YOGA AS AN ADJUVANT THERAPY FOR STUDENTS ENROLLED IN SPECIAL SCHOOLS FOR DISRUPTIVE BEHAVIOUR

Volume I

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Abstract

Background

Disruptive behaviour in children and adolescents has a negative impact on their families, schools, and communities. Common treatments include medication, behaviour management, psychosocial and family programs in various combinations. These treatments have some success, but there is need for improvement in response and relapse rates following treatment. Yoga encourages participants to be actively and independently involved in their own treatment and self-management through respiratory awareness and manipulation, postures and cognitive control. Yoga practices have a positive effect on brain wave frequencies, glucose metabolism, neurotransmitter activity and the autonomic nervous system, all of which are affected in disruptive behaviour. In young people, yoga and similar mind body approaches have been shown to reduce hyperactivity, impulsivity and inattention, aggression and anxiety. However, many of the trials involving young people, took place up to three decades ago. This research needs to be revived and applied to the school environment where the problems are most evident and where inexpensive, non-intrusive and self-management strategies are needed.

Aims and Design

This controlled field study, using a within and between repeated measures design examined the impact of yoga on the behaviour of students aged 8-16 years, enrolled at special schools for disruptive behaviour with the New South Wales Department of Education, Australia. Of the seventy-eight participants (five female) enrolled in the study, sixteen students acted as

their own controls, fifty–five participated in yoga intervention only and seven were in the control condition only. Altogether seventy-one (71) students participated in the yoga intervention and twenty-three (23) in the control condition.

Methods

The yoga intervention, a 13-week comprehensive program consisting of two to three 30-40 minute sessions per week, was taught by a qualified, experienced yoga teacher who was also a specialist teacher for behaviourally disordered students (PSJ). The control group experienced the standard school program provided by the special school. Control and yoga participants were pre- and post-tested on the *Conners' Teacher and Parent Rating Scales–Revised Long Version* (CTRS-R: L, CRRS-R: L), the *Test of Everyday Attention for Children* (TEA-Ch), the Trait component of the *State-Trait Anxiety Inventory* (STAI) or the *State-Trait Anxiety Inventory for Children* (STAIC) and the *Self Description Questionnaire I or II* (SDQI &II). Behaviour observations were conducted using the *Behaviour Assessment System for Children-Portable Observation Program* (BASC-POP) in both the classroom (for control and yoga groups) and the yoga classes by blind independent observers and by the main researcher. School staff wrote comprehensive daily notes, in yoga classes and recorded students' on- and off-task behaviours. Measures designed by the researchers consisted of the *Feelings Faces Scale* (FFS) that was completed after the last yoga class for the week by all students; a yoga survey (YS) requesting student perceptions of the benefits of yoga and *Individual Assessments of Yoga Competence* (IAYC) that were completed at the end of the yoga intervention by two subgroups. A *Physical, Emotional and Mental States* (PEMS) measure was administered pre-

and post-yoga sessions for a subgroup. Breathing patterns before, during and after the yoga relaxation session were recorded using *Respiratory Inductive Plethysmography* (RIP) bands in a subgroup and compared with three young people without disruptive behaviour. Results were analysed using the General Liner Model for all pre- and post-test measures. Mean scores were calculated for the FFS, the Yoga Survey and the IAYC. Visual analysis of the RIP results was conducted by researchers.

Results

Of 71 participants in the yoga group 12 (16.9%) attended from 7 to 10 classes; 36 (50.5%) attended from 11 to 20 classes and 23 (32.5%) attended from 21 to 35 classes. Total absences from the yoga classes (39.76%) were due to sickness and truancy (32.35%); lack of interest, (45.71%); work experience, home school visits or other school programs, (15.89%); and suspension from school (6.04%). Of the 33 students in the control group, 10 (32.35%) discontinued due to leaving the school (n=6) or truancy (n=4); 23 (67.65%) remained in the control group.

Major findings were as follows: On the *Conners' Teacher Rating Scales Revised-: Long Version* (CTRS-R: L), significant improvement over time was found for the yoga group (n=64) in the Oppositional subscale. No other significant changes were seen over time or in group by time interactions for the yoga (n=64) or the control groups (n=20). On the *Conners' Parent Rating Scales Revised-: Long Version* (CRRS-R: L), significant improvements over time were seen in ten out of fifteen subscales for the control group (n=10) and deterioration in

six subscales for the yoga intervention (n=16). Group by time interaction, favouring the control group was seen in thirteen subscales. Significant improvements on the *Test of Everyday Attention for Children*, (TEA-Ch) were seen on two subtests of focused attention and two subtests of sustained attention (one borderline) for the yoga group and two subtests of focused attention, two subtests of sustained attention and one of switching attention for the control group. No significant changes were observed on the *State-Trait Anxiety Inventory* (STAI) or the *State-Trait Anxiety Inventory for Children* (STAIC) nor on the *Self Description Questionnaire I* or *II* SDQ I & II) but pre-test levels were within normal limits. Subgroup analysis of the CTRS-R: L. of students who participated in over 20 classes (n=14) indicated more pronounced significance on the Oppositional subscale. On the *Behaviour Assessment System for Children-Portable Observation Program,* (BASC-POP) significant group by time interaction reductions were observed in oppositional behaviour with a trend in hyperactive behaviours favouring the yoga group in the classroom. Over time, the yoga group's (n=19) classroom behaviours indicated significant reductions in impulsive behaviour and borderline reductions in hyperactivity and total ADHD behaviours. Numbers assessed on this measure were reduced due to one rater proving unreliable (and whose ratings were discarded) and due to technical problems. The control group (n=16) showed no significant changes in classroom behaviours. Subgroup analysis of the BASC-POP for students who acted as their own controls (n=8) indicated significantly less ADHD behaviours in yoga classes at the end of the program compared with all other assessment times. In the yoga classes (n=21) at the beginning of the intervention ADHD behaviours were 33% of classroom behaviours compared with 25% at the end (n=20) of the intervention. Staff observations of yoga classes indicated on-task behavioural descriptors outnumbered off-task descriptors by approximately 4:1. Weekly self-

reports on the *Feelings Faces Scale* (n ≤ 35), immediately after yoga each week, showed an overall positive response in mood, enjoyment of the program, and confidence in yoga practice. Self-report on the *Physical, Emotional, Mental States* measure, showed significant positive changes in physical, emotional and mental states from the beginning of yoga sessions to the end of sessions in a subgroup of students (n≤13). *The Yoga Survey* indicated benefits for 63% to 80% of the respondents (n=27) in six out of the seven items. On the *Individual Assessment of Yoga Competence* students (n=11) scored a mean of 79.64 % (SD 9.44). Breathing patterns, for students with disruptive behaviour (n=7), indicated greater stability during the relaxation compared with before and to a lesser degree after the relaxation but were not as stable as the breathing patterns of students without disruptive behaviour (n=3) throughout the testing period.

Discussion

Yoga as an intervention for students enrolled at behaviour school appears to have immediate positive effects as perceived by students immediately after sessions, in observations of behaviour during the yoga class, in assessed ability during a yoga class and in the stabilizing effects on breathing effort during relaxation. Collecting data on a regular basis appears to be a method of overcoming spasmodic attendance and early withdrawal. Few significant results were found on standardized measures. Results on these tests were affected by a number of methodological issues such as (i) fluctuations in attendance, (ii) withdrawals from the program weeks before post-program assessments, and (iii) to the intervention not being long

and intense enough for parents and teachers to perceive significant changes in the environments in which the students had been ‘acting out’ for most of their childhood.

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1 Introduction

1.1 Disruptive Behaviour

Disruptive behaviour in the school environment continues to escalate in both primary and secondary Australian schools with this problem being echoed in many western countries (Coslin, 1997; DET, 2005, 2007; B. Fields, 2004; B. A. Fields, 2002). This escalation is evident from the high rates of school referrals and suspensions (B. Fields, 2004; B. A. Fields, 2002); the increasing number of behaviour related resources allocated to schools (DET, 1998, 2002, 2005, 2007); the growing number of alternative placements for students with severe disruptive behaviour (de Jong & Griffiths, 2006; DET, 2005, 2007; Quinn & Rutherford, 1998); the increasing number of paediatric diagnoses for Behaviour Disorders (Cormier, 2008; W E Pelham, Fabiano, & Massetti, 2005); and the emphasis educational research is placing on whole school approaches to student behaviour problems (Fullan 2004; Strang, 2001). Academic, social and personal problems (Cantwell, 1996; Cormier, 2008; Milberger, Biederman, Faraone, Murphy, & Tsuang, 1995) frequently accompany these disruptive behaviours (also referred to as externalising behaviours). Persistent disruptive behaviour can manifest in poor literacy and numeracy (Rowe, 1994); poor social skills (J. Biederman et al., 1995; Harada, 2002) and poor self-esteem (Barber, Grubbs, & Cottrell, 2005; B. Hoza et al., 2004; B. Hoza, Pelham, Dobbs, Owens, & Pillow, 2002). Internalising behaviours, such as anxiety and depression, frequently accompany externalising behaviours (APA, 2000).

Characteristics of disruptive behaviour range from physical and verbal aggression towards other students and teachers and destruction of property, to less severe behaviours such as non-compliance including, not following teacher's instructions, talking excessively, remaining off-task, distracting other students, inappropriate and excessive minor and gross motor activity (e.g. fidgeting and out of seat). Although occurring in a minority of students, the disruption to teaching time and quality is immense, affecting the entire class environment. The stress on teachers and the detrimental effect on other student's access to the curriculum is of major concern (Coslin, 1997). The Vinson (2002) Report on Public Education in NSW concluded that disruptive behaviour represented a major professional and personal challenge to teachers.

Psycho-stimulant medication is frequently prescribed for students diagnosed with behaviour disorders unless contraindicated, in which case non-stimulant medications are prescribed. Diagnosed Disruptive Behaviour Disorders include Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) often comorbid with Anxiety Disorders and Emotional Disorders in addition to Learning Disorders and Autism Spectrum Disorder (ASD). However non-response and side-effects can prevent this course of treatment for a minority of young people. Some young people also refuse to be medicated which is sometimes supported by parents.

Behaviour management is another strategy used by schools and parents to address problematic behaviour. Behaviour management is gradually becoming part of basic teacher training (FESW, 2009) and practising teachers need to be up-skilled to manage this emerging trend (DET, 1998, 2007). Behaviour policies are becoming an essential aspect of school policy. For some innovative schools, whole school culture is being addressed through

restorative practices, which promote personal and social responsibility, relationship and community building and non-violent conflict resolution (B. A. Fields, 2002).

Psycho-social strategies are also recognised as an integral part of a multi-modal approach that focuses on schools, parents and the child. This approach encompasses such areas as appropriate curriculum and teaching styles, parenting, anger management, building healthy relationships, social skills training and self-esteem building (Cantwell, 1996; Harada, 2002; Wicks-Nelson & Israel, 2003).

Although in clinical and field trials, behaviour management and psycho-social have been found to be effective (Wicks-Nelson & Israel, 2003), management is ultimately dependent on the skills and experience of teachers and parents who have direct contact with the child with disruptive behaviour. Experience, quality of delivery, consistency and continuity play a large role in the efficacy of these strategies.

When a school is unsuccessful in managing a student's behaviour, alternative settings are sought. In NSW, Australia, the Department of Education and Training (DET) operated 35 such schools in 2006 (Planning and Innnovation DET, 2006). The number of students enrolled in alternative placements for disruptive behaviour represents 0.07% (Planning and Innnovation DET, 2006) of students enrolled in DET schools. Suspension centres are a recent initiative for students on long suspensions and other programs offer part-time enrolment in Tertiary and Further Education Institutions, teaching social and practical skills (DET, 2007). The students who are placed in alternate school settings frequently have a diagnosis of a behaviour disorder. Some students are assessed by school counsellors using the DET with a Mental Health (MH) assessment using the *Disability Criteria for Mental Health Problems*

(NSW DET Schools Sector Code Sheet - July, 2000). This assessment classifies students as either having an externalising and /or internalising behaviour profile. However some students are displaying behaviour problems not yet diagnosed or assessed.

In summary, disruptive behaviour continues to escalate despite the availability of a multi-modal approach to treatments and strategies. Recognising that disruptive behaviour has physiological causes coupled with psychological consequences paves the way for approaches to treatment where the emphasis is on self-management strategies that do not rely heavily on cognitive and reasoning skills but impacts on physiology bringing about changes both on an unconscious and a conscious level. One such approach is yoga.

1.2 Yoga

Yoga is a process that changes the physiology of the body through respiratory awareness and manipulation, postures and cognitive control. The concept of Yoga originated in India between 3000 and 5000 years ago (Eliade, 1973) as both a philosophy and 'science'. The meaning of this Sanskrit word is to 'yoke or join together or unite' (Taylor, 2004). There are several branches of Yoga all of which are said to assist in the development of self-realization. These include *Kama Yoga* (selfless service), *Bhakti Yoga* (devotional love), *Hatha Yoga* (mental and physical purity and balance), *Jnana Yoga* (knowledge and wisdom), *Raja Yoga* (mental mastery), *Mantra Yoga* (voice and sound), *Yantra Yoga* (vision and form), *Laya and Kundalini Yoga* (arousal of latent psychic nerve force) and *Tantra Yoga* (physiological discipline) (Hewitt, 1983).

A treatise on *Raja Yoga* was the first documentation on Yoga. This treatise, known as the *Yoga Sutras* was compiled by sage Patanjali. The *Yoga Sutras* describe in great detail the purpose of Yoga interpreted as the union between the individual self and the universal self (Iyengar, 2001). Within the *Yoga Sutras* are described the disciplines necessary to achieve this *union*. These disciplines are referred to as the eight limbs of Yoga and comprise of a complete system of physical, mental and spiritual development that incorporates *yamas* (abstinences)*, niyamas* (observances)*, asanas* (postures), *pranayama* (breath awareness and control), *pratyahara* (deep relaxation)*, dharana* (concentration), *dhyana* (mental concentration) and s*amadhi* (self realization) (Hewitt, 1983).

Yoga has become popular in the west at a time when society is focusing on self-management of health and wellbeing (Penman, 2008). The aspects of Patanjali's limbs of yoga being focused on are *asanas* for health and fitness and to a lesser degree, relaxation (*pratyahara*) and meditation (*dharana, dhyana, samadhi*) for well being. Yoga's employment in preventative, curative and treatment medicine is becoming increasingly sought and delivered (Penman, 2008).

Since the 1920s, research has supported the claims for physiological and psychological impact of yogic techniques on the functioning of human physiological systems and human health. Highly technical equipment and the further development of psychometric measures have enabled yoga researchers to apply advancements to discover the impact of various yogic techniques on specific functions of human physiological and psychology and diseases and disorders that are continuing to confront the human society.

1.3 Research Problem and Justification

Self-regulatory treatments for students with disruptive behaviour are noticeably lacking in Australian schools. The current, most commonly utilized strategies and treatments in schools and in the home are behaviour management, psycho-social strategies and pharmacology often applied concurrently (Hood, Baird, Rankin, & Isaacs, 2005; Newcorn, 2000). These treatments and strategies are extrinsically controlled; that is, the teacher and other adults direct the behavioural contingencies embedded in behaviour management programs. Medication addresses neurological impairments associated with the behaviours but does not teach new behaviours, so that once medication is discontinued, the previous problematic behaviours characteristically return (W E Pelham et al., 2001; Selikowitz, 1995). Behaviour management and psychosocial strategies depend heavily on the skills and experience of teachers and parents and the levels of consistency and continuity of delivery (R W Greene, 1995).

Yoga prescribes a system of practices that support the child in self-regulating behaviour. This system teaches techniques which develop attention, focus and concentration, both when stationary and during movement and when manipulating the breath (Hewitt, 1983; Satyananda, 1973, 1985d) This psycho-physiologically based system impacts on the functioning of the autonomic nervous system (ANS) and the central nervous system (CNS) (Arambula, Peper, Kawakami, & Gibney, 2001; R. Brown, P & Gerberg, 2005; D. S. Shannahoff-Khalsa, 2007; Telles, Nagarathna, & Nagendra, 1998). Impairments in the ANS and the CNS can result in chronic stress and anxiety, aggression, hyperactivity, impulsivity and inattention (Ramos & Arnsten, 2007). These impairments characterise the child with disruptive behaviour (APA, 2000).

Behaviour disorders and functional impairment persist into adulthood for a high percentage (40-60%) of children (Adams, Kelly, & McCarthy, 1997; Cantwell, 1996). Beyond the school and home environment, regulation of behaviour is the responsibility of the adolescent and young adult and without self- management skills, young people with disruptive behaviour soon become part of the juvenile justice and the adult prison systems (Kenny & Nelson, 2008). Yoga training, when started in childhood, teaches skills that can be carried into adulthood and is also accompanied by a sense of wellbeing which can be a motivating factor for continued practice.

Alternatives and complementary strategies to medication, behaviour management and psycho-social strategies are sought by an ever increasing number of parents. These have included dietary and supplements approaches, chiropractic treatment, biofeedback, massage and yoga (Rojas & Chan, 2005). Clinical trials have been conducted on these approaches but reviews of these trials indicate more rigorous research is needed to substantiate these claims.

Yoga belongs to the class of treatments that encourage participants to be actively involved in their own treatment and self management. It is a non-invasive, inexpensive and potentially feasible addition to the school curriculum. According to a recent literature up to 2005 (Rojas & Chan, 2005) there was only one published, controlled trial of yoga and its effects on ADHD (Jensen and Kenny, 2004). Rogas and Chan (2005, p.127) commented that ‘more rigorous studies were needed to convincingly demonstrate yoga’s efficacy as a treatment for ADHD’ and stated that ‘the results from the Jensen and Kenny (2004) study suggest that yoga may have a role as an adjunct treatment to conventional ADHD treatments’.

1.4 Aim of the Study

This study aimed to assess the effects of yoga techniques as an adjuvant therapy, on behaviour, attention, self esteem, anxiety, respiratory patterns, mood, attitude to yoga and perceived benefits for students, in addition to assessing competency in practicing yoga, in 73 boys and 5 girls, aged 8-16 years, diagnosed or displaying symptoms of disruptive behaviour who were enrolled at DET, Special Schools for Disruptive Behaviour.

2 Literature Review

2.1 Disruptive Behaviour

2.1.1 Definition of Disruptive Behaviour

Educational institutions deliver a curriculum primarily aimed at educating young people in the key areas of learning and within an environment that facilitates that delivery. Students usually gain sufficient cognitive and social skills, to be co-learners. This process is challenged by students who display disruptive behaviour (DB). Disruptive behaviour is comprised of inattention, hyperactivity and impulsivity and unacceptable levels of verbal and physical aggression towards others and property (APA, 2000). Academic, social and personal problems frequently accompany these behaviours (Cantwell, 1996; Milberger et al., 1995), and can manifest in poor literacy and numeracy (Rowe, 1994); poor social skills (J. Biederman et al., 1995; Harada, 2002) and poor self esteem (Barber et al., 2005; B. Hoza et al., 2004; B. Hoza et al., 2002). Disruptive behaviour is defined as externalising or extrinsic behaviour and is associated with poor emotional regulation, a factor in most childhood psychopathology (Zeman, Shipman, & Suveg, 2002). Externalising behaviours, according to Plutchik (1993) are associated with the under-control of emotion whereas, internalising behaviours, such as anxiety and depression, which are frequently comorbid, are associated with the over-control of emotion. Thompson,(1994) (Pp. 27-28) defines emotional regulation as ‘extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying emotional reaction to accomplish one’s goals.’ Poor emotional regulation skills result in poor social, academic and health outcomes (Zeman et al., 2002).

