 4 = often; and 5 = regularly. For the effectiveness scale 1 = not at all effective; 2 = limited value with a limited number of patients; 3 = useful for some patients; 4 = valuable for most patients; and 5= extremely effective. Several questions within the survey offered the respondent the opportunity to either input an unlisted answer, or to expand on a given answer, which offers greater insight into the responses and the reasons behind them. The closing questions of the survey asked the respondents to identify factors which influence their decision making process as to which BMT to use for a given patient.

The contact list for the survey was drawn from the online active membership roster of the AAPD as of July 2008 (http://www.aapd.org/members/finddentist/index.asp). An online sample size calculator (http://www.surveysystem.com/sscalc.htm) was used to determine that at a confidence level of 95%, a confidence interval of ±3, and given the total membership of the AAPD of 7 160, a sample size of 926 respondents would be needed for this research. Based on the response rates of other similar surveys, (Allen et
al. (1990) 53%; Carr et al. (1999) 63%; Adair et al. (2007) 59%; Crossley (2002) 72%) this survey had an expected response rate of 60%. All active Canadian members (n=207) were included in the contact list. At a response rate of 60%, this would result in 124 responses. The American portion of the sample would therefore have to provide 802 (926 – 124) responses. Again, given a response rate of 60%, 1 337 US contacts were required, roughly 20% or 1 in 5 of the total number of American members of the AAPD. The American portion of the contact list therefore included every fifth active American member, by state, as listed in the membership roster. The resulting list contained the names and contact information for 1 669 practicing pediatric dentists in Canada and the United States. Each contact was mailed a cover letter inviting their participation and describing the study, as well as directions to the website where the survey could be completed on the internet (Appendix 1 – Cover Letter), the survey itself, and a pre-addressed and stamped return envelope. A similar cover letter and link to the web-based survey, was sent to the 1 543 contacts with available email addresses. At both four and six weeks after the initial mailing reminder follow up emails with the hyperlink were sent to the 1 543 email addresses. The survey was subsequently closed ten weeks after the initial mailing. Completion of the survey by the respondents was taken as implied consent to participate in the research. All surveys returned by mail were then entered into the surveymonkey database along with the online responses, which was then downloaded and transferred into SPSS v. 15, for descriptive and analytical statistical analysis, and Microsoft Excel XP for graphical depiction.
Results

Responses

The survey (Appendix 2 - Survey) was mailed to 1,669 active members of the AAPD from the online membership roster. Thirty-four mailed surveys were returned to sender as, no such address / recipient has moved, or otherwise undeliverable. Therefore the total number of contacts for this survey was \( n = 1,635 \). The survey was also emailed to the 1,543 available email addresses of this sample population. Emailed surveys were also returned for computer and technical reasons such as, email address no longer valid, email inbox full, or user not accepting unsolicited emails. Responses received by mail, online at the survey hosting website surveymonkey.com, or through an email link, were 602, 175 and 60 respectively. The survey was open for 10 weeks, closing on December 1, 2008, and generated 837 responses, which represents a response rate of 51.2\% (837/1,635). Of the returned surveys 48 were incomplete and therefore discounted, resulting in a total of 789 completed surveys and an adjusted final response rate of 48.2\% (789/1,635).

Personal and Professional Background

Education

Advanced education in pediatric dentistry programs can be divided along the lines of the institution in which the program takes place. Nearly half of the respondents, 45.6\% classified their program as “combined” where training occurred in both a hospital and university setting. Respondents trained only in a hospital, or only in a university setting were 33.3\% and 21.0\% respectively. The most common degree type, held by 78.2\% of
respondents, was a diploma or certificate in pediatric dentistry. A smaller proportion of respondents, 21.8%, held graduate level or other types of degrees (table 1A).

<table>
<thead>
<tr>
<th>Degree Type</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma/Certificate</td>
<td>617</td>
<td>78.2</td>
</tr>
<tr>
<td>MSc</td>
<td>150</td>
<td>19.0</td>
</tr>
<tr>
<td>PhD</td>
<td>6</td>
<td>0.8</td>
</tr>
<tr>
<td>Other</td>
<td>16</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>789</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Similarly, 88.6% completed their advanced training in two years, while the remaining 11.4% spent three or more years training in pediatric dentistry (table 1B).

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two</td>
<td>699</td>
<td>88.6</td>
</tr>
<tr>
<td>Three</td>
<td>83</td>
<td>10.5</td>
</tr>
<tr>
<td>Four</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Five</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>789</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Survey data demonstrated that the majority, 60.3%, of the participating pediatric dentists had attended one or two courses that had dealt with some aspect of behaviour management in the previous three years. Only 87, or 11.0%, of respondents claimed to have attended four or more such courses over the same time period (table 2A). Furthermore, within that same time frame only 27.0% of respondents had even seen more than five courses offered that dealt with the subject matter of behaviour management (table 2B). Seventy one percent of respondents felt that there would be value in offering more continuing education in relation to BMTs.
Table 2A - Behaviour Management Courses Attended During The Previous Three Years

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>132</td>
<td>16.7</td>
</tr>
<tr>
<td>One</td>
<td>228</td>
<td>28.9</td>
</tr>
<tr>
<td>Two</td>
<td>248</td>
<td>31.4</td>
</tr>
<tr>
<td>Three</td>
<td>94</td>
<td>11.9</td>
</tr>
<tr>
<td>Four or more</td>
<td>87</td>
<td>11.0</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2B - Behaviour Management Courses Seen Offered During The Previous Three Years

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>64</td>
<td>8.1</td>
</tr>
<tr>
<td>1 – 5</td>
<td>512</td>
<td>64.9</td>
</tr>
<tr>
<td>6 – 10</td>
<td>154</td>
<td>19.5</td>
</tr>
<tr>
<td>11 or more</td>
<td>59</td>
<td>7.5</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Environment

The distribution of respondents as measured by where they completed their advanced pediatric training was skewed in favour of the Midwest region, AAPD’s Region IV. This region includes schools located in major metropolitan cities such as Toronto, Chicago, Detroit and Cleveland, as well as less populated places such North and South Dakota and Manitoba from which one third of respondents graduated. The Northeast, Region II, dominated by New York and New England, was the next largest area of representation with 20.5% of graduates. Representation from the remaining regions is seen in figure 1.
Figure 1 - Respondents’ Graduate School by AAPD region

![Pie chart showing graduate school distribution by AAPD region.]

Figure 2 presents the location of the contacted respondents according to the AAPD regions.

Figure 2 – Distribution of AAPD Members Contacted by AAPD Region

![Pie chart showing contacted members distribution by AAPD region.]

Over half (57.9%) of respondents defined their current primary workplace setting as suburban, while only 49 (6.2%) described their location as rural. The distribution of pediatric dentists in the various practice types showed 73.2% work in private offices dedicated to pediatric dentistry, evenly divided between those in single and multi
practitioner offices (figure 3). The smallest proportions of clinicians are found in academia/university settings and others such as military bases and public health.

**Figure 3 - Practice Type**

Seventy-three percent of respondents had hospital privileges but only 47.1% had access to general anaesthetic facilities outside of the hospital, such as in-office or in a private surgical centre. The distribution of respondents with hospital privileges by age is shown in table 3.