2.1.2 Diagnosis of Disruptive Behaviour

Many young people with disruptive behaviour are encouraged by schools to see a paediatrician. As a result many are diagnosed with a behaviour disorder often co-existent with emotional disturbance, anxiety and learning disorders. Alternatively, school counsellors can conduct a mental health assessment using the New South Wales Department of Education and Training (DET) *Disability Criteria for Mental Health Problems* (S. S. DET, 2000) to provide an indication of the presence of an externalising/internalising behaviour spectra of these students (see Appendix D).

The multifaceted nature of behaviour disorders requires a multifaceted approach to accurately diagnosing and measuring intervention outcomes. This approach requires the diagnosis and measurement of primary and secondary symptoms of behaviour disorders -- Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) which are frequently comorbid. Between 50%-60% of children with ADHD have comorbid ODD and 25% have comorbid CD (Cormier, 2008). These externalising behaviour disorders, frequently co-exist with Anxiety Disorders (AD), Depressive Disorders (DD), Learning Disorders (LD) and Autism and Asperger's Syndrome (APA, 2000; Banaschewski, Neale, Rottenberger, & Roessner, 2007; Cormier, 2008).

Examples of available diagnostic instruments are listed below:

- An interview with parents to ascertain the child's symptoms and where and with whom and how often these symptoms occur. The interview also covers developmental, medical, school and family, social, medical and mental health history.

- An interview with the child to ascertain the child's view of the symptoms and to screen for symptoms of other disorders, for example, anxiety and depression (Cantwell, 1996).

- Behaviour rating scales: *Conners' Parent and Teacher* (Conners, 1997b)*; Conners-Wells' Adolescent Self-Report Scale* (Conners & Wells, 1985), *Eyberg Child Behaviour Inventory* (Eyberg, 1992); *Child Behaviour Checklist* (Achenbach & Edelbrock, 1983).

- *Matching Familiar Figures Test* (Roberts and Erikson 1968) specifically for impulsivity.

- Behaviour observations of on- and off-task behaviours and primary and secondary symptoms, singly or multiply observed: *Behaviour Assessment System for Children* (Reynolds & Kamphaus, 1992) and the *Behavioural Coding System* (Forehand & McMahon, 1981).

- Cognitive assessment of ability and achievement include :-neurometric, I.Q, achievement, attention, continuous performance tests and distractibility tests-*Test of Variables of Attention* (TOVA)(Greenburg, 1988), *Test of Everyday Attention-Children* (T. Manly, Robertson I A, Anderson, V, Nimmo- Smith I, 1999), *Conners' Continuous Performance Test Computer Program* (Conners' 1997). *Picture Vocabulary* (Dunn & Dunn 1981)

- Anxiety inventories: *State-Trait Anxiety Inventory* (STAI) (C. Spielberger, D, 1983) and *State-Trait Anxiety Inventory for Children* (STAIC) (C. Spielberger, D, 1973); *Screen for Child Anxiety Related Emotional Disorders* (SCARED-R) (Muris et al., 2002).

- Depression scales: *Dimensions of Depression Profile for Children and Adolescents* (Harter & Nowakowski, 1987).

- Self-esteem questionnaires: *Self Description Questionnaire* (SDQ) (Marsh, 1990a).

- Electroencephalograms (EEGs) for topographical mapping of the brain measuring brain wave patterns (Mann, Lubar, Zimmerman, Miller, & Muenchen, 1991).
- A medical evaluation to assess general health and to screen for sensory deficits, neurological problems or other physical explanations for difficulties (Cantwell, 1996).
- In special cases adjunctive assessments such as speech and language assessment and evaluation of fine and gross motor skills (Cantwell, 1996).
- Activity monitors. Portable electronic activity monitors (Actigraphs) measure activity levels in the natural environment and Infrared Motion Analysis System measure activity levels more specifically in a clinical environment (Teicher, 1995).

2.1.3 Behavioural Diagnosis

The students in the study around which this thesis revolves were a heterogeneous sample, with behavioural, emotional, anxiety, mood and learning disorders diagnosed by a paediatrician or assessed as having a mental health problem using DET guidelines by a school counsellor or were undiagnosed. Only disorders present in the study sample are mentioned in the following descriptions of behaviour disorders and comorbid disorders as classified in the DSM-IV-TR (sections 2.1.3.3 to 2.1.3.5 and 2.1.4).

2.1.3.1 Mental Health Assessment

The criteria for a mental health assessment are stated as follows:

'Students must exhibit behaviour(s) that is characteristic of mental health problems at a level and frequency, duration and intensity that seriously affects their educational functioning and emotional well being. The behaviour(s) must be evident in the home, school and community environments. Students must have a current report from a specialist medical practitioner or registered psychologist with appropriate clinical experience, which details the nature of the behaviour(s). There must also be documented evidence of ongoing individual intervention by a mental health practitioner or school counsellor. The school must also provide documentation and evaluation of strategies used to address the student's needs within the school setting' (Disability Criteria, NSW, DET Code Sheet-July 2000) (see Appendix D for more detail).

2.1.3.2 Procedure for Alternative Placement in Behaviour School

Some students at the behaviour schools were without a diagnosis or assessment but presenting with behaviour problems serious enough for behaviour school placement. For placement in a behaviour school, the student needs to have undergone intervention from a support teacher for behaviour and/or deemed suitable by a DET panel that includes District Guidance Officers (counsellors), principals both from mainstream schools and Schools for Special Purposes (SSP) and an assistant principal from a behaviour team.

2.1.3.3 Attention Deficit Hyperactivity Disorder (ADHD)

A diagnosis of ADHD in accordance with DSM IV-TR (APA, 2000) requires six or more symptoms of hyperactivity/impulsivity and/or six or more symptoms of inattention occurring before the age of seven and present in two or more settings with clear evidence of significant impairment in social, academic or occupational domains.

History:

The primary symptoms of ADHD were first associated with brain damage and classified as Brain Damage Behaviour Syndrome, Minimal Brain Damage and Minimal Brain Dysfunction. Progressive editions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) have expanded and updated classification: DSM II -- Hyperkinetic reaction of Childhood; DSM III (APA, 1980) -- Attention Deficit Disorder (ADD) with and without hyperactivity and residual; DSM III-R (APA, 1987) -- Attention Deficit Hyperactivity Disorder (AHHD) with or without hyperactivity; DSM IV (APA 1994) and DSM IV- TR (2000)-Attention Deficit Hyperactivity Disorder (ADHD) with three subtypes-ADHD Predominantly Hyperactive-Impulsive Type; ADHD predominantly Inattention Type and ADHD Combined Type. Classification is undergoing continual revision as more empirical evidence becomes available.

Prevalence:

Estimated prevalence in school aged children 3%-7%, (APA, 2000; Cormier, 2008) with a ratio of 4 males (community), and 9 males (clinical):1 female (APA, 2000). However, prevalence differs between countries and between estimates within countries and largely depends on diagnostic criteria. The following figures for children and adolescents reflect the

variation in statistics. In Australia, prevalence is estimated at 3-6% (Graham, 2008); in USA, 3-5% (Cantwell, 1996); Germany, 4.2% children, New Zealand 6.7% children and 2-3 % adolescents; Japan 7.7% children ; China 6-9% children; Brazil 5+% adolescents; Netherlands 1.3% adolescents (Barkley, 2000). The USA, Australia, Japan, India, China, The Netherlands, New Zealand use the DSM criteria whereas Germany and England and some other European countries use the World Health Organization ICD 10 classification of the disorder (Kewley, 1998). According to Kewley (1998) prevalence for example in UK would be similar to the USA but because ICD diagnostic criteria require the presence of both hyperactivity and inattention, under-diagnosing tends to occur. The number of diagnosed cases of ADHD in the USA increased from 1.6 million to 4.2 million per year during the years 1990 to 1993 (Greenhill, et al., 1999).

Epidemiology:

Although ADHD is phenomenologically and aetiologically heterogeneous, the majority of ADHD diagnoses occur in males. For this reason, research has focused on males. However, Cantwell (1996) suggests that because younger girls tend to present primarily with inattention and cognitive problems, referrals are less common; with the onset of adolescence impairment in girls becomes more evident (Hazell, 2008).

Natural History:

Hyperactive symptoms of this disorder tend to diminish with age, with impulse control and inattention symptoms persisting, accompanied by the manifestation of additional psycho-p-pathological symptoms (Hazell, 2008). Research indicates that for 30% of ADHD children symptoms tend not to persist into adult life; for 40%, functionally impairing symptoms can persist into adult life and for up to 30%, functional impairment may be accompanied by

different types of social and emotional difficulties for example, alcoholism, substance abuse, antisocial personality disorder, anxiety disorder and mood disorder (particularly females) (Cantwell, 1996). Recent research indicates that the ADHD syndromal persistence drops 50% every 5 years although symptomatic persistence is much higher at 50-80% (Hazell, 2008).

Aetiology:

Research to date indicates that ADHD has a neurological basis with both environmental and genetic factors contributing to severity and persistence, all of which play a role in attention/emotion/ learning mechanisms, behavioural inhibition, and executive functioning.

The behavioural disinhibition and impairments in executive functioning theory developed by Barkley (1991) has been cited in the literature as the predominating neurological cause of ADHD. However, a new theory is emerging, not replacing Barkley's but advancing it, drawing upon neuroimaging and the use of tests measuring emotional/motivational/reward mechanisms (F. X. Castellanos, Sonuga-Barke, Milham, & Tannock, 2006). Castellanos et al. (2006) proposes that connecting emotional/motivational pathways (striato-nigral-striatal networks) with cognitive functioning (thalmo-cortico-thalmic networks) (F. X. Castellanos, Glaser, & Gerhardt, 2006; F. X. Castellanos, Sonuga-Barke et al., 2006; Dickstein, Bannon, Castellanos, & Milham, 2006; Mulas et al., 2006; Scheres, Milham, Knutson, & Castellanos, 2007) Castellanos et al,(2006) further establishes a neurophysiological and development theory. In this theory, inattention symptoms may be associated with deficits in 'cool' executive functions and hyperactivity/impulsivity with 'hot' executive functioning. 'Cool' executive functions are associated, for example, with working memory and 'hot' executive functions are associated, for example, with risky decision making. Dysfunction and abnormalities in the neural circuits and functions in the ADHD brain have been found:- in

anatomical mapping using MRI (Carter, Krener, Chaderjian, Northcutt, & Wolfe, 1995; F. Castellanos et al., 1996; F. X. Castellanos, Glaser et al., 2006; F. X. Castellanos, Sonuga-Barke et al., 2006; Dickstein et al., 2006; Mostofsky, Cooper, Kates, Denckla, & Kaufman, 2002; Mulas et al., 2006; Scheres et al., 2007); functional analysis of noradrenergic and doparminergic mechanisms (Arnsten, Jenna, & Hunt, 1996; Berridge & Waterhouse, 2003; Plizska, McCraken, & Mass, 1996; Ramos & Arnsten, 2007), brain wave frequencies (Clarke, Barry, McCarthy, & Selikowitz, 1998; Mann et al., 1991); and in cerebral glucose metabolism in adults and in adolescents (A. Zametkin, Leibenauer, & Fitzgerald, 1993; A. Zametkin, Nordahl, & Gross, 1990).

***Anatomical mapping*:** Anatomical measurement of the frontal–subcortical regions of the brain, implicated in the behavioural and attentional dysfunction in ADHD have been undertaken in several studies (F. Castellanos, Giedd, & Eckber, 1994; F. Castellanos et al., 1996; F. X. Castellanos, Sonuga-Barke et al., 2006; Dickstein et al., 2006; G W Hynd, Semrud-Clikeman, & Lorys, 1990, 1991, 1993; Kieling, Goncalves, Tannock, & Castellanos, 2008; Krain & Castellanos, 2006; Mostofsky et al., 2002; Shaw et al., 2007; Shaw et al., 2006) with the aim of substantiating hypothesized dysfunction in these regions using Magnetic Resonance Imaging (MRI). Earlier findings indicate smaller cerebral volume (4.7%), a lack of symmetry in width of cerebral cortex, significant loss of normal right>left asymmetry in the caudate smaller corpus callosum, smaller right globus palladius; smaller right anterior frontal region; smaller cerebellum and reversal of normal lateral ventricular asymmetry (Castellanos et al., 1994, 1996; Hynd et al., 1990, 1991, 1993). Mostofsky et al., (2002) expanded anatomical analysis with the use of MRI Talairach technology, measuring the cerebral lobes and the prefrontal cortex found significant reductions in lobar volumes in the frontal lobes in both in gray matter (nerve cells and dendrites) in both hemispheres and in

white matter (fatty material ensheathing the axons of nerves called myelin) in the right hemisphere. In addition, within the frontal lobe smaller prefrontal, premotor and deep white matter volumes were observed. More recent studies have found more extensive frontal hypoactivity in addition to regions associated with response inhibition, including the anterior cingulate, dorsolateral prefrontal, and inferior prefrontal cortices, as well as related regions including basal ganglia, thalamus, and portions of parietal cortex, regions involved with emotional and motor responses (F. X. Castellanos, Sonuga-Barke et al., 2006; Dickstein et al., 2006; Mulas et al., 2006). In addition and with the aim of connecting extensive neurobiological, genetic and environmental research findings, Kieling (2008)) is proposing that the longitudinal course of symptoms in ADHD from infancy to adulthood be examined in the context of maturation and development.

***Glucose metabolism*:** Diminished brain glucose metabolic activity in ADHD adolescents compared with controls in frontal (cortical) and striatal (subcortical) areas measured by positron emission tomography (PET) has been reported in the left anterior frontal and in subcortical in the left thymus and right hippocampus (Ernst, Leibenauer, & King, 1994; A. Zametkin et al., 1993; A. Zametkin et al., 1990; A. J. Zametkin & Liotta, 1998). In adults with a history of childhood ADHD reductions in glucose metabolism was found globally and in the premotor and pre frontal cortex in cortical regions and in the right thalamus, caudate and hippocampus and in the cingulate (Zametkin, Nordahl, & Gross, 1990).

Impaired modulation of neurotransmitters–noreadrenalin (NE) and dopamine (DA) have been the subject of research for over a decade to examine their relationship to the frontal/subcortical pathways that control attention and motor behaviour. Plizka and colleagues in the mid 1990s found children with ADHD to have higher basal noreadrenalin levels and

lower levels when performing a mental task compared to controls (Pliszka et al., 1996). Both Pliszka et al, (1996, 2003) and Berrridge and Waterhouse (2003) suggest that the locus coeruleus and the noreadrenalin system modulate both attention and arousal related processes which are also affected in PTSD, Stress, Anxiety, Depression and Substance Abuse. Dopamine, which plays a part in frontal lobe functioning and in particular in working memory (necessary for accessing and manipulating information to solve problems), has been found to be functionally impaired in ADHD (Pliszka et al., 1996, Swanson et al., 2007).

***Brain Wave Frequency*:** ADHD children have been shown to have greater levels of the lower frequency theta waves over all regions of the brain, particularly in frontal and central locations; a significant decrease in beta bands in the posterior regions; a significant increase in delta bands in the posterior sites; and a decrease in alpha bands in all sites measured particularly in the posterior regions compared with normal controls (Clarke et al., 1998). These differences were enhanced in patients during a drawing task with a difference of more than 20% between ADHD and control groups ($p<.01$) in premotor and prefrontal regions (Mann et al., 1991).

Environmental factors include severe marital discord, low socio-economic status, large family size, parental criminality, maternal mental disorder, foster care placement, (Rutter & Quinton, 1977, cited in Beiderman et al., 1995), substance abuse, parental psychiatric pathology, disorganisation (Biederman et al., 1995), maternal smoking (Milberger, Biederman, Faraone, Guite & Tsuang, 1997; Biederman, Faraone, Chen & Jones, 1996) and pregnancy, delivery and infancy complications (Milberger, Biederman, Faraone, Chen, & Jones, 1996).

Genetic factors: Twin studies indicate a 50-80% concordance for monozygotic twins and a 30-40% concordance for dizygotic twins. Adoption studies indicate that biological parents and siblings are three times more affected with ADHD than adoptive parents and siblings (Albayrak, Friedel, Schimmelmann, Hinney, & Hebebrand, 2008).

Comorbidity:

Comorbidity can be a risk factor for persistence and increased severity throughout adolescence and adulthood, (R Loeber, Burke, Lahey, Winters, & Zera, 2000). Disorders cormorbid with ADHD include Oppositional Defiant Disorder (ODD) (60% +) and Conduct Disorder (CD) (20-56%+) (Barkley, 2000); with the combination of ODD and CD (42%-93%) (Biederman, et al., 1996c; Bird et al., 1988; Anderson, Williams, McGee & Silva, 1997; Jensen, Martin & Cantwell,1997,(Barkley, 2000)), anti-social disorder (11-25%+) (Barkley, 2000), major depression (0-33%+) (Barkley, 2000), anxiety disorders 6%-40% (Milberger, Beiderman, Faraone & Tsuang, 1995; Beiderman et al., 1996b; Jensen et al., 1997 (Barkley, 2000); Learning Disabilities (10-92%) (large range due to difficulties with diagnostic confusion and discrimination),(Barkley, 2000; P S Jensen, Martin, & Cantwel, 1997). Accompanying poor social outcomes are evident with reported rejection from peers, aggression from teachers, and self-reported substance abuse, school failure/drop out and conduct disturbance and delinquency (R W Greene et al., 1996). In addition poor academic outcomes have been substantiated in longitudinal studies (Barkley, Anostopoulis, Guevremont, & Fletcher, 1991; Wilson & Marcotte, 1996). The onset of adolescence can produce transitional changes from ADHD to ODD to CD and the emergence of emotional disorders and substance abuse (Hazell, 2008).

Treatments:

Psychopharmacological: The most common pharmacological treatment involves the use of central nervous system stimulants that give a short-term rapid, consistent and predictable response for the majority of recipients 65%-90% (Elia, 1991, Vinson, 1994; Pelham et al., 1993, Plizska 2003, Greenhill, Halperin & Abikoff, 1999). The inconvenience of the short half life of psycho-stimulants (approximately four hours) has been addressed by the availability of long acting replacement psycho-stimulants Concerta (W E Pelham et al., 2001) which alleviates school administration of treatment and enables smoother treatment effects throughout the day. Psycho-stimulants, dextroamphetamine or methylphenidate (Ritalin) are generally initially prescribed. Ritalin significantly increases levels of dopamine in the brain. by increasing levels of extracellular dopamine through blocking dopamine transporters, Ritalin activates the motivational circuits and makes tasks more enjoyable (Volkow et al., 2001). Dexamphetamine acts through the release of newly synthesized dopamine (Patrick & Markowitz, 1997). In Australia according to the Federal Health Department the numbers of diagnosed cases receiving medication increased from 9,940 to 209,100 during the years 1990 to 1997 (Moor,1999). Statistics from 1994-2000 indicate a continuing escalation of prescription rate for psycho-stimulants of 12% from 1994 to 2000 in countries including USA, Canada, UK, Australia, New Zealand, Sweden, Spain, Netherlands, France, Denmark. Australia and New Zealand ranked third after the USA and Canada. However within Australia the rates differed dramatically from state to territory with Western Australia consuming twice that of NSW which indicates large variance in prescribing determinants and supply process (Berbatis, Sunderland, & Bulsara, 2002).

The highest rates of prescriptions are occurring in low socio- economic communities (Possner, 2008; Possner & Reid, 1999). The reasons for this include accessibility, reduced expense (medications are listed on pharmaceutical benefits schemes), lack of access to other more expensive diagnostic and ongoing treatments options, greater pressure and intimidation from schools, medical professionals and media (Graham, 2008). The question that continues to linger is "are prescription rates rising due to better identification and/or over-prescribing and/or a more convenient/available option?'