**Table 3 – Hospital Privileges by Age**

<table>
<thead>
<tr>
<th>Age</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 to 35</td>
<td>113</td>
<td>66</td>
<td>179</td>
</tr>
<tr>
<td>36 to 45</td>
<td>168</td>
<td>59</td>
<td>227</td>
</tr>
<tr>
<td>46 to 55</td>
<td>116</td>
<td>53</td>
<td>169</td>
</tr>
<tr>
<td>56 to 65</td>
<td>178</td>
<td>36</td>
<td>214</td>
</tr>
<tr>
<td>Total</td>
<td>575</td>
<td>214</td>
<td>789</td>
</tr>
</tbody>
</table>

**Experience**

The numbers of respondents distributed between the four defined age brackets in table 4 were fairly evenly distributed. No respondents indicated their age to be over 65 years, so the age group was eliminated from the dataset.
Table 4 – Age of Respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 to 35</td>
<td>179</td>
<td>22.7</td>
</tr>
<tr>
<td>36 to 45</td>
<td>227</td>
<td>28.8</td>
</tr>
<tr>
<td>46 to 55</td>
<td>169</td>
<td>21.4</td>
</tr>
<tr>
<td>56 to 65</td>
<td>214</td>
<td>27.1</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>100</td>
</tr>
</tbody>
</table>

Respondents reported an average of 15.8 years in practice as a pediatric dentist. However, the responses were highly skewed to the lower end, as the mode was 2 years of experience.

Respondents were also asked how many patients per month they treated under general anaesthesia and how frequently they treated children with ASD. The results, shown below in tables 5 and 6, indicate very frequent interaction with patients with ASD, but relatively infrequent use of general anaesthesia.

Table 5 - Number of Patients Seen Under General Anaesthesia per Month

<table>
<thead>
<tr>
<th>Patients/month</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5</td>
<td>462</td>
<td>58.6</td>
</tr>
<tr>
<td>6 to 15</td>
<td>215</td>
<td>27.2</td>
</tr>
<tr>
<td>16 to 25</td>
<td>81</td>
<td>10.3</td>
</tr>
<tr>
<td>26 or more</td>
<td>31</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6 – Frequency of Treating Patients with Autism Spectrum Disorders

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly or more</td>
<td>473</td>
<td>59.9</td>
</tr>
<tr>
<td>Monthly</td>
<td>215</td>
<td>27.2</td>
</tr>
<tr>
<td>Bimonthly</td>
<td>44</td>
<td>5.6</td>
</tr>
<tr>
<td>Less than bimonthly</td>
<td>57</td>
<td>7.2</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>100</td>
</tr>
</tbody>
</table>
Behaviour Management Technique Rating Scale – BMTRS

The BMTRS contains 23 different BMTs that pediatric dentists may use to manage the behaviours of any patient, but specifically those with ASD. The results of scoring each technique on a 1 – 5 scale for both the frequency of use and perceived effectiveness of the technique are reported as the average of all the scores assigned to it, and is shown in table 7.

Table 7 - Average Frequency and Effectiveness Scores

<table>
<thead>
<tr>
<th>BMT</th>
<th>Average Frequency Score</th>
<th>Average Effectiveness Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedation/Inhalation</td>
<td>3.07</td>
<td>2.82</td>
</tr>
<tr>
<td>Sedation/Oral</td>
<td>2.38</td>
<td>2.50</td>
</tr>
<tr>
<td>Sedation/Multi-Drug</td>
<td>1.83</td>
<td>2.13</td>
</tr>
<tr>
<td>Sedation/Other Methods</td>
<td>1.44</td>
<td>1.73</td>
</tr>
<tr>
<td>General Anaesthesia</td>
<td>3.19</td>
<td>4.34</td>
</tr>
<tr>
<td>Stabilization (Wraps)</td>
<td>2.31</td>
<td>2.66</td>
</tr>
<tr>
<td>Stabilization (Parents)</td>
<td>2.93</td>
<td>2.85</td>
</tr>
<tr>
<td>Stabilization (Office Staff)</td>
<td>2.64</td>
<td>2.71</td>
</tr>
<tr>
<td>Support Devices</td>
<td>1.23</td>
<td>1.46</td>
</tr>
<tr>
<td>Tell-Show-Do</td>
<td>4.33</td>
<td>3.41</td>
</tr>
<tr>
<td>Voice Modulation</td>
<td>3.51</td>
<td>2.93</td>
</tr>
<tr>
<td>Non-Verbal Communication</td>
<td>3.65</td>
<td>3.04</td>
</tr>
<tr>
<td>Distraction</td>
<td>3.80</td>
<td>3.15</td>
</tr>
<tr>
<td>Contingent Escape</td>
<td>1.74</td>
<td>1.73</td>
</tr>
<tr>
<td>Contingent Distraction</td>
<td>2.02</td>
<td>1.92</td>
</tr>
<tr>
<td>Live Modelling</td>
<td>2.76</td>
<td>2.50</td>
</tr>
<tr>
<td>Filmed Modelling</td>
<td>1.20</td>
<td>1.43</td>
</tr>
<tr>
<td>Sensory Integration</td>
<td>2.19</td>
<td>2.10</td>
</tr>
<tr>
<td>Sensory Stimulation</td>
<td>2.14</td>
<td>2.05</td>
</tr>
<tr>
<td>Familiarization (Single Visit)</td>
<td>2.93</td>
<td>2.75</td>
</tr>
<tr>
<td>Familiarization (Multiple Visits)</td>
<td>2.65</td>
<td>2.65</td>
</tr>
<tr>
<td>Desensitization</td>
<td>2.83</td>
<td>2.69</td>
</tr>
<tr>
<td>Visual Cues/Social Stories</td>
<td>1.70</td>
<td>1.84</td>
</tr>
</tbody>
</table>
The distribution of scores for the six BMTs with average frequency of use scores greater than 3.00 is seen in figure 4.

Figure 4 - Top Six BMTs for Frequency of Use

These were the only six BMTs with average frequency scores above 3.00, suggestive of being used sometimes or more often while the other 17 BMTs can be said to be used infrequently. Tell-Show-Do had the highest average frequency score of 4.33.

The distribution of scores for the four BMTs with average effectiveness scores greater than 3.00 is seen in figure 5.
Only these four BMTs received average effectiveness scores above 3.00, suggestive of being at least somewhat useful, while the other 19 BMTs were perceived to be ineffective. General anaesthesia had the highest average effectiveness score of 4.34, and was the only BMT to score above 4.00.

The 23 BMTs were drawn from three styles: classical, pharmacological and modern as seen in table 8.

<table>
<thead>
<tr>
<th>Classical</th>
<th>Pharmacological</th>
<th>Modern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilization (Wraps)</td>
<td>Sedation/Inhalation</td>
<td>Support Devices</td>
</tr>
<tr>
<td>Stabilization (Parents)</td>
<td>Sedation/Oral</td>
<td>Contingent Escape</td>
</tr>
<tr>
<td>Stabilization (Office Staff)</td>
<td>Sedation/Multi-Drug</td>
<td>Contingent Distraction</td>
</tr>
<tr>
<td>Tell/Show/Do</td>
<td>Sedation/Other Methods</td>
<td>Live Modelling</td>
</tr>
<tr>
<td>Voice Modulation</td>
<td>General Anaesthesia</td>
<td>Filmed Modelling</td>
</tr>
<tr>
<td>Non-Verbal Communication</td>
<td></td>
<td>Sensory Integration</td>
</tr>
<tr>
<td>Distraction</td>
<td></td>
<td>Sensory Stimulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Familiarization (Single Visit)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Familiarization (Multiple Visits)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desensitization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual Cues/ Social Stories</td>
</tr>
</tbody>
</table>
Using this division a score was calculated for each respondent for both frequency of use and effectiveness for each of the three styles. The overall score for the style was the average of the scores for each BMT within that style. Figures 6A, 6B and 6C illustrate the scores of respondents in each style for both frequency and effectiveness. The data suggested that pharmacological BMTs are underused compared to their perceived effectiveness while classical BMTs are used more frequently than their effectiveness dictates that they should be. Only modern BMTs received effectiveness and frequency scores that closely parallel each other.

Figure 6A - Classical Scores
By multiplying the frequency and effectiveness score for each of the three styles an over all score for each style was calculated for each respondent. The highest score of the three was then used to classify each respondent as a primary user of one of the three styles. The distribution of respondents within each of the three styles is seen below in figure 7.
Users of classical BMTs represented 70% of all subjects, while pharmacological users represented 24% of the sample. Modern users comprised only the remaining 6%, which correlates with the low overall scores for the style. Figures 8A, 8B and 8C illustrate the percentage of respondents who use each of the BMTs in each style often or regularly.
Within the modern style only desensitization, live modelling and familiarization with single and multiple visits were used by more than one fourth of all respondents often or regularly. No modern techniques were used by more than one third of all respondents often or regularly. In contrast, inhalational sedation and general anaesthesia were used
often or regularly by 40% of the respondents. Of the classical techniques, only the three stabilization BMTs were used by less than 50%, while Tell-Show-Do was used often or regularly by over 80% of respondents.

Respondents were asked to indicate the reasons for which they may be frequently using techniques which they find ineffective, or, infrequently using techniques which they do find effective. Figure 9A shows the distribution of reasons why specific BMTs are infrequently used despite being effective; figure 9B shows the distribution of reasons why specific BMTs are frequently used despite being ineffective.

---

**Figure 9A – Factors – Effective Yet Infrequent BMTs**

- Recently Started Use
- Lack of Consent
- Other Factors
- Liability Concerns
- Lack of Training
- Facilities not Available
- Volume of Treatment
- Cost Inefficient
- Too Time Consuming

![Bar chart showing reasons for infrequent use of effective BMTs](image)

**Figure 9B – Factors - Ineffective Yet Frequent BMTs**

- Recently Discontinued
- Other Factors
- Habit
- Parental Expense
- Previous Training
- Parental Expectations

![Bar chart showing reasons for frequent use of ineffective BMTs](image)
The top two most common reasons that effective BMTs were infrequently used were time and cost, identified by 203 and 247 respondents respectively; more than either facility requirements (171) or volume of treatment (192). Lack of training was cited by 118 respondents as a reason not to frequently use effective BMTs. An equivalent number of respondents, 228, reported that parental expectations and previous training compelled them to frequently use BMTs which they felt to be ineffective. The least common factor for both questions dealt with changes in usage habits, either recently introducing or discontinuing the use of a specific BMT.

Lastly, respondents were asked to rank from most important to least important, six factors that influenced their decision on which BMT to use to treat a child with ASD. The results, seen in figure 10 demonstrated that the most influential reason was cost efficiency, with an average rank of 5.1 out of 6, while patient based factors such as, patient co-operation and volume of treatment required, received the lowest mean ranks, 1.8 and 2.9 respectively.

Figure 10 – Decision Factors - Mean Rank Scores
Secondary Analysis

Using the age ranges of the respondents as a demographic indicator it can be seen that general anaesthesia is becoming an increasingly popular choice with the younger cohort of pediatric dentists. Figure 11 details the relationship between age of respondent and the availability of general anaesthesia outside of a hospital setting. Only within the youngest age group did more than half of the respondents have access to general anaesthesia outside of a hospital setting. In regards to the number of patients treated under general anaesthesia per month, the most common response was between 0 - 5 in every age bracket. Similar percentages of pharmacological, classical and modern users; 50%, 56%, and 48% respectively, have access to non-hospital based general anaesthesia.

Figure 11 – Access to General Anaesthesia Facilities Outside of a Hospital by Age
Table 9 shows the distribution of respondents by age amongst the three BMT styles. Respondents were divided nearly evenly between the four age groups in each BMT style.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Classical</th>
<th>Pharmacological</th>
<th>Modern</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 to 35</td>
<td>124</td>
<td>46</td>
<td>9</td>
<td>179</td>
</tr>
<tr>
<td>36 to 45</td>
<td>158</td>
<td>53</td>
<td>16</td>
<td>227</td>
</tr>
<tr>
<td>46 to 55</td>
<td>121</td>
<td>37</td>
<td>11</td>
<td>169</td>
</tr>
<tr>
<td>56 to 65</td>
<td>152</td>
<td>50</td>
<td>12</td>
<td>214</td>
</tr>
<tr>
<td>Total</td>
<td>555</td>
<td>186</td>
<td>48</td>
<td>789</td>
</tr>
</tbody>
</table>

Using level of training in pediatric dentistry as a marker, no correlation was found with a continued interest in offering continuing education courses on behaviour management skills. Regardless of their degree type, respondents had attended the same number of continuing education courses that focussed on behaviour management skills and professed a similar level of interest in being offered more of such courses. Likewise, membership in any organization that concerned itself with patients with special health care needs had no bearing on the frequency or effectiveness of any of the BMT styles.

Table 10A divides the subjects by practice type and BMT style, table 10B uses the type of education program, table 10C uses length of pediatric program, dichotomized into 2 years and 3 or more years, and table 10D uses degree type.

<table>
<thead>
<tr>
<th>Practice Type</th>
<th>Classical</th>
<th>Pharmacological</th>
<th>Modern</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>23</td>
<td>11</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>Pedo - Solo</td>
<td>205</td>
<td>70</td>
<td>21</td>
<td>296</td>
</tr>
<tr>
<td>Pedo - Group</td>
<td>192</td>
<td>77</td>
<td>13</td>
<td>282</td>
</tr>
<tr>
<td>Mixed – Group</td>
<td>87</td>
<td>22</td>
<td>8</td>
<td>117</td>
</tr>
<tr>
<td>Academia/ University</td>
<td>25</td>
<td>4</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>Other</td>
<td>23</td>
<td>2</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>555</td>
<td>186</td>
<td>48</td>
<td>789</td>
</tr>
</tbody>
</table>
Classical BMT users were the most common whether the subjects were grouped by education type, length of education program, or practice type. In each of these groupings pharmacological BMT users were the second most common and lastly modern BMT users. However, within the Academia / University grouping there was a far greater preponderance of classical types, 86.2%, very few pharmacological types, 13.8%, and no modern types. Pharmacological users were most prevalent in the pediatric specific private offices with 37.6% found amongst solo practitioners and 41.4% in group pediatric practices. Of modern users, 43.8% were found in solo practitioner offices, but hospital based pediatric dentists had the highest relative rate of modern users at 10.5%. Hospital based respondents as well had the highest percentage of pharmacological users at 28.9% and consequently, the lowest percentage of classical users.
Tables 11A and 11B show that there were similar distributions of the relative number of respondents from each of the three styles of BMT when grouped by practice location - urban, suburban or rural, or by the frequency of seeing children with ASD.