The most recognized side effects of psycho-stimulants include allergies, weight loss and insomnia and can exacerbate tics and anxiety (L. Greenhill, Halperin, & Abikoff, 1999; J M Swanson et al., 1998). Despite efficacy for the majority of children, stimulants must be continuously taken for efficacy (L. Greenhill et al., 1999; Selikowitz, 1995). Additionally, controlled substances require prescriptions which can be an inconvenience to families and physicians. There is also the problem of hoarding large quantities leading to inappropriate and illegal use (Pliszka, 2003). A link between stimulant medication prescribed in childhood and adult smoking substance abuse (cocaine) has been established by Lambert and Hartsough (1998) in a control study. This link has been disputed by proponents of the benefits of medication by criticizing the design of the study stating that Lambert did not distinguish ADHD from ADHD with comorbid ODD and CD. Comorbid ODD and CD have been claimed to exacerbate the use of tobacco and other stimulants in adulthood (J. Biederman, 2003; Fischer & Barkley, 2003). In addition, stimulant medication has been claimed to reduce substance abuse in adulthood (J. Biederman, 2003; Fischer & Barkley, 2003). Lambert (2005) addressed criticisms by re-examining and re-analysing data from the criticized study (Lambert, 1998) and substantiated her original claims. These results have continued to be criticized on methodological issues. It is obvious that more studies addressing all these

methodological issues need to be conducted to establish this link (B. Kean, 2005; B Kean, 2007). The consequences, if the link is established, would result in major legal battles with pharmaceutical companies (B Kean, 2007). In addition, recent research, although with small numbers n=12 has highlighted the concerning carcinogenic effects of methylphenidate (El-Zein et al., 2005). The twelve children treated had three cytogenetic endpoints in peripheral blood lymphocytes analysed before and after three months of therapeutic doses of Ritalin. These results indicate a significant increase in chromosome aberrations, sister chromatid exchanges and micronuclei frequencies respectively (P=0.000). Elevated frequencies in chromosome aberrations are associated with increased cancer risk.

Children who are non-responders or who experience side-effects are frequently treated with alternative non-stimulant medication, such as tricyclic anti-depressants (TCAs), are prescribed particularly for those ADHD children with tics and co-morbid depression. Selective serotonin reuptake inhibitors (SSRI) are prescribed for comorbid depression and bipolar disorder and adrenergics are prescribed for tics, insomnia and aggression (Pliszka, 2003). However the prescription of these non-stimulant medications is controversial due to side effects and lack of knowledge of long term effects (Nelson, Scott, & Polsgrove, 1999). In Australia, registration of prescriptions of non-stimulant medications are not required by governmental health departments, therefore, accurate statistics on the overall pharmaceutical treatments are lacking.

Recently, due to ongoing concerns about side effects and lack of conclusive evidence about the long term safety of the use of psycho-stimulant medication for ADHD, the US Federal Drug Administration (FDA) Drug Safety and Risk Management advisory committee recommended ‘black box warnings’ but their paediatric committee challenged the

recommendations, opting instead for clearer labelling and eventually the 'Black Box' labelling was dropped (Graham, 2008).

Psychopharmacological in conjunction with Psychosocial Treatments*:* The largest randomised long term psychiatric treatment study of ADHD children (n=576) using a multi modal approach (MTA-1992-1997) was conducted by the National Institute of Mental Health (NIMH) in the USA (L Greenhill et al., 1996). The MTA goal was to compare children's functioning, associated comorbid conditions and impairment during and after 14 months of either medication, psychosocial, combined medication-psychosocial and a community standard treatment. The results of the study demonstrated that stimulant treatment alone was significantly more effective for core behavioural symptoms of ADHD compared with behavioural treatment alone, community care or behavioural treatment combined with medication. Results, however were compromised due to higher doses of medication being administered to the medication only group and post-treatment measures for behaviour management being conducted several months after treatment had ceased (R W Greene & Ablon, 2001). For children with comorbid anxiety (one third of the sample), behaviour modification alone performed as well as medication and the combined treatment. In addition the combination treatment offered greater benefit for non-ADHD symptoms that is, social and family dysfunction, than medication alone (Newcorn, 2000). The MTA study concluded that a combination of treatments to address core symptoms, comorbidity and peripheral symptoms designed for the individual child may be required for the most effective treatment regime (Newcorn, 2000).

***Parental Involvement*:** Parents of children with ADHD are responsible for their child's behaviour and treatment and the manner in which parents do this varies widely from denial to

advocacy. Apart from the services of general practitioners and paediatricians, in Australia community health centres offer parent training courses and family therapy. In addition ADHD support groups offer parents emotional support, access to home based behaviour management strategies, stress management, advocacy methods and current research.

In conclusion, although pharmacological treatments dominate the treatment regime for ADHD, questions surrounding the problems of long-term use and association with substance abuse in later life, are yet to be answered. Although mounting empirical research indicates psycho-social, educational and alternative health treatments have similar efficacy to the pharmaceutical outcomes, health professionals, sociologists, educators, behavioural scientists and parents are continuing to advocate for funding for ongoing research into non-pharmaceutical treatments and the wider dissemination of findings (Graham, 2008; B Kean, 2004, 2007; W.E. Pelham et al., 1993; Timimi et al., 2004).

2.1.3.4 Oppositional Defiant Disorder (ODD)

ODD is a behavioural disorder with prevalence between 2% to 16% depending on population and methods of ascertainment. ODD becomes evident from around the age of eight years to early adolescence and in many cases is a development antecedent to Conduct Disorder (APA, 2000). A DSM IV TR (APA, 2000) diagnosis of ODD requires frequently occurring negativistic, hostile and defiant behaviour manifesting in at least four of the following behaviours: losing temper, frequent arguing with adults, defying adult instructions or rules, annoying and blaming others, being easily annoyed, angry and resentful, spiteful and vindictive occurring for at least six months and with clear evidence of significant impairment

in social, academic or occupational functioning (APA, 2000). Additional behaviours include persistent stubbornness, unwillingness to compromise, give-in or negotiate with adults or peers, deliberate or persistent testing of limits and verbal (and minor physical) aggression (R W Greene, Ablon, & Goring, 2003).

History:

ODD was first termed *oppositional personality disorder* by the Group for the Advancement of Psychiatry (1966) and described children who expressed aggressiveness through oppositional behaviour. DSM-III (APA, 1980) termed ODD as *oppositional disorder* with an expanded definition including persistently disobedient, negativistic and provocative opposition to authority figures manifested by violations of minor rules, temper tantrums, argumentativeness, provocative behaviour and stubbornness. In the DSM-III-R (APA 1987), the name changed to *Oppositional Defiant Disorder* and the number of diagnostic criteria were increased to nine with five required for a diagnosis. In the DSM-IV (APA 1994) an item referring to use of swearing and obscene language was removed and an impairment criteria related to social, academic and occupational functioning was added and number of criteria for diagnosis was reduced to four.

Natural History:

ODD symptoms tend to remain stable with studies confirming persistence in 71% after 2.5 years (P. Cohen, Cohen, & Brook, 1993) and 50% persistence at one year follow up (Costello, Angold, & Burns, 1996) with indications that ODD can be a precursor of CD (R Loeber et al., 2000). Low economic status and parental substance abuse are regarded as predictors of CD in boys with ODD (R. Loeber, Green, Keenan, & Lahey, 1995). Affiliations with

delinquent and drug-using peers and poor attachment to parents are also associated with progression and poorer outcomes (Fergusson & Lynskey 1998).

Comorbidity:

In community samples ODD has been found to be comorbid with conduct disorder >82% (B. Lahey & Loeber, 1994), major depression 9%, anxiety disorder 14%, ADHD 14% particularly with predominantly hyperactivity or the combination type (R Loeber et al., 2000).

Aetiology:

Genetic and environmental factors may contribute to the aetiology of ODD, although results are inconclusive and influenced by instrument and informant. Levy, Hay and McLaughlin (1996) found no differences in ODD behaviours between twins and siblings in a preadolescent sample and Gjone and Stevenson (1997) and Rende and Pomin (1995) found a genetic influence on temperament and aggression. Environmentally, ODD has been suggested as the child's response to an over controlling family where a lack of effective problem solving skills and high levels of criticism and blame by the parents are present (Donnenberg & Weiss, 1997).

Treatment:

A variety of psychological, behavioural and pharmacological treatments are applied to children with ODD. For efficacy, treatments need to consider age, type, range and severity of problems and comorbidity in addition to family needs, commitment and emotional resources (Rey & Walter, 1999). ODD children can also be noncompliant in committing to treatment. Pharmacological interventions include similar medications to those used with ADHD, often

due to comorbid aspects of diagnosis. Anti-depressants with selective serotonin reuptake inhibitors (SSRI) have been found to be effective in reducing arguments with adults, temper outbursts and aggression (Zubieta & Alessi, 1992) and Methylphenidate (Ritalin) has been reported to reduce defiant and aggressive behaviour by 50% (Klein, Abikoff, & Klass, 1997) but the safe use of these medications are under question (Graham, 2008; B Kean, 2007; Lambert, 2005; Lambert & Hartsough, 1998; Wicks-Nelson & Israel, 2003). Parent training has been found to be the most successful means of reducing aggressive, non-compliant and anti social behaviours. Common features of successful programs include promoting and practicing pro-social interactions between child and parent; training to identify, define and observe problem behaviours; management contingencies using rewards for pro-social behaviour and time out and loss of privileges for anti-social behaviour; school involvement in the program. Cognitive problem-solving skills training is another treatment approach. Common features of this approach emphasise thinking about solutions to problematic situations, the use of positive affirmations, the incorporation of games, academic activities and stories with increasing application to real life situations and modelling, prompting and feedback being provided by the therapist (Wicks-Nelson & Israel, 2003).

2.1.3.5 Conduct Disorder (CD)

CD is a behavioural disorder with an onset in childhood or adolescence. It manifests as mild, moderate or severe. A diagnosis of CD in accordance with DSM IV-TR (APA, 2000) requires repetitive and persistent patterns of behaviour where the basic rights of others, societal norms or rules are violated. Criteria for diagnosis includes: aggressive conduct which causes or

threatens physical harm to other people or animals; non aggressive conduct that causes property loss or damage; deceitfulness or, theft, and serious violations of rules and/or lying. At least four of the preceding behaviours need to have occurred within the previous six months and one within the previous 12 months with evidence of significant impairment in social, academic or occupational functioning (APA, 2000).

Natural History:

Conduct disorders have been reported as the most frequent reason for clinical referrals to child and adolescent mental health facilities (J. Hill & Maughan, 2001). Childhood onset has a more severe prognosis than adolescent onset with 40% developing into Adult Anti-Social Personality Disorder where criminality, unstable relationships, substance abuse, child abuse, psychiatric disorder and harsh parenting is evident (Kazdin, 1995b). Adolescent onset on the other hand tends to appear in the context of being part of a gang culture to meet basic survival needs. Although present across the socio-economic spectrum, CD is more frequently diagnosed in lower socio-economic groups (Searlight, Rottneck, & Abbey, 2001).

Aetiology:

Aetiology of CD includes genetic, family and social factors. Hereditary factors are associated with decreased baseline autonomic nervous system activity, requiring greater stimulation for optimal arousal, which is associated with higher risk taking behaviour (Searlight et al., 2001). The neurotransmitter, serotonin, is also implicated in aggression (B. B. Lahey, Hart, Pliszka, Appelgate, & Mc Burnett, 1993; Searlight et al., 2001). Family dysfunction including substance abuse, psychiatric illness, martial discord, child neglect and abuse, inconsistent parent availability and discipline particularly present in low socioeconomic groups, all

contribute to increased risk. Patterns of irritability, inconsolability and a lack of social responsiveness frequently established early in childhood also contribute to the severity of CD.

Comorbidity:

CD is associated with a 46% increased risk for other childhood and adolescent disorders including hyperactivity and emotional disorders. Associations with ADHD are inconclusive; however, research indicates that children with ADHD after the age of 16 are significantly more likely to meet CD criteria (Gittelmann, Mannuzza, Shenker, & Bongura, 1985) and at follow up at the age of 26 years, criteria for Antisocial Personality Disorder (APD). Other studies suggest that CD is more severe and persistent where ADHD is present (R Loeber et al., 2000). The ADHD symptoms of hyperactivity and impulsivity have a stronger relationship with CD than ADHD children with predominating inattention (Babinski, Hartsough, & Lambert, 1999). In regards to anxiety, 25% of children with CD meet the criteria for an Anxiety Disorder. Associations between mood disorders and CD are of increasing concern due to the tendency for the more severe outcomes of serious and life threatening psychiatric conditions leading to substance abuse and suicide (Buydens-Branchey, Branchey, & Noumair, 1998).

Treatment:

Intervention by parents and caregivers, although an important aspect of treatment, is problematic because parents frequently display high levels of psychopathology that result in poor parenting. Such compounding factors complicate treatment delivery. Initially, counselling for parents is recommended followed by the services of mental health specialists with the inclusion of detoxification programs where substance abuse is present. Monitoring of the CD child's activities and whereabouts by caregivers combined with organized, supervised

activities is crucial for intervention efficacy. In addition, strategies and consistent reinforcement of positive behaviours need to replace parental coercion. Pharmacotherapy involving the use of stimulants, anti-depressants, lithium, anticonvulsants and clonodine may address the various presenting symptoms of this complex disorder but like treatments for ADHD and ODD, the safe use of these medications has not been established.

Table 1: Prevalence, Familial Pattern, Persistence, Comorbidity and Treatment of Behaviour Disorders

]	Prevalence	Familial	Persistence	Comorbidity	Treatment
ADHD	Childhood:4-9:1 (clinical) males/ female (APA, 2000) Adulthood: > 40% (Cantwell, 1996)	Genetic factors contribute. Twins 30%-80%. Biological parents 3X more likely to have ADHD than non-biological parent (Albayrak et al., 2008). First degree biological parents frequently have MD; AD; LD; SRD, ASPD. (APA 2000)	Syndromal persistence: drops 50% every 5 years, Symptomatic persistence: much higher -50-80%: Adolescents girls symptoms more obvious (Hazell 2008)	ODD: 40-67% CD: 20-56% AD: 10-40% MD: 0-30% LD:25-50% (Barkley, 2000)	Pharmacotherapy: psycho-stimulants, anti-depressants; (Wicks-Nelson & Israel, 2003) Psycho-social: behaviour management/modification; curriculum modification; specific teaching strategies; cognitive behaviour therapy; social skills; neuropsychological intervention; (Wicks-Nelson & Israel, 2003) Alternative and controversial: biofeedback; yoga; sensory integration; diet; massage; (Rojas & Chan, 2005)
ODD	2-16% USA (APA 2000) More frequent in males than females in childhood but equalizes in adolescents.	Associated with parent ADHD, CD, ASPD, SBD, MD and serious martial discord (APA2000); .	Evident before 8 years and not later than early adolescents. Symptoms usually emerge in the home and overtime appears in other settings. Childhood-onset often a precursor to CD.	ADHD: 61-67% Harada, et al., 2002 Community sample : Child/adolescent CD: 14X/ 7x AD: 5X MD:15X	Pharmacotherapy: stimulants, anti depressants; Parent training; Behaviour management /modification; Cognitive behaviour therapy(Wicks-Nelson & Israel, 2003).

				(Rey & Walter, 1999)	.
CD	6-16% boys; 2-9% girls (USA)(APA 2000, Searlight et al., 2001) <1%-10% in general population studies (APA 2000)	Genetic and environmental components. Risk increases with biological or adoptive parent with ASPD. Biological parent with Alcohol Dependence; MD, Schizophrenia and ADHD (APA 1994).	Can occur in early childhood but significant symptoms emerge in middle childhood to middle adolescence. Early onset predicts worst prognosis Disorder tends to remit by adulthood but a substantial proportion meet criteria for Antisocial Personality Disorder (APA 2000)	ODD: 96% ADHD: 35-70% AD: 19-53% MD: 12-25% (Wicks-Nelson & Israel, 2003)	Pharmacotherapy: psycho-stimulants; anti-depressants (Wicks-Nelson & Israel, 2003) Behaviour management/modification; Parent training; Cognitive behaviour therapy (Wicks-Nelson & Israel, 2003)

Note: ASPD: Anti-Social Personality Disorder; MD-Mood Disorder; SRD-Substance Related Disorder; LD Learning Disorder; AD: Anxiety Disorder.

2.1.4 Comorbid Disorders

Comorbid disorders include the internalising behaviour problems of Anxiety Disorder (AD) 6-24% (Milberger, Beiderman, Faraone & Tsuang, 1995; Beiderman et al., 1996b; Jensen et al., 1997); and Mood Disorders 20% (P. Hill, 1998; Wicks-Nelson & Israel, 2003). Learning Disabilities 10-92% (large range due to difficulties with diagnostic confusion and discrimination), (Jensen et al., 1997) can also be comorbid.

2.1.4.1 Anxiety Disorders

Anxiety disorders are frequently comorbid with disruptive behaviour disorders and include Post Traumatic Stress Disorder (PTSD), Obsessive Compulsive Disorder (OCD), Generalised Anxiety Disorder (GAD), and Separation Disorder (SD) (APA 2000). Following are brief descriptions of these anxiety disorders according to DSM-IV-TR (APA 2000).

Post Traumatic Stress Disorder (PTSD)

PTSD can occur after exposure to a traumatic event involving death or threat of death or serious injury or where threat to physical integrity causes fear, helplessness or horror and for children this can be accompanied by disorganized or agitated behaviour. Symptoms include re-experiencing of the traumatic event, persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness and persistent symptoms of increased arousal. Symptoms must be present for more than one month and disturbance must cause clinically significant distress or impairment in social, occupational or other important areas of functioning (APA, 2000).

Obsessive Compulsive Disorder (OCD)

OCD describes time consuming recurrent obsessions or compulsions that cause distress or significant impairment and aim at reducing stress and anxiety. Obsessions are intrusive and inappropriate persistent ideas and thoughts commonly involving thoughts about contamination, doubts, order, aggressive or horrific impulses and sexual imagery with suppression or neutralizing achieved with another action or thought. Compulsions are repetitive behaviours (hand washing, ordering, checking) or mental acts (praying, counting, repeating words silently) that are not meaningfully connected to reality (APA, 2000).

Generalised Anxiety Disorder (GAD)

GAD features pervasive anxiety and worry frequently occurring for at least six months concerning events or activities (such as work or school performance) social. GAD affects occupational and other important areas of functioning. Symptoms include restlessness, fatigue, difficulty concentrating, irritability, muscle tension and sleep disturbance (APA, 2000).

Separation Anxiety Disorder (SAD)

SAD features excessive anxiety concerning separation from the home or from those to whom the person is attached. This behaviour must last for at least 4 weeks and cause significant impairment in social, academic or other important areas of functioning. Behaviours include wanting to know the whereabouts of the attachment figures and needing to stay in touch with them. For children fears can include getting lost and never being reunited with the attachment figures or their homes or being unable to stay alone or needing to follow the attachment figure around the house. They can also experience nightmares of loss of attachments in a catastrophic manner (APA, 2000).

2.1.4.2 Mood disorders

Mood disorders (MD) including emotional disorder (ED) also present as comorbid disorders in young people with a disruptive behaviour disorder. Mood disorders generally comorbid with disruptive behaviour disorders are predominantly depression with a lesser incidence of bi-polar disorders (APA, 2000).

Depression

Depression can develop from social and school problems, substance abuse and from genetic factors (REF). According to DSM-IV TR (APA 2000), depression includes Major Depressive Episode and Dysthymic Disorder, which describes chronic depressed moods that occur most days for at least two years. In addition there are several specific features and triggers (including substance abuse) for depression noted.

Emotional Disturbances

Emotional disturbances as defined by the Centre for Mental Health Services (the federal agency within the U.S. Substance Abuse and Mental Health Services Administration) describe young people (<18 years) who have a diagnosable mental, behavioural or emotional disorder as classified in the DSM-III R or ICD-9-CM and subsequent revisions that cause functional impairment which considerably limits the young person's ability to gain and maintain developmentally appropriate social, behavioural, cognitive, communicative and adaptive skills necessary for functioning in family, school and community environments (CMHS, 1996). The DSM-IV-TR does not have an Emotional Disorders section but children in three of the schools that participated in this study were classified by the Department of Education and Training as emotionally disturbed with high levels of disruptive behaviour.

2.1.4.3 Learning Disorders

Reading disorder, mathematics disorder and disorder of written expression are frequently comorbid with disruptive behaviour disorders.

Reading Disorder

Essential features include a lower than expected reading accuracy, speed or comprehension for age, intelligence and age appropriate education. In the USA, reading disorder effects approximately 4% of school aged children with 60-80% being males (APA, 2000).

Mathematics Disorder

Essential features include a lower than expected mathematical calculation and reasoning ability for age, intelligence and age appropriate education and significantly interferes with academic achievement or with daily living requiring mathematical skills. In the USA, mathematics disorder effects approximately 1% of school aged children (APA, 2000).

Disorder of Written Expression

Essential features include a lower than expected ability to compose written text. Text includes grammatical and punctuation errors, poor paragraph organization, multiple spelling errors and poor hand writing skills for age, intelligence and age appropriate education. Prevalence has been difficult to establish, but is usually associated with other learning disorders (APA, 2000).

2.1.4.4 Asperger's Syndrome and Autism Spectrum Disorders

Disruptive behaviour can often accompany Aspergers Syndrome and Autism and some of these young people are placed in alternative school settings with students with disruptive behaviour. Aspergers Syndrome according to DSM-IV-TR (APA, 2000) features severe and sustained impairment in social interaction and the development of restricted, repetitive patterns of behaviour, interests and activities. The disorder causes clinically significant impairment in social, occupational and other important areas of functioning. There are no significant delays in language or cognitive development or in the development of age appropriate self help skills, adaptive behaviour or curiosity about the environment in childhood. Autism according to DSM-IV-TR (APA, 2000) describes the child who has sustained impaired social interaction and verbal and non-verbal communication skills and a restricted repertoire of activity and interests.

2.1.5 Alternative and Complementary Health Approaches

For varying reasons, there is a growing body of evidence indicating that families affected by ADHD are interested in alternatives to conventional treatment (Baumgaertel, 1999; Doggert; Rojas & Chan, 2005; Stubberfield & Parry, 1999). Respondents of an ADHD caregivers survey (n=290) indicated that 64% had used alternative therapies and 60% dietary manipulation (Stubberfield & Parry, 1999).

Studies using yoga, neuro/biofeedback, dietary changes, massage and chiropractic methods claim efficacy in treating ADHD but according to a review by Rogas and Chan methodological flaws including small sample sizes, heterogeneous samples, a lack of control

comparison groups and limited measurements of behavioural and cognitive outcomes have limited conclusive results although many of these treatments are showing promise.

Biofeedback/neurofeedback training is a process of feeding back to the individual information on the status of brain wave activity. This training has been found to be effective in increasing deficits in beta and reducing predominating theta wave lengths in ADHD (J. Lubar, Smartwood, Smartwood, & O'Donnell, 1995; J. F. Lubar, 1991) but this treatment is said to require a great deal of motivation and is very costly and time consuming (Rogas & Chan 2005). A recent study (Baillie, 2008) has found positive results from the use of computerised games to induce a relaxation response. Dietary changes have been the feature of numerous studies aiming to reduce ADHD symptoms. The primary dietary interventions that have emerged are the Feingold or additive free diet, the oligoanti-genic diet and the sugar restricted diet (Rogas and Chan 2005). Results are diverse in reported efficacy. Some indicated improvements in parent and teacher ratings whereas some did not. Obviously, larger studies with more sensitive measures are required.

Baumgaertel (1999) indicated that although self-regulatory techniques such as hypnotherapy and biofeedback were found unhelpful in altering the core symptoms of ADHD they were helpful in controlling secondary symptoms of academic under-achievement, cognitive impairment, diminished self-esteem and confidence and social and family dysfunction. These methods are regarded as unique in ADHD treatment because children with ADHD are the active agents of their own coping strategies. Yoga is also a treatment that promotes self-regulation and has been found to reduce core symptoms and some comorbid and secondary symptoms (oppositional and emotional lability) of ADHD as perceived by parents (Haffner, Roos, Goldstein, Parzer, & Resch, 2006; P. S. Jensen & Kenny, 2004).

2.1.6 Educational Approaches to Disruptive Behaviour

2.1.6.1 School Behaviour Policies

In response to DB and as a means of maintaining discipline, schools have developed discipline and behaviour policies. Behaviour policies in public schools within the Department of Education and Training (DET) (NSW Australia) generally involve behaviour management strategies and graded systems of monitoring students whose behaviour is assessed as unacceptable or inappropriate. Schools struggle to adequately deal with disruptive behaviours and frequently resort to punitive measures that result in exclusion within and outside the classroom, detention, suspension and to a lesser degree expulsion. The recognition of the severity of the problem in conjunction with other student welfare problems has lead to the employment of regional welfare officers, home liaison officers, sub-care teachers (for state wards), itinerant support teachers for behaviour, teachers for behaviour classes and school counsellors. In addition, schools are advised to form learning support teams to support students with special needs (DET, 1998). However, in my professional experience, the number of teachers employed in these positions is limited and many schools require more resources. Disruptive behaviours and the implementation of measures to deal with them are time consuming, expensive and stressful for students and school staff without necessarily achieving desired outcomes.

2.1.6.2 Behavioural Management

2.1.6.2.1 Behaviour Modification and Reinforcement

Behaviour modification and reinforcement, cognitive-behavioural approaches and appropriate curriculum modification and delivery are the primary strategies for managing disruptive behaviour in the classroom and school environment (Barkley, 1998; Damico & Armstrong, 1996; Jarman, 1996; Wicks-Nelson & Israel, 2003; Wilkinson & Meiers, 2007).

Applied Behaviour Analysis (ABA) (Nelson, Scott & Polsgove, 1999) evolved from the work of Skinner (1953) and was subsequently developed by Lindsley (1972) and Kazdin (1978). ABA advocates the reinforcement of positive behaviours with concrete and tangible rewards and consequences or punishments for unacceptable or inappropriate behaviour. Consequences for acceptable and unacceptable behaviours are delivered by teachers and school executive staff and supported by the governing educational authority. ABA expanded into a social learning theory (Bandura, 1977), interaction analysis and cognitive behaviour modification (Patterson, Reid & Dishion 1992, cited in Nelson et al., 1999). Social learning theory considers the role cognitive processes play in behavioural sequences and interactional analysis. It focuses on child-parent and child-peer relationships and the effects of socio-economic factors in contributing to poor long term social outcomes (Nelson et al., 1999). Applied behaviour analysis has formed the foundation for a range of strategies for children with hyperactive/impulse, attention and/or non-compliance problems (Barkley, 2001; P. Cohen et al., 1993; Fowler, 1992; Patterson & Wardanian, 1998; Rice & Richmond, 1997). These encompass consequences that are frequent, instantaneous and salient with positive consequences being delivered before negative consequences. Although applied behaviour

analysis strategies are widely applied, current research is exploring strategies known as positive behaviour support (PBS) which emphasises positive social and academic outcomes and minimises negative consequences. Functional assessments and behaviour support plans are also becoming increasing adopted for students with disruptive behaviour (DET; Nelson et al., 1999).

Although theoretically robust, (Nelson et al., 1999) behaviour management's efficacy is dependent on the quality, consistency and frequency of delivery. A USA National study on school programs for children with emotional and behavioural disorders found that programs overemphasized and misused token economies, minimally used academic teaching strategies, and rarely taught social skills, offered insufficient counselling and therapy and did not offer adequate support for students' transition needs (Knitzer, Steinberg, & Fleisch, 1990). Greene (1995) noted that teacher variables such as teacher flexibility, teacher-student compatibility, tolerance for disruptions and teacher competence in implementation and management play a major role in effectiveness of behaviour and classroom management. Behavioural programs are both time consuming and effortful (Wicks-Nelson & Israel, 2003). Behaviour management alone, in view of teacher variability in competence, has been found to be less effective than medication alone for hyperactive and inattentive behaviour problems, but in conjunction can deliver better outcomes than either alone (Newcorn, 2000).

2.1.6.3 Psycho-social intervention

Psycho-social approaches aim to promote self-regulation through teaching problem solving strategies, anger management and social skills and communication skills thus reducing the

need for teacher control. (Damico & Armstrong, 1996; R W Greene & Ablon, 2001; Jarman, 1996; Porter, 1996). Examples of programs are *Helping Increase the Peace Program* (Anderson, 1999), *Talk Sense to Yourself* (Wragg, 1989), Mind Matters (Sheehan et al., 2000), *Skill Streaming the Elementary School Child* (McGinnis & Goldstein, 1990) *Skill Streaming the Adolescent Student* (McGinnis & Goldstein, 1990) and *Circle Time* (Roffey, 2006).

2.1.6.4 Classroom and Teaching Strategies

Classroom management, organization, curriculum modification and appropriate teaching styles are necessary for teaching children with disruptive behaviour. These include regular use of visual aides, oral testing, organizational tools (colour coding, lists), keeping tasks short, displaying rules clearly and graphically and referring to them regularly, seating proximity to teacher (Barkley, 2001; Patterson & Wardanian, 1998; Wicks-Nelson & Israel, 2003). The use of appropriate teacher language is important for effectively communicating expectations, acknowledgement and correction (Richmond, 2007). Building positive and appropriate relationships with students promotes positive student behaviour (Mirsky, 2003; Wilkinson & Meiers, 2007). These strategies are dependent on teachers' knowledge, training, adaptability and experience without which disruptive behaviour will failed to be managed appropriately.

2.1.6.5 Alternative Settings

Some educational institutions including DET, NSW have faced increasing pressure to remove students who are not responding to behaviour management and/or medical treatment from mainstream classrooms and have established a number of alternative school placements. For DET, NSW this has taken the form of suspension centres n=22, tutorial centres n=40 and special schools for behaviourally and emotionally disturbed students schools n=35 (Planning and Innnovation DET, 2006). Although this strategy is at odds with "inclusive education" for students with behaviour problems (Bennett, DeLuca, & Bruns, 1997; Cook, Semmel, & Gerber, 1999; de Jong & Griffiths, 2006) the safety of staff and other students is an important factor in addition to the continued delivery of curriculum to all students. DET, NSW behaviour schools and schools for behaviour disorders (mental health diagnosis required), which will be referred to as Schools for Disruptive Behaviour (SDB) restrict enrolment numbers to approximately 28 students, with up to seven students per class. Teachers have special education qualifications or experience in special education and are supported by a teachers' aide (Planning and Innnovation DET, 2006). Enrolments in these settings comprise less than 1% of the total school population in NSW. According to DET, NSW, (2005/2006) consensus there were 274 (29 female)/304 (91 female) enrolments in behaviour schools, 123 /202 enrolments in behaviour classes, 545 (113 female), 519 (38 female) in schools for the emotionally disordered and 517/504 in classes for the emotionally disordered and 350 (18 female)/296 (15 female) enrolments in Juvenile Justice DET schools. Combined, these numbers represent is .24 % of the 741,578 total enrolments in 2005 and .25 % of 740,415 total enrolments in 2006 (Planning and Innovation DET, 2005 ; Planning and Innnovation DET, 2006).

Alternative Education Placements in DET NSW schools aim to be re-integrate students into their home school or help them transition into the workplace. The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) in Western Australia (WA) commissioned a nation wide survey on programs that exhibit best practice in addressing student behaviour issues (de Jong & Griffiths, 2006). Alternative Education Placements (AEP) was one of the programs in the survey and de Jong & Griffiths, (2006) reported advantages and drawbacks of such programs. It was argued that successful AEPs involve organisation and partnerships that adopt a "holistic/systems/wraparound" framework with parent and community participation, interagency collaboration and a shared vision with an emphasis on relationship building. AEPs that provide mentoring and role modelling from highly qualified staff capable of providing a supportive, non threatening learning environment are the most successful in meeting the needs of students. Behaviour management, when integrated into the educative process, encouraged student ownership of their learning program, included planned future pathways, improved literacy, numeracy, resilience, self-understanding and life skills. However, AEPs may negatively label students, reduce self-esteem, increase behaviours targeted for modification and show poor sustainability if inadequately resourced and staffed. Male students from minority culturally and linguistically diverse communities were noted as forming the majority of those students placed in AEPs. De Jong and Griffiths, (2006) also expressed a concern that AEPs could become "dumping grounds" for unmanageable students and should be considered as a last resort.

2.1.6.6 School Culture

School culture is shaped by its theoretical approach to learning and behaviour. Many schools follow policies that support the applied behaviour analysis theory of reward and punishment. Some schools have progressed to extreme policies such as "three strikes and you are out" and zero tolerance resulting in expulsion of many students (B. A. Fields, 2002; Quinn & Rutherford, 1998). Other schools have expanded their mandate to address the emotional and social developmental needs of students which has traditionally been the province of the home and community. One such approach is R*estorative Practice,* which is a whole-school approach to behaviour (Mirsky, 2003). Restorative practice evolved from *Restorative Justice* that views disruptive and antisocial behaviour and crime as an outcome of conflict between individuals, resulting in harm to victims, communities and perpetrators and where rule /law breaking is a secondary consideration (Umbriet & Coates, 1999; Van Ness, 1993). Problematic behaviour is understood as a breakdown in relationships, resulting in situations of conflict that should not primarily be punishable with suspension or exclusion. This approach has been successfully trialled throughout Australia (Queensland Department of Education, 1996; Education Queensland, 1998; Strang, 2001) but it requires resources for training staff in a holistic school-wide approach to abandon a control/punishment orientation in favour of *Restorative Practices* (Fields 2002)

2.1.7 Psychophysiology of Disruptive Behaviour and Comorbid Disorders

Although aetiology has been discussed previously under the behaviour disorders headings, the following review deals with psychophysiology across the spectrum of behaviour disorders and includes comorbid disorders. Dysfunction in the central and the autonomic nervous systems and endocrine systems are implicated in externalising and internalising behaviour disorders. The autonomic nervous system (ANS) psycho-physiological parameters include heart rate, heart rate variability, skin conductance levels (electrodermal reactivity) and blood pressure in addition to respiration (Boyce et al., 2001; Garralda, Connell, & Taylor, 1991; Rogeness, Cepeda, Macedo, Fischer, & Harris, 1990; van Lang et al., 2007; Zahn & Kruesi, 1993). The central nervous system parameters include neurotransmitter functioning (Levy, 1991; Plizska et al., 1996; A. J. Zametkin & Liotta, 1998) (previously discussed in section 2.1.3.3 and the endocrine system includes hormones associated with stress and aggression (Dmitrieva, Oades, Hauffa and Eggers, 2001; Garalda, Connell, Taylor's, 1991; McBurnett, Lahey, Rathouz, Loeber, 2000; Pine, et al., 2006). Stress levels are modulated in the overall functioning of all these systems (Berridge & Waterhouse, 2003; Plizska et al., 1996; Ramos & Arnsten, 2007).

Boyce et al. (2001) found low reactivity in children (n=122) with externalising behaviour problems in both branches of the ANS (sympathetic and parasympathetic) and high reactivity in children with internalising behaviour problems mainly in the parasympathetic branch, compared with peers with no symptomatic behaviour.

Rogeness et al.,(1990) found that children (n=589) with conduct disorder (CD) had a lower heart rate than children without CD and children with Separation Anxiety had a higher heart rate than children without an Anxiety Disorder. Children with Major Depressive Disorder had higher systolic blood pressure than children with CD but did not differ on heart rate.

Garralda et al. (1991) examined autonomic reactivity to different tasks, in children with CD (n=25) and Emotional Disorder (n=25). The children with conduct disorder displayed increased skin conductance levels to pleasurable tasks but decreased skin conductance levels to an intense emotionally yet neutral task and also failed to reduce skin conductance during a silent period. The children with emotional disorders displayed higher skin conductance levels to the anticipation of unpleasant and challenging tasks and higher heart rate reactivity to the actual unpleasant task. Both groups showed low heart rate reactivity to an arousing task and to silence. The children with conduct disorder responded negatively to reward is of particular interest when considering that many behaviour management strategies are based on a reward /negative consequences model. In addition, it has been suggested that the inability to reduce arousal to silence and increase arousal to neutral stimulation in conduct disordered children may underlie the excessive activity and impulsivity often found in children with disruptive behaviour and may manifest in 'sensation seeking' and risk taking activities in an unconscious effort to increase arousal (Gorenstein and Newman, 1980, Cloninger, 1988, Zuckerman, 1988 cited in Garralda, Connell, Taylor, 1991).

Endocrine system functioning involving stress and aggression hormones has been found to be effected in behavioural and emotional disorders. Dmitrieva, Oades, Hauffa and Eggers (2001) investigating the proposal that Conduct Disorder may originate with a stressful upbringing and be associated with physical, sexual and thyroid dysfunction. Hormone levels from the

adrenal, gonadal and growth hormone axes, associated with stress, aggression and development were measured in (n=28) CD patients and (n=13) healthy children matched for age (10-18years old. The CD group had higher levels of dehydroepiandrosterone sulphate (DHEA-S) (correlated with smaller physical measures and disruptive behaviour ratings), cortictropin (ACTH) (associated with aggression) and free Tri-oiodothyronine (fT_3) (both correlated with restless-impulsive ratings) if under 14 years. There were no differences between groups for cortisol levels (associated with stress) or gonadal hormones or maturity ratings (not associated with aggression). Authors suggested that adrenal and growth axes may have neurotropic repercussions in development.

McBurnett (2000) measured salivary cortisol levels in CD boys (n=38) mean age 9.75 years (SD 1.7) aged between, 7-12years. Salivary cortisol concentration was found to be low and was associated with persistent and early onset of aggression measured from four annual child psychodiagnostic evaluations of CD symptoms and from peer assessments. However, with conduct disordered boys (n=67) aged between 8 and 13 years with comorbid anxiety (K. McBurnett et al., 1991) cortisol levels were found to be high.

Breathing disorders are also associated with childhood and adolescent hyperactivity and anxiety disorders. Atypical ventilatory physiology involving significantly larger minute ventilation[1], larger tidal volumes[2] and more variable breathing patterns in room breathing and

[1] Minute Volume=Breath rate +Tidal Volume (http://www.unisanet.unisa.edu.au/12925/resp_adapt_to_exercise.pdf)

[2] Tidal volume is volume of air inspired or expired during a regular (The American Heritage® Medical Dictionary Copyright © 2007, 2004 by Houghton Mifflin Company. Published by Houghton Mifflin Company)

in exposure to CO^2 exposure is evident in anxiety (Pine et al., 2006) and children with suspected sleep disordered breathing display hyperactivity in addition to daytime sleepiness (Ma, Melendres, Lutz, Marcus, & Marcus, 2004).

Stress as a factor in behaviour problems is becoming increasingly evident (Ramos & Arnsten, 2007). The pre-frontal cortex of the brain, known to guide and control behaviour under non-stressful conditions is known to go "off-line" during stress. In response, the posterior and subcortical regions come "on-line" in response. Both systems are modulated by noradrenalin. This neurochemical switch has been associated with survival instinct which allows a "habitual and reflexive mechanisms to control behaviour during dangerous conditions" (Ramos & Arnsten, 2007) (page 531). It is suggested that this "neurochemical regulation may make the prefrontal cortex vulnerable to dysfunction in daily lives and in psychiatric disorders such as ADHD, particularly under conditions of repeated or uncontrollable stress" (Ramos & Arnsten, 2007) (p.531). This action in the noradrenergic neurons also contributes to the stress response in the autonomic nervous system via the sympathetic nervous system where adrenalin is released by the adrenal medulla which leads to increases heart rate, enhancement of pulmonary function and increases in blood pressure, which prepare the body for the flight or fight response (Ramos & Arnsten, 2007).