Table 11A – Practice Location by BMT style

<table>
<thead>
<tr>
<th></th>
<th>Classical</th>
<th>Pharmacological</th>
<th>Modern</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>190 (34%)</td>
<td>74 (40%)</td>
<td>19 (40%)</td>
<td>283 (36%)</td>
</tr>
<tr>
<td>Suburban</td>
<td>327 (59%)</td>
<td>103 (55%)</td>
<td>27 (56%)</td>
<td>457 (58%)</td>
</tr>
<tr>
<td>Rural</td>
<td>38 (7%)</td>
<td>9 (5%)</td>
<td>2 (4%)</td>
<td>49 (6%)</td>
</tr>
<tr>
<td>Total</td>
<td>555</td>
<td>186</td>
<td>48</td>
<td>789</td>
</tr>
</tbody>
</table>

Table 11B Frequency of Treating Patients with ASD by BMT style

<table>
<thead>
<tr>
<th></th>
<th>Classical</th>
<th>Pharmacological</th>
<th>Modern</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>330 (60%)</td>
<td>106 (57%)</td>
<td>37 (77%)</td>
<td>473 (60%)</td>
</tr>
<tr>
<td>Monthly</td>
<td>152 (27%)</td>
<td>56 (30%)</td>
<td>7 (15%)</td>
<td>215 (27%)</td>
</tr>
<tr>
<td>Bimonthy</td>
<td>32 (6%)</td>
<td>10 (5%)</td>
<td>2 (4%)</td>
<td>44 (6%)</td>
</tr>
<tr>
<td>&lt; Bimonthly</td>
<td>41 (7%)</td>
<td>14 (8%)</td>
<td>2 (4%)</td>
<td>57 (7%)</td>
</tr>
<tr>
<td>Total</td>
<td>555</td>
<td>186</td>
<td>48</td>
<td>789</td>
</tr>
</tbody>
</table>

The availability of general anaesthetic facilities outside of a hospital and having hospital privileges had only minor effects on the BMT style of the respondent. Those with access to general anaesthesia outside of the hospital were 2.7% more likely to be pharmacological users. Those respondents with hospital privileges were 7.4% more likely to be pharmacological users than those without.
Discussion

The results of the present survey revealed several noteworthy trends regarding the behaviour management of children with ASD by this sample of pediatric dentists in Canada and the United States. Despite a wealth of literature concerning children with ASD in the dental setting, there are few, if any, other studies that ask dental practitioners to describe their BMTs for treating people with ASD. This survey then, has offered the pediatric dental community a chance to respond to a topic which has been widely discussed in the literature, but never fully evaluated.

A primary goal of this study was to determine the familiarity of pediatric dentists with contemporary behaviour management techniques for children with ASD. The low BMTRS scores for the modern techniques suggest that the respondents may be unfamiliar with these techniques. Many respondents circled scores of “1” for both frequency and effectiveness throughout the later portion of the BMTRS, which contained all the modern techniques. Others made specific reference to never having heard of, or not being familiar with, the techniques listed. Many respondents called for an increase in the amount of continuing education courses that are offered on the subject of behaviour management of children with ASD, indicating a conscious lack of knowledge with respect to the available techniques. Classical techniques, on the other hand, were widely used, well known, but suffer from a lack of effectiveness, as perceived by the responding pediatric dentists.

This study sought to elucidate the specific influences which impact on a pediatric dentist’s skills and familiarity with various BMTs. By correlating the results of the Personal and Professional Background section with the BMTRS data it has been shown
that many factors, which can broadly be described under the categories of education, environment and experience, play a role in describing this expertise. These and other major factors, principally finances and parental interests, are discussed in detail below.

Lastly, this study has attempted to highlight modern BMTs in dental and health care literature and how they can be implemented in the management of children with ASD. By presenting eleven different modern BMTs in the BMTRS, respondents were offered an opportunity to demonstrate their interest in, and use of, a range of contemporary methods to treat children with ASD. Based on these results, the sampled group of pediatric dentists indicated that they do not believe these modern methods are as useful as the reviewed literature has suggested at managing the specific behaviours and challenges faced when treating children with ASD. Despite an extensive list of BMTs, only six were found to be used frequently (score >3); which included four classical, and two pharmacologic, but none of the eleven listed modern techniques. A similarly restrictive list is found for the effectiveness scores where only general anaesthesia was considered *valuable for most patients*. This list included three classical and one pharmacologic technique, but again, none from the modern style.

**Responses**

With an adjusted final response rate of 42.8% it can be surmised that there is a high level of interest within pediatric dentistry with regards to the issue of behaviour management of children with ASD. Other surveys on similar topics have received slightly higher responses rates. Allen *et al.* (1990), was responded to by 160/300 (53%) pediatric dentists; Carr *et al.* (1999), received 338/528 (63%) responses; Adair *et al.*
(2007) had 2768 of 4180 (59%) members of the AAPD respond; and Crossley (2002), received responses from 218/304 (72%) of UK pediatric dentists. It should be noted however that only Adair et al. (2007) had a sample size that exceeded the current study and that the 59% represents all responses received, not just those that were complete, as was used in the current study. Though the expected response rate for this study was not met, it nevertheless represents a substantial representation of pediatric dentists in Canada and the United States.

Representative Sample

Subjects in this study were evenly dispersed through the given 10 year age categories, although, none of the respondents were from the eldest age group. This is most likely explained by the exclusion criteria used. Only active members of the AAPD were included; many members above the age of 65 are likely listed as retired, or honourary, and therefore were not contacted. Several studies exist which detail the age distribution of pediatric dentists in their subject pool (Carr et al., 1999; Adair et al., 2004(c); Adair et al., 2007). The most authoritative source is the American Dental Association’s recent statistical analysis of the profession of pediatric dentistry, Survey of Dental Practice: Pediatric Dentists in Private Practice (2008). The grouping of age brackets in each of these other studies differs from that used in the current survey, eliminating the possibility of direct comparison. However, in comparison to the 2008 Survey of Dental Practice study it can be said that there was greater representation from the youngest age group of 25 – 36 years old, at the expense of the middle to older age groups, above 46 years old. Similarly, Carr et al. (1999) found 57% of their sample
population were from combined programs, similar to the 47% in the current survey. But only 17% of Carr et al.’s respondents were graduates from hospital programs compared to one third in this study. Additionally, 60% of their sample worked in suburban practices, nearly identical to the 58% reported in the present survey.

Participants in this survey were recruited by contacting every fifth active member of the AAPD in every state in addition to every Canadian member. The values for contacted members by region, presented in figure 2, very closely reflect the actual distribution. As for the respondents, using the location of their pediatric graduate school, as presented in figure 1 as well closely approximates their location as many pediatric dentists practice, if not in the same state, then at least in the same AAPD region in which they trained (Nainar and Feigal, 2004).

While generally similar, one discrepancy in the distribution is the over representation of the Midwest and under representation of the West amongst the respondents. This may be attributable to the responses of Canadian pediatric dentists to this, a Canadian based survey that was sent to all Canadian members of the AAPD, who are concentrated in Ontario, part of the AAPD’s Midwest region. By comparison, Nainar and Feigal (2004) studied the distribution of pediatric dentists in the across the US, and noted an average of 4.03 pediatric dentists per 100 000 children in the US. But gross disparities exist between the densely populated Northeast states, to the severely underserved, largely rural states where the ratio of pediatric dentists to children, is closer to 1:100 000. Furthermore, they recognized that the AAPD’s membership represented almost 95% of the pediatric dentists in the United States (Nainar and Feigal, 2004),
indicating that the membership list of the AAPD was a valid representation of pediatric dentists as a whole.

**Education**

The ADA’s 2008-09 *Survey of Advanced Dental Education* reported that, 349 first year residency positions in pediatric dentistry were available in Canada and the United States, representing a greater than 75% increase over the preceding decade. While this increase represents growth in all types of programs, advanced education in pediatric dentistry continues to be dominated by 24-month, certificate or diploma granting programs, as compared to longer, generally university or combined, degree granting programs (ADA, 2010). Neither the institution (university, hospital or combined) nor length (two, three or more years) of the graduate program had a significant impact on the overall style of BMT used. Respondents with graduate degrees (MSc., or PhD.) were 7% more likely to be classical users, and 10% less likely to be pharmacological users, than those with diplomas/certificates. Both groups contained very few modern BMT users. But, when specifically considering the frequency and effectiveness scores, the data demonstrated several significant links which highlighted differences between hospital and university trained pediatric dentists. Training within a hospital produced pediatric dentists that used pharmacological BMTs more often and they found them to be more effective, than those trained elsewhere.

The data demonstrates that only one in four of the respondents, regardless of degree type, or program duration, have attended more than two behaviour management continuing education courses that have been offered over the last three years. One can
only speculate as to the reason for the low attendance rate to such courses. However, anecdotally, based on comments that respondents included with their survey, (Appendix 3 – Respondent Comments) many felt that the methods presented at the courses have not changed since completing their advanced training, and that no progress has been made in the area so there would be little value to attending the courses.

Environment

General anaesthesia was considered to be the most effective technique, yet less than half of the respondents were able to offer this treatment option to their patients outside of a hospital setting; most practitioners treated less than six patients, regardless of health status, per month, with this modality.

The age of the respondents provided conflicting data with regards to the use of general anaesthesia. Only in the youngest cohort of respondents did more than half have access to general anaesthesia outside of the hospital setting. For the question of number of general anaesthesia cases done per month, the eldest cohort had the highest number of responses in the two highest categories of 16 -25 and 26 or more. Some of the variance between the age groups in the use of general anaesthesia outside of the hospital setting, can be explained by the relative numbers of respondents in each category that have hospital privileges. While overall 73% of respondents have hospital privileges, there were significant differences within the age groups. Only 63% of the youngest cohort had hospital privileges, in contrast to 83% of the oldest group. This may explain why the use of general anaesthesia outside of the hospital has increased in the youngest group. Those with hospital privileges had significantly higher scores for both the effectiveness and
frequency of use of pharmacological BMTs. This suggests that treatment decisions may be influenced by what the practitioner is able to offer, rather than how the patient presents. This is further supported by noting that those respondents without hospital privileges had higher frequency of use scores for classical BMTs, indicating a greater reliance on those techniques. This increased dependence came at the expense of modern techniques, which were significantly lower in this group. Conversely, frequency and effectiveness of use scores of pharmacological BMTs were no different for those with access to general anaesthesia outside of a hospital setting, and those without. Therefore, contrasting conclusions may be reached as to whether a practitioner’s environment dictates treatment protocol. As noted above the primary demographic difference between these two groupings with opposing conclusions, was age. Therefore it can be argued that the younger pediatric dentists, who offer general anaesthesia in their office or private surgical centre, may be less inclined to rely on other pharmacological BMTs, than the older cohorts who offer treatment under general anaesthesia in hospital setting.

Location of the practice was considered as a potential predictor of BMT choice. However, no significant differences were noted between those in urban or rural settings, in terms of their primary BMT style. When the respondents were grouped according to practice type it is seen that those in Academia/ University settings found pharmacological and modern BMTs significantly less effective and consequently used them much less frequently. Classical type users however comprised 86% of the Academia/University respondents. Moreover, not one respondent who works primarily in an academic setting was classified as a modern BMT user. This stands in contrast to those working in private practices, where classical users were only 70% of the total; and while still a very small
proportion, 42, (6%) of the respondents were primarily modern BMT users. Hospital based respondents had the highest proportion of modern BMT users, at 11%, while 29% were pharmacological BMT users, the highest of any practice type.

**Experience**

Sixty percent of the respondents to this survey treated children with ASD on a weekly or more often basis. However, the low effectiveness scores for all but the most frequently used BMTs suggests that there is a disparity between what is needed and what clinicians are providing for their patients. The sample population in this study did not demonstrate any significant differences in BMT style based on age. This data was similar to Adair *et al.* (2007) who also reported that there were no significant differences in neither age nor gender, for the use of a host of BMTs from the classical style, including Tell-Show-Do, nonverbal communication, and distraction. It follows that when asked about their intention to change their BMT habits, respondents in their study overall, and in each age category, indicated little to no intention to change. The techniques which their population reported that they would be increasing their use of were from the “basic” category, and include BMTs which in the present study are described as classical, such as Tell-Show-Do, nonverbal communication, and distraction. Meanwhile, techniques which were considered “advanced”; voice control and various forms of stabilization, were likely to decrease in use. Their results support the findings in this study that pediatric dentists appear to show little interest in utilizing any of the modern techniques. The authors however did report an increase in the use of both nitrous oxide and general anaesthesia amongst younger clinicians (Adair *et al.*, 2007). However, no such difference was seen in the pharmacological BMT style in this study; all ages had an equivalent proportion of
pharmacological users. Increasing frequency of use scores for inhalational sedation, were found to be correlated to decreasing age bracket. The same trend is not seen for the frequency of use of general anaesthesia, where the overall average is 3.19 and was similar in all the age groups.

Carr et al. (1999) found a relatively high frequency of use of restraint or stabilization BMTs compared to the results seen here. The authors reported that physical restraint by the dentist, dental personnel, parents, or wraps was used at least “sometimes” by 72% - 82% of respondents in the US Southeast. The same BMTs were used “sometimes” or more frequently by only 44% - 66% of respondents to this survey.

In considering the frequency of treating children with ASD, the three user types were equally represented within each of the response categories. However, modern BMT users were more likely to be seeing their patients who have ASD frequently than those primarily using the other BMT styles. This result might have been anticipated given the very nature of several of the modern techniques which rely on building rapport and familiarity with the patient over time; often a relationship that requires weekly or more frequent visits. Moreover, the data demonstrated the value of experience in treating children with ASD. Those that see these patients weekly or more often reported higher frequency and effectiveness scores for all BMT styles, when compared to the monthly group. This result may be interpreted that, in treating children with ASD, the more experience that a clinician has with a given child the better the likely clinical result.

Marshall et al.’s (2007) statement that returning patients with ASD were no more cooperative than new patients is in contrast to this interpretation. However both Luscre and Center (1999) and several respondents to this survey (Appendix 3 – Respondent
Comments) disagreed and place a high value on familiarity with the dental setting and staff as it relates to managing the behaviours of children with ASD. The results of this study showed that pediatric dentists are willing to treat this challenging population, leading to increased exposure. This increased exposure can result in greater satisfaction for the clinician, less frustration for the parents and a higher level of care for the patients.

Influencing Factors

Over 70% of respondents indicated that they practice in an office dedicated to pediatric dentistry, whether on their own or in a group practice. As such, the ability to physically design the office or adjust protocols and schedules to accommodate the modern techniques should exist. Particularly, more so than in a general practice office or dental school setting where other demands on physical space or need for appropriate surroundings might make such designs unfeasible. Other barriers to the implementation of certain BMTs were identified. Cost efficiency was the highest rated reason to choose a given BMT. Many of the modern techniques require a significant time investment on the part of the dentist, child, and family. Unless the dentist can be properly remunerated for their efforts, many may not be willing to try these techniques. Meanwhile the parents’ and the dentists’ intentions, were scored lower indicating a lesser degree of importance. Patient–based factors, such as the volume of treatment required, or their level of cooperation were considered the least influential items on the list of influencing factors (See Appendix 2 – Survey). Many factors were identified by respondents as barriers to frequently choosing effective BMT, or forcing them to frequently use those which are ineffective. Again, chair-time and expenses, to either the parent or practitioner, were
some of the more commonly cited reasons. These findings may indicate a tendency for pediatric dentists to adjust their treatment modalities to reflect the financial realities more so than the clinical needs of their patients with ASD.