2.1.8 Self Regulation

A self-regulation theory, proposed by Kuhl (2000) is comprised of mechanisms that facilitate-self-regulation and self-control and mechanisms that inhibit self-regulation- volitional inhibition, volitional avoidance and self-inhibition. Self-regulation is said to comprise of a

number of unconscious psychological skills and actions related to attention and decision control, self-motivation and mood management. Deficits in self-regulation are defined as rumination, preoccupation and alienation. Mechanisms associated with self-control are planning, impulse control and taking initiative.

Linked to this theory, is Barkley's model of behavioural disinhibition which he proposed is a major factor in ADHD. In this model, behavioural disinhibition describes an inability to inhibit impulsive responses; the inability to stop an ongoing response that is proving maladaptive; and the inability to control for interference by competing stimuli. He proposes that behavioural inhibition is functioning ineffectively in the four executive functions:- working memory; self regulation of affect/ motivation /arousal and the ability to detect and modify stimulus (rendering ADHD children emotionally unstable and less objective), internalisation of speech (characterised in ADHD children by excessive talking, lack of organisation and rule oriented self speech); and reconstitution (seen in ADHD children as diminished ability to analyse and synthesis information and generate multiple plans of action in the service of goal oriented behaviour and creativity) (Barkley, 1996).

Self-regulation also relates to Bandura's (1997), study of self-efficacy. Bandura found that self-efficacy was the most powerful predictor of persistence in learning and effective academic outcomes. This conclusion was reached over two decades of investigation of applying the principles developed in social learning theory to academic performance.

Emotional regulation has been defined as the extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying emotional reactions to accomplish one' goals (Thompson, 1994, cited in Zenman et al., 2002). Poor emotional regulation is intricately linked with disruptive behaviour and forms part of most childhood psychopathology, affecting

social functioning, academic outcomes and psychosocial maladjustment (Zenman, et al., 2002). Being aware of the emotions that accompany behaviour is an essential aspect of competent emotional functioning.

The theories of Kohl (2000), of Barkley (1996) and Bandura (1997) and the work of Zenman et al., (2000) emphasis that self-regulation is an extremely important component of functioning effectively on a social, emotionally and mental level.

For children with externalising and internalising disorders, the lack of self regulation has increased the need for treatments and strategies to control for this deficit. Treatments such as medication and behaviour management strategies are two of these treatments, however these treatments do not teach self-regulation, in themselves but result in regulating the undesirable behaviours.

A treatment strategy, less discussed is the effect of exercise on self-regulation. In a wait-listed control study, Oaten and Chen (2006) found that self-regulation significantly increased after an exercise program for sedentary undergraduate students compared with controls. Using a visual tracking task, under distraction (thought suppression task) significant improvements in performance were seen over time, over session and over session by time in the exercise group and in group by time interaction favouring the exercise group. These results indicate improvements in regulatory stamina and in resistance to distraction. Self-reported behaviour measures also indicated improved self-regulatory behaviour over time and group by time favouring the exercise group. Decreases were found in consumption of coffee, alcohol and cigarettes and a reduction in stress and emotional distress. Increases were found in healthy eating, emotional control, maintenance of household chores, attendance to commitments, monitoring of spending, and improvement in study habits. Although the Oaten and Chen

(2006) study sample were students without disruptive behaviour, results are relevant to the problems experienced by young people with disruptive behaviour.

Associations between exercise (treadmill walking) and ADHD have been reported by Tantillo and colleagues (2002) in a control study that tested the rate of spontaneous blink rate, in children with and without ADHD (n=18, n=25). Findings indicated children with ADHD displayed significant increases in spontaneous blink rate, after maximal exercise. Although authors do not conclude that these findings are sufficient to determine a dopamine effect of exercise they consider that it is sufficient evidence to warrant further investigation.

Yoga is another treatment that promotes conscious self–regulation through developing self-awareness and unconscious self-regulation on a physiological level through the regulation of the central nervous system and the autonomic nervous system. Yoga practices combine body movement in the form of yoga postures, conscious regulation of the breath and conscious relaxation and meditation practices. The following sections of the literature review the background of yoga in theory and in practice. The empirical research presented conveys the implications and the applications of a broad field of yoga research to disruptive behaviour.

2.2 YOGA Review

2.2.1 Definition and Origins

The subject of yoga is broad, diverse, and complex and encompasses philosophy, yogic physiology and psychology and a wide range of techniques attached to the many branches of yoga that have evolved over millennia. It is not within the scope of this literature review to give a detailed explanation of this system, therefore only aspects of

yoga relevant to this thesis will be discussed. The relevance may not appear obvious until the last chapter in the literature review where an attempt to substantiate parallels between the evolving western scientific explanation of behaviour and the yogic explanation.

The word *yoga*, translated from the Sanskrit word, conveys the concept of union, joining, binding, to hold fast (Eliade 1973). In the context of yoga's origins, this union can be interpreted as a union between the human spirit (*yoga*) with the universal spirit (*samkhya*). *Samkhya* concerns the macrocosm in nature and the universe and yoga concerns the microcosm, the internal world of the human being, both of which are interdependent. Yoga can be defined as the exploration of the body–mind in which consciousness resides, where analysis of the structures of the internal universe and study and development of latent powers enable an ability to go beyond the barriers of the senses, and the limitations of elative time and space (Y. A. Satyananda, 2007a). Within all yogic paths is the process of becoming non-attached to all that binds humans to the material world or matter (*prakriti*). Yogic thought equates attachment to possessions, family, status and life in general and fear of losing connection to these attachments with suffering. By removing attachment, suffering is eliminated, resulting in liberation and freedom. How does this quest to eliminate suffering equate with existing in a world where everything is interdependent? It appears that a growing conscious awareness of one's attachments and fears through gaining mastery of the body, mind and emotions leads to transcendence of the human state developed through yogic practices enabling a worldly life without suffering and the realisation of one's 'true' nature.

Yoga and the many evolving paths of yoga originated from the experiences of scholars/sages/gurus living in what is know known as India. The timeline dates back to the pre-Vedic Period of (6500-4500 BC) and progresses through the Vedic Period (4500-2500), the Brahmanical Period (2500-1500 BC), the Upanishard Period (1500-1000 BC), the Epic Period (1000-100 BC), the Classical Period (100 BC-500 CE), the Tantric Period (500 -1300 CE), the Sectarian Period 1300-1700 CE) and the Modern Period (1700- Present) (for more detail please refer to Eliade, 1973; Satyananda Academy 2005; (Feuerstein, 1998/9). Yogic knowledge and wisdom was originally deemed sacred and secret and consequently was orally transmitted from gurus to initiates/disciples who in turn could become gurus. In this way, traditions were formed and knowledge passed down through the ages (Eliade, 1973).

2.2.2 Classical Yoga

What has become known as 'classical' yoga was expounded by Patanjali in 2nd Century BC, in the form of *sutras*[3]. Patjanali's *sutras* were the outcome of compiling and classifying ascetic practices and contemplative formulas from the preceding centuries that he validated, justified and incorporated into a philosophy. From this philosophy arose the eight limbs of *raja* yoga (mental mastery), which if practiced regularly *(sadhana)* would lead to 'liberation' (Eliade 1973). The eight limbs were ordered into *yamas* (restraints), *niyamas* (disciplines*), asanas* (postures and cleansing practices)*, pranayama* (breath control)*, pratyahara* (withdrawal from the senses)*, dharana*

[3] Thread; highly condensed ,aphoristic method of literary expression (Hewitt 1991).

(concentration , *dhyana* (contemplation) and *samadhi* (freedom). *Yamas and niyamas* were regarded as preliminary to following any ascetic practices and are not dissimilar to the ten commandments of Christianity. Yamas (restraints) comprise of *ahimsa* ('non-violence'), *satya* (truthfulness), *asteya* (honesty), *brahmacarya* ('sexual abstinence') and *aparigraha* (non-possessiveness). *Niyamas* (disciplines) comprise of *shaucha* (cleanliness) *samtosa* (contentment), *tapas* (asceticism and austerity), *swadhyara* (self study) and *isvara* (study of metaphysics). The third limb is commonly called *hatha* yoga and comprises *asanas* (bodily attitudes and postures); *bandhas* (muscular contractions) and *kriyas* (cleansing practices). The fourth limb is *pranayama,* which defines the conscious manipulation of the breathing pattern. *Prana* means breath activity but also refers to the energy responsible for sustaining life's physiological systems and is potent within the air and the connection between life and matter. *Ayama* means restraint, referring also to control over the physiological system. The fifth limb is *pratyahara* (drawing the senses inward), and described by (Hewitt 1991. p 422) as 'the imitation of the senses of the thinking principle by withdrawing them from their objects'. This practice can result in total body/mind relaxation through mentally guided visualizations. The sixth limb is *dharana* (concentration) which results from unwavering focused attention in a one pointed way on something that is fixed, for example, a candle flame. The seventh limb is *dhyana* (contemplation) which refers to becoming one with fixed concentration acquired in *dharana* and reaching a stage of effortless mental poise. The final limb and goal is *samadhi*, (self realization, liberation, a clear and calm mind) (Lidell, 1983; Eliade, 1973; Shrikrishna, 1996).

The yoga program devised for use in the study around which this thesis is based uses aspects of Patanjali's eight limb approach but in a simplified form and adapted for students lacking in any prior experience of yoga.

Hatha Yoga developed over the 4th, 5th and 6th centuries from the classical form of yoga. It is in contrast to the other spiritual practice of Buddhism which emphasised the *yamas* and *niyamas* and meditation to the exclusion of *asana* and *pranayama*. Although considered important, the proponents of *Hatha* Yoga regarded the *yamas* and *niyamas* as subtle mental disciplines and restraints that needed to be preceded by the more gross bodily disciplines and restraints of *asana* and *pranayama* to avoid the occurrence of mental and moral tension (Muktibodhananda, 1993). *Shatkarmas*[4] were advocated as prerequisites to the practice of *asana* and *pranyamas* in order to create harmony between the two pranic flows, *ida*[5] and *pingala*[6] (Satyananda, 1973).

In addition, other yogic paths have evolved in an interconnected manner, all of which appear to have the same goal of liberation and these can be practised concurrently. Other paths include *tantra* (the extension of knowledge), *karma* (selfless service), *bhakti* (devotion), *mantra* (chanting), *jnana* (knowledge and wisdom), *raja yoga* (mental mastery) and *swara* (science of breath) (Eliade, 1973).

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[4] Shatkarmas practices precede asana and pranayama and include processes that cleanse and purify nasal passages and the alimentary canal, massage abdominal organs, wash the colon, purify the frontal region of the brain and develop concentration (Satyananda, 1973).

[5] Ida- Ida nadi conducts manas (finite mind) composed of chitta (individual consciousness) and ichchha (willpower) shakti. Emerges from the left side of mooladhara chakra and intersects each of the chakras before reaching the left side of ajna chakra. Associated with the mental processes (Satyananda, 1973)

[6] Pingala – Pingala nadi conducts prana shakti. Emerges from the right side of mooladhara chakra and intersects each of the chakras before reaching the right side of ajna chakra. Associated with the mundane realm of experience and externalised awareness (Satyananda, 1973)

The concept of awareness is one of the main aims of yoga. Satyananda (1981) describes awareness as 'knowing what is happening within' (p.9). For this to occur, the practitioner needs to become the detached observer or the witness to all subjective internal and external stimuli. This practice enables the practitioner to dis-identify with thoughts, feelings, actions and reactions. This approach differs from an analytical approach from rumination which involves a tendency to analyse, dwell on, and revaluate where thoughts are dwelled upon and re-evaluated in relation to the self (K. W. Brown & Ryan, 2003).

Raja yoga regards awareness as a continuum from the gross level to the subtle level. Awareness generally develops with an awareness of what is happening with the body, for example tightness or tension and progresses through to more subtle levels such as awareness of energy levels and thought processes. Expanding awareness broadens the vision and perception which is said to occur through *buddhi* (the intellect) (Codron, 2004).

By practicing yoga, the student's awareness naturally and gradually develops. A teacher initially guides students to become aware of the body through movement and arising sensations. This approach differs from physical exercise where emphasis is placed, for example, on speed, strength and capability.

2.2.3 Yoga Physiology and Psychology

Although yogic physiology, psychology and philosophy are expressed somewhat differently from 'western' physiology, psychology and philosophy, there are identifiable parallels between the east and west. The terms *chakras, nadis, gunas* and *koshas* are

core aspects of the yogic perspective on human physiology and psychology as they relate to and exist within the wider universe. *Chakras* are described as whirlpools of psychic energy arising from intersecting *pranic* or energy pathways/channels called *nadis* (flows) within the human body. The *nadis* consist of two circuits - *prana shakti* (vital force) and *manas shaki* (mental force). There are said to be at least 72,000 *nadis*, which flow like electric currents and correspond to the meridians in acupuncture (Motoyama, 1993). The *nadis* are distributed throughout the whole body and through these *nadis* the inherent rhythms of activity in different organs are maintained. Within the network of *nadis* are ten main channels and of these ten there are three main channels which control the flow of prana consciousness within all the other *nadis*. These three main channels are called *pingala, ida* and *sushuma*. *Pingala* controls all the vital pranic processes; *ida*, the mental processes and *sushumna* the spiritual force. *Sushuma* flows inside the central canal of the spinal cord and *ida* and *pingala* flow simultaneously on the outer surface of the spinal cord but still within the bony vertebral column. All three major *nadis* begin at the base of the spinal cord where the first of the major *chakras* (*mooladhara*) is situated. All the other major *chakras* (previously described as whirlpools of psychic energy) are situated on the spinal axis, at locations known in modern science as nerve plexuses and endocrine glands. The base *chakra* is *mooladhara* (coccygeal plexus and testes and ovaries), the second is *swadhistana* (sacral plexus and testes and ovaries), the third is *manipura* (solar plexus and adrenal glands), the fourth is *anahata* (cardiac plexus and thymus gland), the fifth is *vishuddhi* (cervical plexus and the thyroid gland), the sixth is *ajna* (medulla oblongata and pineal gland) and the crown chakra is *sahasrara* (upper cerebellum and pituatory gland) (Muktibodhananda, 1993; Y. A. Satyananda, 2007b). The conscious awakening to the energy of the *chakras* is said to be the traversing of the journey from ignorance and

lower states of awareness to higher consciousness and divine inspiration (Y. A. Satyananda, 2007b). Symbols, Sanskrit sounds and senses are attributed to each of the *chakras* and visualising, resounding and focusing on these attributes is said to awaken awareness (Persson, 2001). With the connection between physiology and psychology in modern science becoming more discernable the yogic texts describing this connection are becoming more feasible in the eyes of western scientists and being subjected to empirical research (Motoyama, 1993; D. S. Shannahoff-Khalsa & Kennedy, 1993; Stancak & Kuna, 1994; Telles, Reddy, & Nagendra, 2000). Psychologically the chakras are related to security (*mooladhara*) joy, detachment and sexuality (*swadhistan*), achieving, dynamism, self esteem (*manipura*), unconditional love, compassion, devotion (*anahata*), communication, inspiration (*vishuddhi*), intuition, intellect (*ajna*) and universal consciousness (*sahasrara*) (Y. A. Satyananda, 2007c; Vivekananda, 2005). Further and more in depth explanations of the *chakras* and their relationship to human behaviour and spiritual evolvement are available (Eliade, 1973; S. S. Satyananda, 1984; Vivekananda, 2005) but are too detailed to further elaborate in the context of this literature review. The knowledge of the *nadis* and *chakras* was not taught to the young people participating in this thesis study due to the advanced nature of these practices.

The *gunas* describe three modes of *prakti. Prakti* is defined as the primordial substance, eternal, dynamic and creative. The *gunas*, according to the Bhagavad Gita are *sattva*, *rajas* and *tamas*. *Sattva* describes luminosity, intelligence, purest nature and without debility. *rajas* describes motor energy and mental activity, passion, attachment to thirsts and insatiable desires with attachment to works and *tamas* describes static inertia, psychic obscurity and ignorance, recklessness laziness and sleep are coexistent whether in physical, biological or psychomental phenomenon (Eliade 1973(Jayaram, 2000/7).

Sattva exists by suppressing *rajas* and *tamas*, *rajas* exists when *sattva* and *tamas* are suppressed and *tamas* exists when *sattva* and *rajas* are suppressed. Carl Jung, a well known forefather of modern psychology was profoundly influenced by yogic knowledge and wrote and lectured on the topic from the 1930s (Coward, 1985) Jung, according to Coward (1985), found confirmation and support for his concept of libido in the *rajas guna*. When the behaviour of the current study population is viewed from the viewpoint of the *gunas*, hyperactive behaviour could be equated to *rajas* and inattentive behaviour could be equated to *tamas*.

According to yogic theory, the *koshas* (sheaths, dimensions) are described as human dimensions similar in context to the body, breath, thoughts, emotions, and the psychological concepts of the conscious, subconscious and the unconscious (Janakananda, 1997). The *koshas* are a means of understanding human existence in terms of gross to subtle energies (Vivekananda, 2005). In the Paingala Upanishard texts (1500-1000BC) the *koshas* are described as five sheaths made of food, vital air, mind, psychic understanding and bliss (Janakananda, 1997). Individuals are said to interact with the world through the koshas and subsequently they are said to govern all human activity and experience (Meannjin, 1999). *Annamaya kosha* (physical sheath) describes the gross physical body sustained through the food we ingest. *Pranamaya kosha* (energy sheath) describes the energy known as *prana* that vitalizes life through the air we breathe. *Manomaya kosha* (mental sheath) describes the instinctive, unconscious mental activity of the mind yet it also describes the ego and rational thinking but in terms of the instinctive mind that is responsive to sensory input. *Vijnanamaya kosha* (the wisdom sheath) describes the intuitive mind involved with higher learning, intuition and psychic abilities and reflects evolved states of love, joy, security, accomplishment and relationships *Anandamaya kosha* (bliss sheath) describes a transcendental state where

peace, love and joy are experienced as a sense of oneness with all existence universal (Y. A. Satyananda, 2005b; Vivekananda, 2005). The *koshas* relationship with the yoga program in the thesis study is concerned with bringing greater awareness to the body (movement sensations), to the breath , to what is happening in their thoughts and feelings and their capacity to have greater control over, body, mind and emotions through awareness.

Yoga is involved with governing these gross to subtle energies, represented by the *koshas* and the *chakras*, to bring about health, well being and personal and spiritual growth (Meannjin, 1999). Physical and psychological problems are seen to arise, from a yogic perspective, when imbalances are present in the *koshas* and *chakras*. To treat these imbalances specific yogic practices are prescribed (Persson, 2001).

Yoga as a therapeutic transformative process is becoming associated with psychotherapy. As a psychotherapeutic tool, yogic meditation can be seen as a method of self-monitoring negative and impulsive thoughts and actions. Developing the ability to disassociate the self from thoughts, emotions, fantasies and images is a key outcome of meditation (Ryan & Deci, 2000). This ability contributes to the development of self-regulatory behaviour.