Nearly 30% of respondents felt that their previous training limited them to frequently choosing ineffective BMTs. Inversely, 15% felt that their lack of training kept them from frequently using effective BMTs. This general sense of inadequate education may be able to be traced back to the education received through the post graduate training in pediatric dentistry. As previously noted, academia/university based respondents have a high proportion of classical BMT users, few pharmacological BMT users and no modern BMT users. These results can be interpreted that those in the position to teach the future cohorts of pediatric dentists exhibit a definite bias in their own approach to treating children with ASD, which in turn influences their students. Yet, it should be noted that only 29 respondents identified as working in a University/Academia setting. With modern BMT users making up 6% of the sample we would only expect one or two Academia/University respondents to be modern BMT users. Further, academic dentistry, and health care in general, is firmly focused on evidenced based practice. Modern BMTs thus far lack abundant rigorous evidence basis for their use within dentistry so it follows that those who identify as working in Academia/University would avoid this style until a stronger level of evidence supporting its use develops.

Identifying Obstacles

These results have suggested that pediatric dentistry has made few if any adaptations with regards to behaviour management of children with ASD. The strong
response rate to the surveys indicates that pediatric dentists in Canada and the United States have an interest in discussing the ability to provide behaviour management for their patients with ASD. This may be due to two primary reasons: first, the increase in the prevalence of ASD, such that they present to pediatric dental offices more frequently. Second, there is a generalized dissatisfaction with the approaches that are currently available, as evidenced by the overall effectiveness of use scores for the listed BMTs. This dissatisfaction may stem from many sources; a lack of facilities or access to these facilities, a lack of funding or remuneration to adequately treat and appropriately manage the child with ASD, and a lack of knowledge and training regarding how to work with these patients to optimize their oral health care. Only the latter is completely within the purview of the speciality to address, without outside intervention, and yet even here a great many barriers were identified, in terms of education, environment, and experience which can contribute to the sizeable challenges faced in caring for this population.

Summary

As professionals, dentists are obligated to continue their education throughout their careers, in the interest of providing the best in current patient care. Formal education may conclude with graduation from an advanced program in pediatric dentistry, however, continued education is available via current literature, participation in seminars, meetings, study clubs and continuing education courses. Unfortunately, there appears to be a deficit in these domains in terms of teaching modern BMTs discussed in this study. Hospitals and universities, as the principle sites of formal education, are staffed by individuals who have long excelled at teaching classical approaches to behaviour
management, and to a lesser degree, pharmacological management of children, but are seen as lacking in developing, teaching and adopting, more contemporary methods. It appears that continuing education courses suffer the same shortcoming, or at least the perception of it. Many respondents claimed to have not seen very many such courses offered. Furthermore, many clinicians commented that they felt apathetic towards the courses available as they were only offering the same materials that have been presented throughout their formal education.

Another challenge to the adoption of novel BMTs is the infrastructure that they require. The preponderance of classical techniques may be due to the ease with which they can be implemented into the dentist’s traditional work environment. The utilization of pharmacological techniques require, advanced training and education, the proper support staff, monitors, drugs, recovery areas, or in many cases access to facilities outside of the dental office. Modern techniques are also variable in terms of their ease of use. While some take only an open mind and additional time, others require video equipment, TV screens, light and sound effects, or significant alterations to the time and space requirements throughout the dental office.

Finally, this study has demonstrated that previous experiences play a significant role in shaping a dentist’s approach to the behaviour management of the child with ASD. Whether through the location or duration of their training program, or the number of interactions with children with ASD, prior familiarity plays a major role in determining the choice of BMT utilized. Senior practitioners may have long standing beliefs, or inherent biases in their habits, be it through positive or negative experiences, on how to approach the behaviours of children with ASD, that can be very different from the
younger practitioners. Pediatric dentists, who treat children with ASD on a regular basis, as a group tend to treat such patients differently than those who treat these children less frequently.
Conclusion

Summary of Findings

From the data and analysis presented herein it can be concluded that for the population of Canadian and American pediatric dentists surveyed:

- Children with ASD were treated frequently; weekly or more often by 60% of respondents, and at least monthly by more than 85%.
- Only four of twenty-three BMTs were considered effective, general anesthesia the most so, although it is not the most frequently used.
- Seventy percent of respondents were primarily users of classical BMTs, while only 6% were modern technique users.
- Those in private practice had the highest percentage of modern BMT users while academia had none.
- Lack of training or education, and time and financial constraints were two of the most commonly cited reasons why the frequency of use of a technique did not often match its perceived effectiveness.
- Cost efficiency was considered the most influential factor in choosing a BMT, while patient based factors such as co-operation and volume of treatment required were the least guiding.
- Seventy one percent of respondents saw value in offering more continuing education courses offered with respect to behaviour management of children with ASD.
- Privileges to work in a hospital environment, experience treating children with ASD, and educational background all played a significant role in determining behaviour management strategies used.
Future Directions

The specific objectives of this survey have been achieved, thereby identifying an even greater need for further research in this area. Random, controlled, clinical-based trials investigating the efficacy of the modern techniques described here are clearly required. Though several small scale studies have begun, most are in fields outside of dentistry, and so their specific relevance may be called into question. Those that have taken place within the dental setting, are few in number, with sample sizes too small to be clinically significant.

Much of the current study has looked at the dentists themselves, and how their circumstances relate to their ability to provide care to children with ASD. By considering their personal characteristics several factors have been noted that can affect their skills in providing care to this population. Future research might look at the dental treatment received by children with ASD from graduate students in hospital or university settings to see what influences can be noted and how early differences in treatment approaches develop. A controlled trial comparing dentists who have been recently taught modern or advanced behaviour management techniques versus those with years of experience treating children with ASD could highlight the relative value of these two modalities.

This study has also suggested that future directions in BMT education in pediatric dentistry should include alternate techniques. One of the primary factors identified that prevented many of the respondents from trying many of the modern techniques was a complete unfamiliarity with them. This was noted by many of the respondents who commented on the value of offering continuing education in behaviour management. Many respondents requested courses specifically designed for pediatric dentists, rather
than those geared towards general practitioners, which reviewed the same material that
was taught in dental school. Specifically, several pediatric dentists asked for courses that
would be taught by practitioners in private practice, and not by those involved in
academia, for the very same reason. Evidence supporting this claim, that academia based
individuals are only teaching classical techniques, is found in the division of the
respondents by BMT style. As previously noted, private practice represented a strong
percentage of modern users while none were from university/academia. If one is not
using a technique, he or she is unlikely to be teaching it, or if at all, with any degree of
conviction. It would seem therefore, that there is a need that the current educators in
pediatric dentistry are not sufficiently addressing, be it at the graduate level or through
continuing education. Inviting progressive educators from the ranks of private practice to
teach both current and future pediatric dentists could address this shortcoming.

Lastly, several systemic issues regarding dental care for children with ASD have
been identified, primarily related to the funding and insurance coverage available for
such children. The health care system is designed to deal with problems once they
already exist, rather than focussing on their prevention. Higher levels of funding,
whether through government programs, private insurance or otherwise, might allow more
parents of children with ASD to visit the dentist earlier and more frequently. This
increased familiarity with the dental office and education of the parents and patients
would allow these children to be more active participants in achieving their own oral
health care goals. While the initial increases in costs would be substantial, significant
savings could be realized downstream with school days not missed, teeth not needing to
be restored, general anaesthetics not having to be preformed, potential health hazards avoided, and oral health improved.

**Limitations**

The study design and topic of this research carries with it several inherent limitations. Survey research in general is biased by self selection of the respondents, known as the non-responder bias. The title of survey was clear and descriptive to all contacted subjects both in hard copy and on the web. Any clinician not interested in behaviour management as a subject, or with little interest or exposure to ASD would likely not have taken the time to respond to this survey. Therefore the respondents are more likely to be comprised of pediatric dentists who are involved in the care of children with ASD and are interested in discussing their behaviour management. A second element of bias was introduced by mixed modality design of the research. Follow up reminders were sent only by email and not mail. Therefore only the 1 543 contacts who had email addresses listed with the AAPD were sent this notice, and only those whose emails were not bounced back to the mailing program actually received it. Further, of those that received the reminders, there is no way to tell if the email was placed in the “junk” or “spam” folder, or if it was ever opened or just deleted. A similar bias would exist had the reminders been mailed – there is still no guarantee that the letter would ever be opened – but the degree of uncertainty would have been lessened.