2.2.4 Yoga in the West

The introduction of yoga into the 'west' came in the late 19th Century with yogic master Vivekanada visiting USA in 1893 which opened the floodgates of western interest and visits by Indian yoga teachers to the West.. Yoga in the west today is becoming increasing popular both as a means of improving health and wellbeing, treating disease

and disorders and also as a way of developing a less materialistic attitude to life (Penman, 2008; Saper, Eisenberg, Davis, Culpepper, & Phillips, 2004) A recent non-randomised survey conducted in Australia (n=3832, including n=1265 yoga teachers) found that 57% initially practiced yoga to reduce stress and anxiety and 76% continued to practice for this reason; 18% initially saw yoga as a spiritual practice and 41% continued for this reason; 29% initially practiced for personal development, 56% continued to practice for this reason (Penman 2008). The demographics of the majority of the sample indicated that they were middle aged, tertiary educated, females living in the city on incomes of over $70,000, non-smokers, meat eating, alcohol and coffee drinking with 15% working in a healthcare occupation. Although the demographics represent only 0.2% of the Australian population and are not necessarily representative, the 2005/6 Australian census indicated that 1.7% of the Australian public over 15 years old participated in yoga - which represents approximately 273,500 people. In addition yoga was ranked 13th on the scale of 'physical activities' (equal to football) in which people indicated that they participated in the Australian Bureau of Statistics (ABS) Census 2006 (Penman 2008). Like Penman's results (85%), the majority of yoga participants in ABS Census 2006 were female (90%). A survey, commissioned by the *Yoga Journal*, and conducted by Harris Interactive Services Bureau of a representative sample of 4,700 Americans indicated that 7.5% practised yoga, and (Penman 2008).

The popularity of yoga in Australia has been growing since the 1950s when Michael Volin, taught by Indra Devi, set up the first yoga school and television program, followed soon after by Roma Blair who taught yoga through classes and a television program in the 50s and went on to form the International Yoga Teachers Association in 1967 (Y. A. Satyananda, 2005a). The number of yoga classes, yoga schools and yoga teacher training organizations have continued to increase especially in the late 20th

Century and early 21st Century some of which are present also in USA, UK, Europe and other developed and developing countries. The schools include Iyengar, Ashtanga, Sri Pattabhi Jois, Viniyoga, TKV Desikachar, Shri T Krishnamacharya, Satyananda, Kundalini, Bikram all of which have similarities and differences. Teaching associations in Australian include Yoga Teachers Association of Australia (YTAA), International Yoga Teachings Association (IYTA), Satyananda Yoga Teachers Association and the Satyananda Yoga Academy, BSK Iyengar Yoga Association of Australia (BSKIYA) and Yoga Alliance (Penman 2008).

The popularity of yoga has been fuelled by articles in newspapers, radio and television reports, yoga magazines and books, CD's and DVD's readily available on the topic. As found by Penman (2008) this interest is in response to a need by individuals to address health and fitness issues and stress related problems but also for spiritual fulfilment which has tended to be neglected with the modern materialistic lifestyle.

The yoga masters, since their first visits to the west saw the physical, psychological problems arising from living a western lifestyle and approached the introduction of yoga to the west from this perspective. The physical body aspects of yoga being *asanas*, have come to be equated with yoga more than *pranayama* (breath control), *pratyahara* (relaxation/ sense withdrawal), *dharana* (concentration), *dhyana* (contemplation) and *samadhi* as well as the range of the other yogic paths previously mentioned. As yoga becomes more popular, more people are embracing the deeper aspects of yoga as is evidenced from Penmans (2008) survey. Anecdotal accounts of the popularity of yoga and scientific reports occasionally appear in newspaper articles (Clegg, 2007; Hamer, 2003; Laurinatis, 2007; Lennon, 2001; Teutsch, 2001; Williams, 2002) and yoga magazines for example *Australian Yoga Life*, *The Yoga Journal* and *Bindu.* These

magazines include articles on yoga practices and styles, for example on yoga for stress in daily life, for improving well being, for children, for sportspeople, for numerous illnesses in addition to philosophical discussions (Bodhananda, 1981; Castleman, 2002; Ruiz, 2003; Sweet, 2002; Wythes, 2005).

Most of the texts, many written by both yoga masters and yoga teachers describe the benefits of each asana, in particular and to a lesser degree, broadly describe the benefits of the pranayama, pratyahara, concentration and meditation (Devi, 1960; Hewitt, 1983; Satyananda, 1973; Yesudian, 1975). These claims, although frequently based on yogic texts, are generally not substantiated with empirical research but for the lay person looking for increased health and fitness this has not obviously been an issue. Yet some major texts are written by masters and their students and although they explain yoga as a science as perceived from very early understandings, the western requirement for something to be regarded as a science must be explained through the western lenses of science and empirically proven (Hewitt, 1983; Iyengar, 2001; Muktibodhananda, 1993; Nagendra, Mohan, & Shriram, 1988; Satyananda, 1973, 1985b).

With stress related and mental health issues becoming more prevalent in western societies, the need for treatments have challenged the medical world to address this ongoing and escalating problem.

The World Health Organisation (WHO) estimates that 5-10% of the population at any given time suffers from depression needing psychiatric or psychological intervention and that by the year 2020 depression is predicted to be the second biggest global burden of disease for all ages, both sexes (www.who.int/mental_health/ management/depression/en accessed 29/1/08). By 2020, unipolar depression and ischemic heart disease are projected to be the leading cause of work years lost in the

global economy due to premature death and disability. According to the Global Burden of Disease (GBD) study, if this projection is fulfilled, depression will disable more people than wars, AIDS and traffic accidents combined (Murray & Lopez, 2003).

In addition according to WHO figures nearly three quarters of people with mental health problems never seek help from a health professional either due to a lack of resources, or unavailability of health professionals or because of the social stigma attached to the mental health conditions (www.who.int/mental_health/management/depression/en accessed 29/1/08). Although medical diagnosis and treatments are becoming more informed, sophisticated and technical, the demand for non-medical, non-pharmacological and self-help approaches are being increasingly sought by the general population. The knowledge of alternative and complementary treatments and for some, the lack of confidence in the pharmaceutical approach has fuelled this search. Apart from yoga and other alternative treatments like acupuncture, massage, diet are being sought as treatments for stress and mental health conditions, physiological ailments and diseases like osteoporosis and arthritis, female reproductive problems, in addition to life threatening diseases like cancer.

The empirical evidence to support the impact of yoga on the physiological, psycho-physiological and neurological parameters is constantly increasing in addition to the efficacy in treating specific diseases like hypertension, asthma, cancer and mental health disorders.

2.3 History of Yoga Research

To bring the ancient system of yoga into the 20th Century, researchers from India began publishing articles on basic physiological data on *asana* and *pranayama* practices in 'Yoga Mimamsa', a quarterly journal begun in 1924. This journal also featured semi-scientific and popular articles on various aspects of yoga. 'Yoga Mimamsa' was published by Kaivalyadhama, a yoga institute in India, that 60 years later collated and published a bibliography of these articles called 'Abstracts and bibliography of scientific and semi-scientific articles on yoga and specific techniques'. This bibliography referenced the work of 67 authors, who wrote articles on *asanas, pranayama, kriyas* (internal cleansing practices), *mudras* (symbolic hand gestures) and *bandhas* (muscular tightening or locks), meditation, yoga education and yoga therapy (Bhole, 1985).

Reviews and bibliographies of yoga and meditation from the west began to emerge with Funderburk (1977) publishing '*Science studies yoga: a review of physiological data*' in the USA followed by Peo (1978), who published '*Medical and psychological scientific research on yoga and meditation: General effects and possible applications'* in Scandinavia., With meditation becoming more popular and the subject of enquiry, Shapiro and Walsh (1984) published *Meditation: Classic and Contemporary Perspectives*' in the USA. This book endeavoured to analyse the claims and counter claims on the efficacy of meditation through presenting theoretical and empirical studies on psychological, psychiatric, neurological, biochemical and phenomenological studies of advanced meditators (J. D. H. Shapiro & Walsh, 1984). Perhaps the most comprehensive bibliography published on yoga research, prior to the 1990s, was written by Monro, Ghosh and Kalish (1989) in the UK, titled, '*Yoga Research Bibliography: Scientific studies on yoga and meditation.*' This bibliography

contained reference to 1600 papers gathered from yoga centres, private collections, specialist publishers and articles published in Yoga Mimansa and in international peer reviewed journals. Although reference to yoga research in Medline was scant from 1950s to 1980 (238 articles), 1049 articles are now referenced, with 47% of these published since 2000.

Lamb (2001)) has drawn upon presentations and articles by Malathi (2001), Majmundar (2000) and Arpita (1990) and several other authors from peer reviewed articles to compile a list of the physiological, psychological benefits and biomedical effects of various yoga practices. The physiological benefits involve the autonomic nervous system, brain wave frequencies and the cardiovascular, respiratory, gastrointestinal and endocrine systems. The psychological benefits include somatic and kinaesthetic awareness, mood improvements, self acceptance, social adjustment and reduction of anxiety, depression and hostility. Psychomotor improvements involve grip strength, dexterity, hand-eye coordination, reaction times, steadiness, balance and integrated functioning of body parts. Improved cognitive functioning focuses on attention, concentration, memory and learning efficiency. From a biochemical perspective, yoga practice effects glucose metabolism and neurotransmitter activity. It reduces sodium, cholesterol (LDL &VLDL), triglycerides, cholinesterase and white blood cells. Additionally, it increases the production of cholesterol (HDL), ATPase, hematocrit, hemoglobin, lymphocytes, thyroxin, vitamin C and serum protein. This scientific evidence is contributing to the substantiation of yoga as an ancient system which advocates holistic recognition and development of the potential and capacity of the human body, mind and psyche. Yoga's efficacy as a drug-free means of sustaining a healthy lifestyle and treating 'modern day' ailments (stress related conditions such as anxiety, depression, and heart disease) is gaining increasing attention in mainstream medicine and psychology.

Australian medical practitioners are accepting and utilizing evidence of positive outcomes as witnessed by the growing number of general practitioners surveyed in Victoria (1997), Western Australia (2000), and nationally (2005) who are recommending yoga to patients (Penman 2008).

Yoga research has been developed and advanced with the availability of Electroencephalograms (EEG), Positron Emission Topography (PET) scans and Magnetic Resonance Imaging (MRI) which enable much needed physiological evidence of the impact of yoga on the autonomic and central nervous system. Leading universities in the West, India and in some other countries such as Russia, are providing necessary but by no means sufficient funds for the advancement of yogic research. However, compared with the financial investment that pharmaceutical companies allocate for conducting research trials, yoga research is severely hindered. The availability of yoga practitioners for research trials is rapidly increasing as yoga gains popularity both in the general population and in clinical populations – even though yoga as a preventative health strategy or as a therapy is dependent on the effort, discipline and motivation of participants. Additionally, yoga is an empowering tool to support people in assuming responsibility for their health. Yoga, though, is unlikely to fit into the large profit making mould of the pharmaceutical companies. Therefore, the generation of funds needed for large scale and diverse research projects will probably continue to be dependent on universities and to a lesser degree yoga organizations and associations.

2.4 Yoga Studies Relevant to Disruptive Behaviour

Yoga research and its outcomes are relevant to the impairments that characterise children with disruptive behaviour. Yoga studies examine the effect of *asanas, pranayama*, relaxation, and meditation on central and autonomic nervous system functioning that includes physiological, psycho-physiological, neurological parameters and mental health problems. The majority of measures used in the studies reviewed in this section were not employed in this thesis study. However, the knowledge forthcoming from these studies is considered important background knowledge to establish the empirical links between the fields of yoga research and the fields of disruptive behaviour research.

2.4.1 Specific Yogic Practices in Yoga research

Empirical research has focused on the effects from integrated yoga programs and singular practices. As research becomes more specialised, the investigation of singular practices has become more the focus in order to isolate specific effects of particular practices. However, integrated yoga programs align closer to the 'classical yoga' perspective. Additionally, children are more likely to participate in an integrated program because it offers more diversity to retain their interest. This is of particular relevance to the inattentive, hyperactive, oppositional child (Prior, 1996).

Many yoga practices involve breath awareness. Movements prescribed in executing postures (*asanas)* frequently involve conscious manipulation of the inhalation and exhalation process as does *pranayama.* Aspects of yoga relaxation and meditation also focus awareness on the breath. Stovik (2000) in his review on the 'Science of Breath-A Yogic View' describes the

relationship between the yogic relationship with breath and the involuntary nature of breathing-'Although respiratory centres in the medulla establish the primary rhythm of breathing, breathing is unique among visceral functions in that it can be brought to awareness and regulated voluntarily'(Stovik, 2000). This is the role of *pranayama* that enables a voluntary relationship with the central mechanisms of control.

2.4.1.1 Asana

Asana is defined in yogic texts as a natural state of comfort and homeostasis in a physical posture (2002). Satyananda (1996), in reference to traditional Yoga Sutra texts on Raja Yoga, describes *asana* as a 'state of being in which one can remain steady, calm, quiet and comfortable with the physical body and mind'. Although *asana*s resemble physical exercises, a distinction is drawn with respect to pace, positions, attitude, breathing and focused awareness on body sensations. Although not substantiated with empirical evidence, many texts on yoga claim benefits, for example the *Shashankasana* (moon pose) (for image see Appendix F, of Manual of Practices, no. 33) tones the pelvic muscles, relaxes the sciatic nerves and regulates the function of the adrenal glands (Satyananda, 1987). The popularity of yoga in the west has been built to a large degree, on the practice of *asana*. Most yoga classes and texts substantially focus on this aspect of yoga. Additionally *asana* practice can suite all ages. A glance into any book on yoga *asana*s will reveal hundreds of *asana*s involving, sitting, standing, and lying in prone or supine positions; twisting, stretching, balancing in forward backward, sideways motions, performed slowly, quickly and stationary.

The head of the Institute of Religious Psychology at Mitaka, Tokyo, Motoyama, PhD (1993) has given an example of the curative effect of an asana (involving moving the toes and ankles), on rheumatism. From a Western medicine perspective, contracting and extending the joints of the toes and in the ankles, stimulates nerves and activates related muscles. From an Eastern medicine perspective these movements involve the activation of the meridians that are governed by organs in the body (Motoyama, 1993 Pp.6-7).

There is some research on individual *asanas.* As an example, Rai et al. (1994) compared the states of horizontal supine, chair sitting and *Siddhasana* (yogic seated position). Results indicated that sitting in *Siddhasana* increased respiratory parameters of minute volume, and tidal volume, increased oxygen consumption, increased CO_2 elimination, increased heart rate frequency and oxygen pulse compared to the other two positions. However most of yoga research involving *asana,* includes *pranayama,* relaxation and meditation therefore specific benefits of asana are not able to be identified.

2.4.1.2 Pranayama

Pranayama techniques are the most extensively researched of all the yoga techniques investigated. Techniques involve forced unilateral and bilateral nostril breathing through the left and right nares at a varying pace, with inspiration and exhalation ratios and abdominal or thoracic dominant breathing. Unilateral breathing has been explained in ancient Indian texts (as transcribed by Muktibodhananda 1999) as the flow of air through the nostrils in the form

of a subtle energy called *swara*. *Swara* has a rhythm of dominance from one to the other nostril. In modern science this phenomenon is known as the nasal cycle[7] (Keuning, 1968). The nasal cycle is an ultradian rhythm[8]. *Pranayama* involves the manipulation of the *swara*. Air flowing though the left nostril is said to indicate that the left subtle energy channel called *ida nadi* is open (see section 2.2.3). Flow through the right nostril indicates the right subtle energy channel called *pingala nadi* (see section 2.2.3) is open. When breathing through both nostrils the subtle energy channel called *sushumna* (see section 2.2.3) is open. The ancient sages described the *ida nadi* as being heat dissipating or cooling and the *pingala nadi* as being heat generating.

The nasal cycle is based on alterations in the autonomic tone of the nasal vasculature, which is thought to be regulated by cells in the suprachismatic nucleus of the hypothalamus (Shannahoff-Khalsa, Kennedy, Yates, & Ziegler 1996; Mirza, Kroger & Doty, 1997). The patency and functional efficiency of the right and left nares changes alternatively with an average periodicity of about two to three hours. Breathing through a particular nostril has been found to activate either division of the autonomic nervous system, where right nostril dominance is correlated with the activity phase of the basic rest/activity cycle (sympathetic

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[7] The nasal cycle has been described 'as an alternating congestion and decongestion of opposite nostrils where there is a vasconstriction in one nasl turbinate paralleled by vasodilation in the other. The mucosa of the nose are densely enervated with autonomic fibres and the dominace of sympathetic activity on one side produces vasoconstriction in the turbinates, while the contralateral nostril exhibits a simultaneous dominance of the parasympathetic activity which causes swelling (p.226 Shannahoff –Khalsa, 1991).

[8] The ultradian rhythms of lateralised neural activities help to organise the functions of biological systems to meet primary body needs (D. Shannahoff-Khalsa, 1991). These functions that are associated with work and rest , eating and the many other behaviours that are defined in the basic rest/activity cycle (Kleitman, 1982)

arm) and left nostril dominance with the rest phase (parasympathetic arm) (Werntz et al., 1983). To reduce arousal, promote relaxation and improve concentration this nasal cycle is manipulated by employing techniques of *pranayama.*

Pranayama techniques have been claimed by Motoyama (1993, Pp.11-12) to stimulate stagnant blood in the body having a curative effect on disease and a beneficial influence on the functioning of the heart and lungs. He points out that that a significant percentage of blood is collected in the lower abdomen and unless this blood is circulated back to the heart, abdominal organs can become weak and diseased. The effect of extending and contracting the abdomen during the breath holding component of *pranayama* is thought to facilitate the circulation of blood into the organs.

2.4.1.3 Yogic Relaxation

Although yogic relaxation is distinct from the psychological techniques of progressive muscle relaxation developed by Jacobson, in the 1920s and Benson's "relaxation response" (H. Benson et al., 1975; H Benson & Klipper, 2000), all reduce the sympathetic activity of the autonomic nervous system (ANS). Jacobson's technique focuses on the tightening and relaxing of muscle groupings and has been described as a relaxation where muscle relaxation produced autonomic effects opposite to anxiety (Kerr, 2000). Benson's 'relaxation response' involves relaxing the muscles throughout the body before becoming aware of the inhalation and exhalation of the breathing process (H Benson & Klipper, 2000). Benson's technique has been described as a decreased state of sympathetic nervous system arousal (Barrows & Jacobs, 2002).Yogic relaxation, termed *pratyahara* is the fifth of Patanjali's limbs of yoga

(see section 2.2.2). *Pratyahara* incorporates the techniques of Jacobson and Benson but is more extensive and is intricately involved in yogic theory. Although *Pratyahara* means withdrawal of the senses, the process involves heightened awareness of sensory stimuli, systematic awareness of parts of the body and body sensations, visualizations and affirmations, the process culminates in withdrawal into a relaxed and restored body and mind (Satyananda, 1984).

Smith, et al. (1996) did a comprehensive review of relaxation techniques, using an 82 item wordlist yielding ten relaxation categories. Yoga relaxation was found to be most associated with awareness and joy.

2.4.1.4 Meditation

The word meditation originally comes from the Indo-European root word *med* which means "to measure". Meditation entered English through the Latin word *meditatio* which originally indicated every type of physical or intellectual exercise but its meanings became associated with contemplation (Houghton, 2000). The Yogic meditation of the final three of Patanjali's limbs of yoga describe *dharana* (concentration), *dhyana* (contemplation), *samadh*i, (self realization, liberation, a clear and calm mind) (Eliade, 1973; Shrikrishna, 1996). Meditation, especially in combination with other yogic techniques has been described as 'an intense absorption of attention, profound willingness to let go of personal goals and concerns, a willingness to experience something appraised as greater than the self or beyond oneself, and an intense absorption of attention to the sensory world' (J C Smith et al., 1996). Meditation is not confined to Yogic meditation; meditation practices are a component of the Buddhist,

Hindu, Christian and Islam religions. Newberg & Iverson (2003) describe the process of meditation as a complex process involving changes in cognition, sensory perception, affecting hormones and autonomic activity. Meditation studies reviewed by Astin et al. (1998) conclude efficacy of meditation in reducing anger, anxiety and fear and increasing positivity, enhancing endurance to affective challenges and improving psychosocial coping.

2.4.2 Yoga Research Studies of Parameters Relevant to Disruptive Behaviour

Many authors of the following reviewed studies have employed more than one instrument. Because this review deals with one parameter at a time, the same studies may be mentioned more than once. The yoga experience factor in treatment outcomes has been considered by researchers through recruiting participants with long, short and no yoga experience. Trials have also compared treatments with variations of the same technique, with rest states and with control conditions.

2.4.2.1 Respiratory Activity

Although respiratory activity is a parameter that could have been included in the following section, it as been separated because of the importance the breath has in yogic techniques, yogic physiology and yogic philosophy. Respiratory rates can indicate the body's response to physical and emotional stress though the sympathetic arm of the autonomic nervous system. This response increases the availability of oxygen to the muscles to enable either the flight or

fight response (Ramos & Arnsten 2007). In the healthy person, this response is temporary but where stress levels persist, atypical respiratory patterns endure, creating psychopathological conditions (Stovik, 2000; Ramos & Arnsten, 2007). The effects on respiration of yogic breathing practices either alone or in conjunction with other yoga practices have been investigated by Arumbula et al. (2001); Lou et al. (1999); Robert McComb et al. (2004); Telles (2000); and Vempati & Telles (2002).

Interactions between breathing behaviour, physiology and the concepts of emotion and cognition have been established in a series of studies on Pavlovian conditioning reviewed by Ley (1999). Ley suggests that if breathing affects emotions and cognitions, diagnostic procedures should include dysfunctional breathing. Furthermore, he proposes that 'if changes in emotion or cognition induced by changes in breathing ameliorate complaints, new strategies of psychological intervention can be developed so that breathing-induced changes counteract the complaints' (p.470, Ley, 1999). He points out that 'remedial breathing (breathing retraining) in the treatment of panic disorders, anxiety disorders and breathing related psychological complaints might benefit from Pavlovian and operant conditioning techniques' (Ley,1999, p.470).

Literature since the early 1900s suggests respiratory effects are associated with emotional states (Feleky, 1916 cited in Stovik, 2000) and subsequent studies confirm this (Bloch, et al., 1991). Stovik (2000) refers to Freud's proposal that preconscious emotion may produce chronic and stylised modifications of respiratory activity.

Breathing disorders are associated with childhood and adolescent hyperactivity and anxiety disorders. Atypical ventilatory physiology involving significantly larger minute ventilation, larger tidal volumes and more variable breathing patterns in room breathing and in exposure

to CO^2 exposure is evident in children and adolescents with anxiety disorders and comorbid ADHD compared with healthy controls (Pine et al., 2006). Children with suspected sleep disordered breathing also display hyperactivity in addition to daytime sleepiness (Ma et al., 2004).

Hyperventilation is a respiratory problem described as a 'physiological response to abnormal increase of respiratory "drive" which can be caused by a wide range of organic, psychiatric and psychological disorders or a combination of these (Innocenti, 2002). Although hyperventilation is a normal response to stress, in its chronic state it is a condition of spontaneous occurrence of somatic symptoms associated with anxiety. Hyperventilation is a form of chronically disturbed breathing with or without recognizable stresses or known aetiology. When hyperventilation occurs an anxiety/hyperventilation spiral is set in motion, perpetuated by physiological and/or psychological causes, setting up conditioned reflexes of new and incorrect patterns of breathing. Hyperventilation results in vascular constriction, resulting in decreased blood flow, and an inhibition of transfer of oxygen from haemoglobin in the circulating blood to tissue cells. Hyperventilation produces a range of cardiac, peripheral and cardiac symptoms. Fluctuations in Pa CO_2 (alveolar partial pressure of carbon dioxide), have a destabilizing effect on the autonomic system, resulting in a sympathetic dominance (Innocenti, 2002). Breathing patterns related to chronic hyperventilation, vary widely from gross upper thoracic movement at 50 breaths per minute to near normal movement. The respiratory rate and volume may be extremely irregular and the pattern interspersed with sighs. A breathing education treatment employed by physiotherapy involves the patient becoming very consciously aware of their breathing and making subtle changes to inspiration, expiration and rest periods (Innocenti, 2002). This technique is an aspect of the relaxation technique employed in the current study and which was objectively measured using

thoracic and abdominal bands that recorded breathing effort. Chronically atypical breathing patterns are associated with an over-aroused system in such disorders as anxiety (Boyce et al., 2001; Garralda et al., 1991; Pine et al., 1998) Little research has been conducted on the breathing patterns of children with disruptive behaviour where there is evidence of an under-aroused system.

The current thesis study included the measurement of breathing patterns using the *Summit*^{TM} *Respiratory Inductive Plethysmography* (RIP) in a subgroup of students before, during and after a yoga relaxation technique. The aim was to ascertain if children with disruptive behaviour displayed atypical breathing patterns and whether yogic relaxation produced any changes in breathing patterns.

The following studies use yogic postures, breathing and meditation techniques to test the effect on respiratory responses in relation to breathing patterns, breath volume, breath rate and tidal volume. Consequent effects on central nervous system functioning are also investigated.

Telles et al. (2000) investigated respiration before and after two relaxation techniques (cyclic meditation and *Shavasana)* to test ancient yogic texts (Chinmayananda, 1984) which suggest that a combination of calming and stimulating measures may be helpful in reaching a state of mental equilibrium. Cyclic meditation (calming and stimulating) included four phases-chanting, contracting muscles, *asanas* and relaxation and *Shavasana* (calming) involved lying still in supine position. Both techniques were practiced on separate days by (n=40) male volunteers (mean age 27.0=/- 5.7 years). Results indicated a significant decrease in breath rate and increases in breath volume for the cyclic meditation and *Shavasana* group. However, the magnitude of change was greater for the cyclic meditation group. Breath rate decreased 18% after cyclic meditation and 1.2% after *Shavasana* and breath volume increased 28.8% after

cyclic meditation and 15.9 % after *Shavasana*. Authors suggested that these outcomes supported the proposal that a combination of yoga postures and relaxation reduces arousal more than relaxation alone.

Arambula et al. (2001), found that the thoracic and abdominal breathing patterns of a 59 year old yoga master practicing *Kundalini* Yoga meditation indicated a reduction from 11 breaths per minute (BPM) (before) to 5 BPM (during) to 13 BPM (after) with abdominal breathing more pronounced during meditation. Deep, slow abdominal breathing has been correlated with an increase in alpha EEG as proposed by Fried (1987) which is indicative of an alert yet relaxed state and suggested as an implication of this study.

Vempati and Telles (2002) compared measures at baseline and post-test of breath volume (BV) breath rate (BR) in yoga based guided relaxation (GR) and supine rest (SR). Participants (n=35) were males with a mean age 27.5 years (SD= 4.7 yr) and with an average of 30.2 months yoga experience. Measurements were taken five minutes before, ten minutes during and five minutes after GR and SR. Each of the practices was measured at the same time of the day on different days in randomised order. Breath amplitude increased by 15% in the GR group which is associated with a reduction in physiological arousal.

Robert McComb, et al. (2004) investigated the stress reducing effect of a mindfulness meditation and relaxation program by measuring physical functioning and submaximal exercise responses. Participants (n=18) were white middle class women with a mean age of 60 years (SD 6.3 years) with a history of heart disease randomised into a treatment or control group with no mention of previous meditation experience. The program ran for eight weeks, two hours per week. Results indicated a significant difference in breathing ventilation over time ($p<.01$) and between groups ($p<.01$) and breathing frequency ($p<.01$) favouring the

meditation group. Authors noted that the respiratory system is affected in heart disease, for example dyspnoea and that the respiratory system involves afferent input from the higher brain centres (behaviour) in the central nervous system (CNS), sensory mechanoreceptors and chemo receptors which in turn provide input to a centrally control mechanism that in turn provides output to effector muscles (Caruana-Montaldo, Gleeson, & Zwillich, 2000; Johnson, 1997). Authors suggested through meditation participants learned to consciously control their breathing patterns that incorporated the higher brain centres of the CNS.

Sarang and Telles (2006) study was a follow on from Telles, et al. (2000) and investigated respiration before, during and after two relaxation techniques (Cyclic Meditation and *Shavasana*). Participants (n=50 males) aged between 18-48 years with a mean age of 27 years (SD 6.3 years) were clinically healthy males with three to sixty months of yoga experience. Two 22.5 minute interventions were conducted, 1) consisted of cyclic meditation and 2) *shavasana* (S). Both interventions were administered randomly to all participants one day apart. Assessments of the four phases of the cyclic meditation were recorded and compared with *shavasana*. The breath volume and rate increased during the stimulating yoga postures of the CM and returned to baseline during the calming practices. Assessment for (n=10) participants was also conducted 30 minutes after interventions. Breath rate for the cyclic meditation group significantly decreased post intervention which did not occur for the S group. This suggests that a combined yoga program has more residual effects than relaxation alone. Authors stated that results from both studies suggest that respiration patterns can act as indicators of the psychological state even though past theoretical models have employed metabolic rate only and have attributed changes in respiration to this variable. Additionally, although yoga *asanas* have been found to increase metabolism and respiration (Rai & Ram,

1993) when performed slowly and combined with supine rest can have an overall effect of reducing metabolic rate and breath rate.

2.4.2.2 Effects of Yoga on Neurophysiological, Psychophysiological, Physiological Parameters and Cognitive Functions Impaired in Disruptive Behaviour

Coupled with respiratory activity is yoga's impact on the functioning the central nervous system and the autonomic nervous system. Central nervous system changes are associated with brain wave frequencies, oxygen consumption (also referred to as glucose metabolism), cerebral hemispheric lateralisation, neurotransmitter activity and cognitive functioning. Autonomic nervous system changes are associated with heart rate and variability, blood pressure, skin conductance and respiration. Muscular activity and performance are additionally affected.

2.4.2.2.1 Brain wave frequencies

Brain wave frequencies indicate states of consciousness. Brain wave frequencies indicate conscious states to unconscious states, descending from beta (14-36 oscillations per second-Hz), alpha (7-14 Hz), theta (4-7 Hz) and delta frequencies (0-4 Hz) as measured using Ectroencephalogram (EEG). Beta frequencies are present in the normal wakeful state associated with thinking, problem solving and attention to external stimulus. Mental tensions and anxiety result in increases in beta Hz (1998). Alpha frequencies are associated with one-

pointed attention and are indicative of a calm yet alert state (Nilsson, 1988). Vigilance and attention are associated with the low alpha frequency band and task specific processes and upper alpha band with higher brain functioning processes (Klimesch, 1999). Theta frequencies are associated with unconscious memories that can arise during deep meditation and the brain of the young child (Nilsson, 1988). Short-term theta has been recorded during concentrated task performance (Saskia et al., 1996) and memory operations (Klimesch, 1999) and longer lasting theta is associated with emotional stimuli. Delta waves are usually associated with sleep Nilsson (1998) although delta waves have been detected in deep relaxation (Mangaltheerthan, 1988).

Brain wave frequencies measured in ADHD indicate greater levels of lower frequency theta and less alpha and beta wave frequencies over all regions of the brain (Chabot & Serfontein, 1996; Clarke et al., 1998; J. F. Lubar, 1991; Mann et al., 1991). With theta being associated with unconscious memories and emotional states, the displays of dramatic mood swings, temper tantrums, aggression and emotional outbursts occurring in children with externalising and internalising disorders has apparent associations.

Enquiry into the effects of various yoga practices on brainwave frequencies has been conducted to ascertain changes in consciousness. The subject of consciousness is a core aspect of yoga. There are accounts of *Yogis* attaining states of *Samadhi* (described as a state in which practitioners are oblivious to external and internal stimuli with higher nervous activity in a state of ecstasy). One such account was of Yogi Satyamurti, who after five days in an isolated chamber recorded a straight line on ECG equipment (i.e. no heart beat) (Kothari, Bordia, & Gupta, 1973). Within a half hour of finishing the experiment an active ECG reappeared. Although *Samadhi* is beyond the reach of most modern day yoga students and

most of the trials reviewed do not expect to discover participants to have attained *Samadhi*, trials do test for changes in states of consciousness.

One of the earliest studies exploring brain wave frequencies was conducted by Anand (1961). Experienced *Samadh*i meditators (n=4) were recruited to test for the persistence of alpha wave activity. Group 1 (n=2) were exposed to external stimuli-light, sound, touch and vibration. Group 2 (n=2) were exposed to pain tolerance -fingers in cold water (4 degrees) for 45-55mins) during rest and during the meditative state. Results for both groups indicated prominent alpha activity during normal rest. Group 1 indicated that external stimuli did not block alpha activity while meditating but blocking occurred during the rest phase while still exposed to external stimuli. Group 2 indicated that persistent alpha activity occurred during 'the hands in immersed in cold' trial. Authors suggested that the brain activity of the meditating yogis probably depended on mutual influences between the reticular activating system9 (RAS) and the cortex, which does not depend on the activation of the RAS through external and internal afferents. Authors referred to the suggestion of Magoun (1958) that the basis for the conscious state of the brain is the activation of reticular activity through the peripheral afferents without which higher nerve activity passes into sleep. This study

[9] Reticular activating system (RAS) is the part of the brain (the reticular formation and its connections) believed to be the center of arousal and motivation in mammals (including humans).The activity of this system is crucial for indirectly maintaining the state of consciousness. It is situated at the core of the brain stem between the myelencephalon (medulla oblongata) and mesencephalon (midbrain).It is involved with the circadian rhythm; damage can lead to permanent coma. Fibers from the reticular formation are also vital in controlling respiration, cardiac rhythms, and other essential functions. The reticular activating system (RAS) has suggested involved with pathological conditions affecting behaviour, such as Alzheimers Disease and Attention Deficit Hyperactivity Disorder. RAS is said to filters out normal stimuli and activates when something new or different occurs http://en.wikipedia.org/wiki/Reticular_activating_system

illustrates the extent of "control" experienced meditators can have over the influence of external sensory stimuli.

Several studies since have found that yoga practices increased both alpha, theta and delta brain wave activity.

Santha et al (1981) found that alpha wave activity increased with the practice of *asanas, pranayama,* prayer and meditation. Participants (n=10) were healthy male soldiers taught yoga for a month and continued to practice daily for a further three months.

Mangaltheerthan (1988), Head of Department of Applied Science, Bihar Yoga University, India, found that the relaxation technique of *Yoga Nidra* significantly increased alpha waves which progressed into theta and delta waves compared to a control group. Delta waves are usually associated with sleep but participants remained awake. Participants (n=34) were females divided into three groups. Group 1 comprised experienced yoga practitioners; Group 2 comprised randomly selected medical students with no experience of meditation or yoga; and Group 3, drawn from the same pool as group 2 acted as the control. The control group listened to a tape by the same speaker with the same tone of voice and speech rate about the physiology of meditation.

Satyanarayana et al. (1992) found a gradual increase in alpha waves in the occipital area (T2-A2) of the brain from 38 $\pm$ 3.8 (SD) % day 1 to 64.2 $\pm$ (SD) % day 30 ($p<0.001$) and in the prefrontal area (FP2-A2) of the brain from 22% $\pm$ 2.5 (SD) day 1 to 43.1% $\pm$ 3.6 (SD) % day 30 ($p<0.001$). Participants (n=8) were trained in Santhi Kriya yoga for 50 minutes per day for 30 days in a pre-test, during test and post-test design. These results imply that the Santhi Kriya practice promotes calmness.

Arambula (2001) found increased alpha in the occipital region during Kundalini meditation and increased theta15minutes after, compared with before. This was a single case study involving a yoga master with 32years of experience. These results imply that Kundalini meditation produces a restful but alert state.

Kamei et al (2003), found an integrated yoga program consisting of asanas, pranayama and meditation significant increased alpha activity (during asana, $p<.005$, during pranayama, $p<.0005$, during meditation $p<.0001$) compared to a rest period. Participants (n=8) were experienced yoga instructors.

Lou et al.(1999) set out to measure neural structures subserving relaxation /meditation technique *Yoga Nidra* and contrast them with resting states of normal consciousness using ^{15} O-H_2O PET scan. Participants (n=9, 3 female) were experienced yoga teachers with age range of 23-41years and at least five years of yoga experience. Participants initially were scanned in normal consciousness without any sensory input followed by listening to a *Yoga Nidra* tape for 45 minutes with a voice that induced relaxation/meditation through different stages (full explanation p.100, Lou et al, 1999). Results indicated the subjective experiences of reduced conscious control of attention and behaviour, relaxation and loss of will and an intense sensory experience. Theta band frequencies increased ($p <0.03$) by 11% in all regions and alpha essentially remained the same as normal consciousness.

The following studies by (Aftanas & Golocheikine, 2005; Aftanas & Golocheikine, 2001) have been reviewed separately and in more detail due to 1) the equipment employed was more sensitive to effects and measured more regions of the brain 2) design was more complex including a comparison with subjective measures. Numbers were small and no control condition was included but two groups were compared and repeated measures were

employed. Participants in Aftanas and Golocheikine (2001) (n=27) were 11 short-term meditators (STM) (6 female) and 16 long term meditators (LTM) (female 9) matched for age. Results from three phases of assessment-rest, meditation (Sahaja Yoga Meditation[10]) and outcome indicated that during the meditation phase the extent of thought, the level of positive emotion and the level of anxiety, restlessness and unease indicated emotionally positive states. Non-linear dimensional complexity (DCx) (computed on a 62-channel EEG) indicated anterior frontal and midline theta synchronization as well as enhanced theta connectivity between pre-frontal and posterior cortex in STM group with greater effects in the LTM group. Linear measures showed increases in theta 1 (4-6 hertz (HZ), theta 2 (6-8 HZ), and alpha 1 (8-10 HZ) frequency over the same regions. Non-linear results were suggested as increased control over the allocation of attention resources required to maintain the targeted meditative state and the inhibition of inappropriate stimuli. Increased theta band power in the frontal midline region was said to increase with increasing task demands and is related to orienting, attention, memory and effects processing mechanisms.

Aftanas & Golosheykin (2005) assessed whether experienced meditators (n=25, 13 females) demonstrated differences in arousal to non-meditators (n=25; 12 females) during restful states and emotionally aroused states in everyday life (via a aversive movie clip). Participants were aged between 20-40 years. Results indicated that both groups increased arousal, and decreased EEG power (increased theta) with greater impact on the posterior cortical regions.

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[10] Sahaja Yoga Meditation is described as a model conscious mental process, characterised by internal attention and emerging positive emotional experiences where the meditator experiences mental silence yet is alert and ware , free of unnecessary mental activity (Aftanas & Golocheikine,2002).

Alpha bands decreased as arousal increased; however, meditators showed significantly larger power values in theta and alpha during the lowest level of arousal (eyes closed phase versus eyes open eyes, of the rest condition). During the aversive video clip, both groups had significant decreases in alpha power; however, the non-meditators had significantly greater gamma power in the anterior cortical sites, an indicator of greater arousal. Subjective ratings for the meditators demonstrated lower scores for nine emotions except happiness while viewing the neutral clip and significantly lower emotional reactivity to the aversive movie clip compared with controls. These results suggest that the practice of meditation induces a calmer state of mind during restful conditions and an ability to retain this state during emotional arousal relative to no meditation practice.

The aforementioned studies indicate that the practice of yoga relaxation and meditation techniques by experienced and to a lesser extent inexperienced practitioners induce greater alpha and theta brainwave frequencies, particularly in the occipital and the parietal regions of the brain and in the midline frontal and central regions.