The data analysis provided in this study is limited to purely descriptive statistics which effectively demonstrate trends and tendencies. These results are sufficient to address the stated objectives of the study. However, more in depth analyses such as Chi
squared tests, regression analysis and cluster analysis could certainly be used to draw out more detailed information from the dataset. Using these statistical techniques could yield further associations between the demographic data available and the use of the various BMTs that can enhance our understanding of the subject.

Many of the terms used in the survey were purposefully left undefined. The goal was to allow the respondent to project their own understanding of the terms into the question thereby introducing a personal influence on their responses. For example in question 7a there is no definition of the terms urban, suburban, and rural. This allows the respondent to answer, as they interpret themselves which is one way their treatment decisions are influenced – perception of their own environment. The BMTs are not defined either, especially some the modern techniques, which it was expected would be unfamiliar to some respondents. This was done in order to avoid the respondents interpreting some of their own unique BMTs as the listed techniques. By leaving the BMTs undefined the respondent is forced to admit that either this is a BMT that is known to them and then respond appropriately, or to recognize that there are BMTs that are not within their skill set. It could be argued that the lack of definitions can have the opposite effect, because the respondent can interpret their own unique BMT as one of the unfamiliar ones and answer based on their own definition of the technique. An attempt to avoid this potential error was made by including BMT #24 – “Other”. However, few respondents took the opportunity to fill in this response.

Within the personal and professional background section of the survey some of the available responses to the multiple choice questions can be scrutinized. In particular question 10 asks how many patients the respondent treats under general anaesthesia each
month. The lowest available answer is 0 – 5. This erroneously groups together those who
do few general anaesthesia cases with those who do none. One option should have been 0
and a second option of 1-5. Question 11 asks how often the respondent treats patients
with ASD. Here, the first choice, the highest frequency, weekly or more often, may be
too broad. But a choice of every three days or less, would likely lead to more uncertainty
and guesswork by the respondent.

A five point Likert scale was chosen for the BMTRS based on the feedback from the
pilot testing of the survey. It was felt that an odd number scale was needed to allow for an
intermediate response. A three point scale would not be descriptive enough while a seven
point scale would be overly complicated for the respondents to answer accurately.

Behaviour management is an intrinsically difficult topic to quantify. The gold
standard for research design is generally believed to be double-blinded randomized
controlled studies, which is not strictly possible in this field. Even when accepting that
blinding is not possible, subjects cannot act as their own controls, as would be ideal,
because their previous experience would influence their subsequent behaviours. The
problem is further confounded because most patients, children with ASD especially,
rarely behave the same from day today. Tolerance of, and reactions to, procedures vary
from day to day, even hour to hour. A different problem exists for the clinician. Rarely
can the BMT of a pediatric dentist be distilled to one style or technique. A key to
successful behaviour management is having a multitude of techniques at one’s disposal
and blending them appropriately for any given patient, situation and time. In practice, any
use of sensory integration for example, would probably be followed with Tell-Show-Do;
inhalation sedation with nitrous oxide is generally considered ineffective without the use
of other verbal techniques. Gold standard, level 1 evidenced based, behaviour
management studies may simply not be possible, and so, all attempts to study behaviour
management, while still being analysed critically, should be considered as valuable
additions to the body of literature.

Closing Remarks

This investigation has explored the relationship between the education, experience
and environment of a sample of pediatric dentists in Canada and the United States and the
approaches and successes of these dentists in treating children with ASD. Respondents to
the survey have self reported their frequency of use and effectiveness of twenty-three
different BMT which can be categorized as classical, pharmacological or modern.
Combined with the demographic data this survey has illustrated the current state of
affairs in the dental management of the child with ASD. By including an expansive
listing of the modern approaches to behaviour guidance of the child with ASD, this
research has introduced, and brought further attention to, these potentially valuable
techniques which have largely been developed in other fields, but have the potential to be
successfully adapted to a dental setting. Moreover, both the successes and shortcomings
of the current educational model for pediatric dentists have been described, and proposals
for its enhancement presented.

Through their responses to this survey, this sample of pediatric dentists
throughout Canada and the United States have demonstrated an interest in the subject of
behaviour guidance of the child with ASD and dissatisfaction with the current methods of
treating this burgeoning population. It is hoped that through the information presented in,
and insights gained from, this research pediatric dentistry can further evolve in its approach to the behaviour management of patients with ASD, and continue to provide the exceptional dental care that has been the hallmark of the profession for generations.


Appendices
Appendix 1 – Cover Letter

September 12, 2008

Dear Doctor,

Patients with Autistic Spectrum Disorders, ASD, represent an increasing proportion of the paediatric special needs population in North America today. The behaviours displayed by these patients very often present a significant barrier to their receiving optimal oral health care.

My name is Evan Zaretsky, I am a paediatric dentistry graduate student at the University of Toronto. I am conducting a survey of paediatric dentists across Canada and the United States, regarding their behaviour management techniques for children with autism. Your participation in this research will increase our understanding of how best to treat patients with autism spectrum disorder, and will take less than 15 minutes of your time to complete. The survey, as well as a prepaid return envelope, is enclosed in this package for your convenience. If you prefer, the survey is also available online at www.surveymonkey.com/autism. You are assured of complete confidentiality and anonymity in completing this survey. Your responses will not be linked to your name in any way.

This research has been approved by the Research Ethics Board at The University of Toronto. If you have any questions about your rights as a participant, you may contact the ethics office at ethics.review@utoronto.ca or (416) 946-3273; or in regards to the survey itself, myself, Evan Zaretsky at e.zaretsky@utoronto.ca.

Kindly, consider taking the time to complete the survey now, either on-line or in hard copy. Please ensure that your responses be received no later than November 14 2008. Your participation in this research is invaluable and would be greatly appreciated.

Sincerely,

Dr. Evan Zaretsky
MSc. Candidate
Appendix 2 – Survey

Personal / Professional Background

1) What is your age group?
   a) 25 – 35
   b) 36 – 45
   c) 46 – 55
   d) 56 – 65
   e) 65+

2a) Which year did you receive your DDS/ DMD/ BDS?
   ______________

2b) Which dental school did you graduate from?
   ____________________________________________________________

3a) Which year did you complete your formal advanced paediatric training?
   ______________

3b) At which university/hospital did you do your advanced paediatric training?
   ____________________________________________________________

4a) The program is considered______________ .
   a) Hospital based
   b) University based
   c) Combined

4b) What was the duration of the program?
   a) Two years
   b) Three years
   c) Five years
   d) Other ________________

4c) What designation did your program grant you?
   a) Diploma / Certificate
   b) MSc.
   c) PhD.
   d) Other ____________________ please specify
5) How many years have you practiced as a paediatric dentist?
______________________

6) Do you hold membership in any organizations that focus on special needs patients?
   a) Yes ______________________________ please specify
   b) No

7a) In what type of setting is your primary practice located?
   a) Urban
   b) Suburban
   c) Rural

7b) What is the nature of your primary practice?
   a) Hospital based
   b) Private practice – single practitioner
   c) Private practice – group practice - paediatric only
   d) Private practice – group practice - general dentistry and specialties
   e) Academia / University based
   f) Other ______________________________ please specify

8) Do you have privileges at a local hospital?
   a) Yes
   b) No

9) Do you have access to / offer your patients general anaesthetic outside of a hospital OR setting?
   a) Yes
   b) No

10) On average how many patients would you see under general anaesthesia in one month?
   a) 0-5
   b) 6 – 15
   c) 16 – 25
   d) 26 or more
11) Approximately how often do you treat patients with ASD, Autism Spectrum Disorder?
   a) Weekly or more
   b) Monthly
   c) Bimonthly
   d) Less than bimonthly

12) Of the continuing education courses that you have attended in the last three years, how many have dealt with some aspect of behaviour management?
   a) 0
   b) 1
   c) 2
   d) 3
   e) 4 or more

13) In the last three years, how many continuing education courses dealing with behaviour management have you seen offered?
   a) 0
   b) 1-5
   c) 6-10
   d) 11 or more

14) Do you feel that there would be value to offering more continuing education in relation to behaviour management techniques?
   a) Yes
   b) No
   c) Don't Know
Behaviour Management Technique Rating Scale

Below is a list of Behaviour Management Techniques that you may or may not be aware of, or using, in treating patients with ASD.

A) Given a scale of 1 – 5 where 1 = never; 2 = rarely; 3 = sometimes; 4 = often; and 5 = regularly; please indicate the frequency with which you use the technique in treating patients with ASD.

B) Given a scale of 1 – 5 where 1 = unknown/not at all effective; 2 = limited value with a limited number of patients; 3 = useful for some patients; 4 = valuable for most patients; and 5 = extremely effective; please indicate your impression of the effectiveness of the technique in treating patients with ASD.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Sedation – inhalation</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>2- Sedation – oral</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>3- Sedation – multi drug</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>4- Sedation – other</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>5- General anaesthetic</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>6- Protective stabilization – wraps</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>7- Protective stabilization– parent/ guardian</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>8- Protective stabilization – office staff</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>9- Protective support devices - i.e. VacPac</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>10- Tell-Show-Do</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>11- Voice Modulation</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>12- Non-verbal communication</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>13- Distraction</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>14- Contingent escape</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>15- Contingent distraction</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>16- Live modelling</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>17- Filmed modelling</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>18- Sensory integration</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>19- Sensory stimulation</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>20- Familiarization – single appointment</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>21- Familiarization – multiple appointment</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>22- Desensitization</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>23- Visual cue/ Social Story boards</td>
<td>1…2…3…4…5</td>
</tr>
<tr>
<td>24- Other ___________________please specify</td>
<td>1…2…3…4…5</td>
</tr>
</tbody>
</table>
25) If there are techniques which you indicated that you find effective, yet use infrequently, the reason(s) for this is/are: check all that apply

☐ Too time consuming
☐ Cost inefficient
☐ Lack of training
☐ Lack of consent
☐ Facilities resources not in place / available
☐ Have only recently started using it
☐ Liability concerns
☐ Volume of restorative needs is too great
☐ ___________________________________ (other)

26) If there are techniques which you indicated that you find ineffective, yet use frequently, the reason(s) for this is/are: check all that apply

☐ Habitual use
☐ Parental expectation
☐ Previous training
☐ Have recently discontinued use
☐ Less expensive option for parents
☐ ___________________________________ (other)

27) Please rank the following factors in order of importance in selecting a given behaviour management technique with which to treat a patient with ASD. (1 = most important, 6 = least important)

___ Cost efficiency
___ Ability of the patient to co-operate
___ Parental wishes
___ Your training and skill set
___ Volume of dental treatment required
___ Long- term patient education/management
Appendix 3 – Respondent Comments

On the Value of Offering More Continuing Education in Relation to Behaviour Management Techniques

☞ “FOR SURE”
☞ “Only if conducted by private practice dentist”
☞ “Maybe the younger pedo docs could learn that not everyone needs drugs or hospitalization”
☞ “Only if they are in regard to specific behavioural disorders, most pedos are just fine with healthy normal kids”
☞ “Not for me, but perhaps for others with less experience”
☞ “Not for me but other practitioners”
☞ “Depends on who teaches it. Because academia may see more special needs patients than private setting. But academia also sedates /GA most special needs patients. So where are the behaviour management techniques or experience? Who is qualified to teach such a course?”
☞ “More continuing education is necessary in this area that is geared towards pediatric dentists and not GP’s”
☞ “Behaviour management really only improves with experience for which there is no substitute” “I find that I don’t need sedation or even N2O very often anymore as my behaviour management techniques usually suffice. With a lot of autism cases this involves elimination of as many outside stimuli as possible (especially noise)”
☞ “I have been asking UofT for a non pharmacologic technique CDE course” “Basically if some form of verbal communication is possible chair side treatment is possible even without chemical or physical restraint. I can only wish the ODA had codes to bill for non pharmacologic behaviour management”
On the BMTRS

- “ASD is a quite wide and therefore some techniques are used with children according to the severity of the disorder. The questionnaire does not discriminate between light moderate and high functioning patients. I treat ASD patients everyday in a hospital setting. Effectiveness varies a lot from one patient to another. Personally I have never heard of Contingent escape and Contingent Distraction.”
- “Most patients with autism do not respond to techniques listed 10 – 23”
- “Sometimes actually often GA is a good long term education /management technique. Treating a child “calmly” and successfully with GA often leads to continued positive visits w/o GA.”
- “The WIDE variations in behaviours make this rating scale misleading, I think. Mild ASD like Asperger’s patients do not need the same level of BM as severely uncommunicative ASD patients”
- “I am not familiar with all the techniques listed on the previous page”
- BMTRS only partially filled out and scrawled on the remainder of the survey “sorry I got tired of filling out your survey, especially since no cash is involved” “OK I am now tired of this” “No cash - no complete” and added a sad face.
- “Applied Behavioural Analysis – I have a PhD in child development and psychology so I provide treatment to many children with psychiatric problems” for a write in technique on the BMTRS.

On Influencing Factors

- “Difficult to charge for sedation or other things when children are under… (Government insurance program)
- “N2O works well for some of the higher functioning patients but not well for the more severe ones. The spectrum is truly that, and is very broad”
- “I use whatever works regardless”
- “Usually not interested in educating themselves” “Changes with age and other factors”
- "Bad question" " Too broad" "Can't rank, too subjective
“I find it difficult to answer the last questions with accuracy because ASD is so wide. I base the technique not on the fact that they are autistic but where they function as an individual”

“All are needed and equally important when deciding what is the best way to approach treatment”

“Cost efficiency - “varies with insurance” Parental wishes - “varies with personality of the parent” Long term management – “varies with IQ of the parents” “Ask me again next week and it will probably be different – very difficult to rank”

Miscellaneous

“Other than GA, my success with ASD patients is very much related to the parent/caretaker’s level of involvement to acclimating the children and socializing the child to the medical environment”

“Questions 25 – 27 are worded in a confusing manner and unable to answer as author intends”

“I refer them to the hospital”

"I don't use drugs or GA - if they need it I refer out - I'm a behavioural specialist” “Use the same colour chair, same asst, same Dr., and always have the parents present. Do not want new or different stimulants”

“Personally I do not like restraint if possible unless have parents help in limited situations”

“If I have an ASD patient that is severely affected or requires significant treatment I refer to a pedo who offers sedation or GA I don’t do any sedation for any of my patients”

“Yes I have a lot of cases that go to the OR but most of the work is done in the clinic so they don’t go to the OR for an exam or polish or one tooth. Manage in the chair due to risk of GA.” “Please note that one person’s definition of ineffective may be different from another i.e. restrain, child’s yells and cries but you get the work done – is this effective or not?...my answer: yes, it is effective”

“Dr. Zaretsky, good luck with your research. Please have a Tim Horton’s for me!”