Although these studies show that yoga practices of relaxation and meditation indicate increase theta waves, the behavioural differences between children with disruptive behaviour (ADHD) who have increased theta and reduced alpha, and meditators, may be due the presence of increased alpha waves. Increased theta and reduced alpha and beta waves in young people with ADHD appear to manifest as a reduction in attentional abilities and increase in emotional states. The question arises as to whether there could be an increase of alpha frequencies in the ADHD brain bringing greater vigilance and awareness of behavioural traits and leading to greater regulation for ADHD sufferers and subsequently whether yogic relaxation and

meditation be a means of inducing this heightened state of awareness and regulation for ADHD sufferers.

2.4.2.2.2 Glucose Metabolism / Oxygen Consumption

Glucose metabolism is a biochemical process responsible for the formation, breakdown and inter-conversion of glucose. This process requires oxygen and yields fuel for the energy needs of the organism (Mora & Pessin, 2004). Glucose metabolism (GM) also referred to as oxygen consumption (OC) is simultaneously effected as with brainwaves frequencies, as an outcome of practicing of yoga techniques. Cerebral glucose metabolism has been found to be decreased in adults with a childhood history of ADHD (A. Zametkin et al., 1990) and to a lesser degree in the adolescent ADHD brain (A. Zametkin et al., 1993) in comparison to controls (see section 2.1.3.3--aetilogy). Yoga studies have demonstrated both increases and decreases in oxygen metabolism, depending on the yoga technique employed

Telles and Desiraju (1991), found specific very slow breathing practice with breath holding both increased and decreased oxygen metabolism in a randomly assigned trial with two conditions. Using the Benedict–Roth apparatus, oxygen consumption was found to increase by 52% in the short breathing holding group (22.2 % of one respiratory cycle) and decrease by 19% in the long breath holding group (50.4 % of the respiratory cycle). Participants (n=10males) aged 28-59 years, were long-term experienced yoga practitioners. Investigators considered that the differences in oxygen consumption may have been related to the effects of breathing on i) skeletal muscular relaxation or activity ii) on variations of autonomic nervous system discharges altering regional blood flows and metabolism; iii) on adrenal,

cortico–medullary secretions; or iv) may be due to differences in regional activities of neurons in the cerebrum.

Telles et al. (1994) found that breathing through a particular nostril can alter oxygen metabolism. Compared to baseline, breathing through the right nostril indicated a significant increase of 37%, through the left nostril a non-significant increase of 24% and a significant increase from volar galvanic skin resistance and through alternative nostrils a non-significant increase of 17%. Participants (n=48 males) were aged between 25–48 years and randomly assigned to one of the three groups. Breathing practices were carried out in 27 respiratory cycles four times a day for one month. Investigators suggested that the right nostril group results may be due to increased sympathetic discharge into the adrenal medulla and the left nostril group results could be interpreted as a reduction in sympathetic nervous system activity supplying the sweat glands.

Telles et al., (1996) found that right nostril breathing significantly ($p< 0.05$) increased in oxygen consumption (17%). Participants (n=12, 4 male), with an average age of 27.2 years (SD 3.3 years) performed the technique for 45 minutes over two consecutive days in two alternating treatment groups in a crossover design. This result combined with an increase in systolic blood pressure and a significant decrease in digit pulse volume are indicative of increased vasoconstriction that shows that right nostril breathing has a sympathetic stimulating effect.

Herzog et al., (1990) found a changed pattern of regional glucose metabolism during yoga meditative relaxation. Participants (n=8 males) with a mean age of 32years underwent an experimental and control phase (resting state). PET measurements were done in 15 adjacent planes of the brain in four participants in the rest phase first and visa versa for the other four

participants. Meditators described the experience as a feeling of relaxation, peace and detachment. Results indicated that although there were intra-individual changes of the total cerebral regional glucose metabolism, the alterations were not significant for the inter-group comparison of specific focal changes. Nor were there changes in inter-hemispheric differences in metabolism. However, the frontal versus occipital regional glucose metabolism was significantly elevated ($p<0.05$) during meditation. These alterations were attributed to a slight increase of frontal glucose metabolism and a more pronounced reduction in primary and secondary visual areas. Investigators suggested that these results implied that Yogic meditation impacts on the anterior/ posterior glucose metabolism ratio involving frontal and occipital regions of the cortex. This was claimed to indicate a holistic behaviour of the brain metabolism during the time of the altered state of consciousness induced by meditation.

Lou et al. (1999) measured regional blood flow using PET scans during a relaxation technique, *Yoga Nidra* (Satyananda, 1984) (a technique taught in the current thesis study). Results indicated that regional blood flow in the parietal and superior frontal lobes (that is, motor attention regions) changed when focused on sensations of weight and body parts stages of *Yoga Nidra*. Similarly, regional blood flow in the left hemispheric parietal and superior temporal lobes accompanied the sensation of joy; and regional blood flow in the occipital and parietal lobes accompanied visual imagery. Additionally subjective experiences (instrument not stated) indicated reduced conscious control of attention and behaviour, relaxation, a sense of stillness and focused sensory experiences.

2.4.2.2.3 Lateralisation of Cerebral Hemispheric Activity

Duplication of both body parts and lateralisation of neural activity has added substantially to the survival of living organisms. Lateralisation of the central nervous system (CNS) and the autonomic nervous system (ANS) (which are independent yet with complementary activity) (Ramos & Arnsten, 2007) are facilitated by ultradian rhythms which are proposed by Shannahoff-Khalsa (1991) to be associated with the basic rest-activity cycle Kleitman (1967, 1982). The basic rest-activity cycle, termed by Kleitman (1967, 1982) describes the bodily functions associated with for example, work, rest and eating. 'The nasal cycle[1] is identified as an ultradian rhythm and describes the alternating congestion and decongestion of opposite nostrils where there is a vasoconstriction in one nostril turbinate and a parallel vasodilation in the other[1] (Shannahoff-Khalsa 1991, p.226). *Pranayama* breathing techniques have been found to manipulate this nasal cycle.

Jella & Shannahoff-Khalsa (1993) (n=51), in a randomized trial, found that forced unilateral nostril breathing (FUNB), through the left nostril stimulated the right hemisphere with simultaneous greater improvement in spatial performance tasks attempts ($p<0.001$) and in answering more questions ($p<0.028$) compared to right nostril breathers. Right nostril breathers, although not significant ($p<.140$), indicated improvement in attempting more questions and correctly answering more verbal performance questions than the left nostril breathers.

Lateralising effects are associated with relatively greater integrated EEG values in one hemisphere correlating with predominant airflow in the contra-nostril. This association is described as an interrelationship between cerebral dominance and peripheral autonomic

nervous function (Werntz et al., 1987). Lateralising activity as a result of FUNB is also associated with blood glucose as demonstrated by Backon (1988). Using an Ames Glucometer blood glucose monitor with (n=1) participant measured for 10 minutes in each of 10 trials, parasympathetic activation was found to be induced by right brain hemispheric activation via the left FUNB and sympathetic activation induced by left brain hemispheric activation via right FUNB.

The emotional functions of the cerebral hemispheres have also been reported to be altered following forced unilateral nostril breathing with left nostril breathing associated with higher levels of negativity (Schiff & Rump, 1995).

A yoga study by Shannahoff-Khalsa and Beckett (1996) was prompted by cerebral abnormalities and lateralization in Obsessive Compulsive Disorder (OCD) prompted by the correlation between prefrontal and basal ganglia abnormalities and elevated glucose metabolism (Swedo, 1989) and left frontal dysfunction (Flor-Henry, Yeudal, Koles, & Howarth, 1979).

Cerebral lateralisation is evident in the ADHD brain with deficits observed particularly in the right hemisphere (F. Castellanos et al., 1994; F. Castellanos et al., 1996; G W Hynd et al., 1993; G. W. Hynd, Semrud-Clikeman, Lorys, Novey, & Eliopulos, 1990; G. W. Hynd et al., 1991). With yoga studies finding that breathing through a particular nostril can influence the functioning of the contra-lateral side of the brain (Jella & Shannahoff-Khalsa, 1993), the possible implications for influencing atypical lateralization in ADHD are open for investigation. The effects of *pranayama* on emotional states is particularly relevant to children with both externalising and internalising disorders who display higher levels of

emotional lability on teacher and parent rating scales (Conners, 1997b; P. S. Jensen & Kenny, 2004).

2.4.2.2.4 Neurotransmitter Activity

Neurotransmitters (NT) are a chemical means of interaction between neurons which are either excitory or inhibitory. NT are made and stored in the pre -synaptic neuron and released after stimulation to transverse to the synapse and bind to a specific receptor on the post-synaptic junction to excite the next cell. Noradrenalin and dopamine are excitory NTs implicated in ADHD. ADHD medication, Ritalin, significantly increases the levels of dopamine in the brain by blocking dopamine transporters which in turn activates the motivation circuits and makes tasks more enjoyable (Volkow 2001) cited in (Sutcliffe, Bishop, & Houghton, 2006b) . High baseline levels of noradrenalin in ADHD are associated with the high levels of activity and impulsivity (Plizska et al., 1996).

Neurotransmitters-nor adrenaline and dopamine have received some attention in the yoga research literature.

Kennedy, Ziegler and Shannahoff–Khalsa, (1986) measured noradrenalin (NA), dopamine (DA) and adrenalin (AD) activity using radioenzymatic technology in relation to the nasal cycle. The trials tested for a relationship between neurotransmitter activity and the nasal cycle which can be manipulated by forced unilateral nostril breathing. Alternations were found in neurotransmitter levels in each arm in seven readings from six adult participants which correlated with the nasal cycle[1]. This pattern of neurotransmitter secretion was stated as being suggestive of an ultradian rhythms due to its apparent similarity with manifestation resultant

from pituitary hormone secretion, loco motor activity and other autonomic functions that are characteristic of the basis rest-activity cycle (Kleitman, 1967).

Bacon and Kullock (1989) investigated the involuntary blink rate as a clinical monitor of the lateralization of dopaminergic activity during the practice of forced unilateral nostril breathing in one adult participant Decreases of half the normal range of 20 blinks per minute were found with left nostril breathing (right hemisphere stimulation) and decreases to a quarter of the normal rate with right nostril breathing (left hemisphere stimulation), after twelve trials of six minutes duration, using a 2-channel electro-oculogram (EOG).. It was suggested that this effect has implications for disorders with existent dopaminergic dis-regulation such as ADHD, schizophrenia and Parkinson's Disorder, where the nasal cycle may be adversely effected.

Kjaer et al. (2002) measured endogenous dopamine (ED) tone during *Yoga Nidra* using C-raclopride PET scan tracer to test for loss of executive control during the practice. Participants (n=8) were meditation teachers. Results indicated a 65% increase in dopamine release with all participants reporting a decreased desire for action and heightened sensory imaging.

2.4.2.2.5 Endocrine Activity

The endocrine system is a series of glands in the body that are controlled by the hypothalamus. The glands release hormones that are chemical messengers which act on receptors on targeted cells in the tissues. Hormones are either peptides, amines or steroids (Morris, 1994).

Varying hormone levels are associated with changes in behaviour. Increased levels of the hormone cortisol is associated with stress and anxiety (Kamei & Kumano, 1994) and decreased levels are associated with aggression in boys (A. G. Herzog, Edelheit, & Jacobs, 2001; K McBurnett et al., 2000).

Improvement in endocrine system function has been described by Schell, Allolio and Schonecke (1994) who investigated physiological (endocrine and cardiovascular parameters) and psychological effects of yoga practice on stress levels of healthy women. Participants (n=12) aged between 27-55 years (mean age 32.5 years) were experienced yoga practitioners (EY) (mean age 32.5 years) and women (n=13) aged between 22-54 years (mean age 29.5 years) without yoga experience acting as controls. Assessments were conducted before and during an hour yoga session of *asana*s, *pranayama* and meditation and for the control group before and while reading newspapers. The hormone activity of cortisol plasma and plasma prolactin although consistently lower during the experimental period in the yoga group did not significantly differ. Growth hormone was in higher concentrations in the yoga group prior to the experimental period and significantly decreased during the experiment which did not occur in the control group.

Kamei et al. (2003) in addition to investigating the impact of an integrated yoga program on cortisol levels. During the yoga session cortisol serum levels decreased ($p < .05$) with a negative correlation between ratio of changes in serum cortisol and alpha activity. Implications of these findings indicate that yoga reverses secretion of cortisol which is related to stress-induced suppression of immune function (Kamei & Kumano, 1994).

Robert McComb, Tacon, Randolf, Caldera (2004) investigated the stress reducing effect of a mindfulness meditation and relaxation program on stress hormones-noradrenalin (also

referred to as a neurotransmitter), adrenalin, cortisol, aldosterone and growth hormone, thyroxine, physical functioning and submaximal exercise responses. Participants (n=18) were white middle class women with a mean age of 60 years (SD 6.3years) with a history of heart disease randomized into a treatment or control group with no mention of previous meditation experience. The program ran for eight weeks, two hours per week. Results indicated a non-significant decrease in resting cortisol levels for the meditation group only with other hormones levels not changing but baseline levels were within the normal levels for both groups.

Woolery, Myers, Sternlieb, Zeltzer, (2004) employing Iyengar[11] Yoga techniques examined effects on cortisol levels, depression and mood. Participants (n=28, 4 male) were young adults aged between 18-29 years (mean age 21.5 yrs SD =2.3 yrs) with mild levels of depression ascertained from scores from 10-15 on *Beck Depression Inventory (BDI)*) (Beck, 1961). Participants neither smoked nor suffered from substance abuse nor had a psychiatric diagnosis. A yoga group (n=13) and wait-listed control group (n=15) were randomly selected from participants. The yoga treatment consisted of two, one hour classes per week over 5 weeks. Postures (back bends, inversions and standing poses) deemed effective for depression (according to Iyengar) formed the content of the treatment program. Results demonstrated a trend towards higher morning cortisol levels at the end of the program for the yoga group. This is unexpected as high cortisol levels are generally associated with responses to stress and pathological conditions. Authors noted that in contrast to this association, high cortisol levels

[11] Iyengar Yoga refers to a style of yoga developed by BSK Iyengar that emphasises postural alignment and precision and advocates holding postures aided by the use of props such as bolsters, straps and blocks to facilitate better alignment and support (Spiers, 2003).

have also been associated with high self esteem, hardiness, tenacity and lower nervousness, depression and emotional lability (Zorilla, DeRubeis, & Redei, 1995).

In summary, high cortisol levels which are associated with high stress levels and anxiety, are reduced with specific yoga practices although the findings of Woolery et al. (2004) are in contrast to this. Another contrary finding is that children with high levels of aggression have been found to have low cortisol levels (A. G. Herzog et al., 2001; K McBurnett et al., 2000) but not if they have comorbid anxiety (K. McBurnett et al., 1991) and the findings of Schell et al., (1994), Robert Mc Comb et al., (2004) and Kamei et al, (2000) that associate meditation and yoga practice with low cortisol levels. This association is linked to an reduced arousal of the ANS which is found to be present in yoga practitioners (Pal, Velkumary, & Madanmohan., 2004; R P Vempati & Telles, 2002) and in children with aggression (Garralda et al., 1991). Investigation of the effects of yoga practices on aggressive children's cortisol levels is yet to be conducted but is warranted, given the effects of yoga on reducing aggression in boys in juvenile detention Suarez (2002) (see section 2..2.3.2).

2.4.2.2.6 Cognitive Activity

Cognitive ability is impaired in children with ADHD. Parents and teachers identify cognitive problems with attention on the Conners Teacher Rating Scales (CTRS) and Conners Parent Rating Scales (CPRS) (Conners 1997). Working memory (necessary for accessing and manipulating information to solve problems), is functionally impaired in ADHD (Pliszka et al., 1996, Swanson et al., 2007).

Yoga studies have found improvement in cognitive activity in the indicators of reaction time, (an index of processing ability of the central nervous system and a means of determining sensory-motor performance) (Das, Gandhi, & Mondal, 1997) and spatial and verbal performance.

Madanmohan, et al. (1993) investigated the effects of yoga training over time, on visual and auditory reaction times in 27 inexperienced yoga students who practiced an integrated yoga program for 12 weeks. Results indicated significant decrease in visual reaction time of 17% ($p<0.001$), in auditory reaction time of 19% ($p< 0.001$).

Jella & Shannahoff (1993) investigated the effects of unilateral forced nostril breathing (FUNB) over time on cognitive performance. Participants were voluntary psychology students (n=51, 25 male) aged between 17 and 40 years. A verbal analogy task based on the Miller Analogies and SAT Tests were used to test for left-hemispheric performance and mental rotation tasks based on the Vanderburg and Kuse adaption of Sheppard and Metzler's test were used to test for right hemispheric performance. Results indicated that spatial performance was significantly enhanced during left nostril breathing ($p=.028$), with a non-significant improvement in verbal performance during right nostril breathing. Authors suggested that forced unilateral breathing may have application in treating psycho-physiological disorders with hemispheric imbalances and autonomic abnormalities.

Sarang and Telles (2007) investigated the effects of cyclic meditation and a yoga relaxation technique (supine rest) in experienced yoga students (n=40) compared with a control group (n=29) in a letter cancellation task, in a non-randomised control trial. Letter cancellation tasks require visual selectivity and repetitive motor response (Lezak, 1995 cited in Sarang and Telles, 2007). Participants were male volunteers aged between 18 and 48 years. The

assessment task was conducted immediately before and after the sessions. Results demonstrated no differences in baseline. Significant increases in total and net scores were demonstrated in the cyclic mediation group and in the relaxation group ($p<.001$) with no change in the control group. Authors suggested that these results indicated improved visual selectivity and repetitive motor response in addition to sustained attention, visual scanning and activation and inhibition of rapid responses. Distractions were also reduced, indicated with significant fewer errors in the cyclic meditation group ($p<.05$).

Telles, Raghuraj, Maharana, & Nagendra, (2007) (n=20), investigated the effects of three yoga breathing practices and breath awareness in the same letter cancellation task employed in Sarang and Telles(2007). Participants were (n=20) male volunteers aged between 20 and 40 years. Participants performed all techniques on separate days in a randomised order. No significant differences were demonstrated at baseline. Results demonstrated significant improvement in alternative nostril breathing in letters left out ($p<.01$) and total errors ($p<.01$); in right nostril breathing in letters left out ($p<.02$); with no change in left nostril breathing or breath awareness assessments. Authors suggested that due to a letter cancellation task being left hemispheric specific (Springer & Deutsch, 1998 cited in Telles et al (2007), significant improvements from alternative nostril and right nostril breathing were expected.

Implications of these results support an integrated yoga program, cyclic meditation or relaxation and alternative and right nostril *pranayama* as a means of improving visual selectivity and repetitive motor response, attention, visual scanning and both activation and inhibition of rapid responses and potentially useful in decreasing distractibility.

2.4.2.2.7 Autonomic Nervous System Activity

The autonomic nervous system is the peripheral arm of the central nervous system and the parameters such as heart rate and variability, blood pressure and skin conductance/resistance are under its control. These parameters have been extensively investigated in response to yoga practices in the following trials.

Santha et al. (1981) investigated the effects of a three month integrated yoga program on soldiers (n=10) with no previous yoga experience in a pre- and post- test design. Results demonstrated significant reductions in heart rate ($p<0.001$), blood pressure ($p<0.01$) and skin temperature ($p<0.001$) which indicates a reduction in sympathetic dominance.

Bhargava et al. (1988) examined the effects of alternate nostril breathing (*nadi shodana pranayama* (NSP) with breath holding practiced 30 minute a day for four weeks, in a pre and post design. Participants (n=10) were males between the ages of 19 and 28 years. No-significant changes occurred in blood pressure. Significant decreases in heart rate following *nadi shodana pranayama* for breaking point breath holding in normal respiration ($p< 0.01$) in inspiration; ($p<0.001$) in expiration and deep expiration ($p< .01$) and hyperventilation ($p<0.001$) and significant increases after deep inspiration ($p<0.01$). Authors suggested that results imply that *nadi shodana pranayama* alters breath holding capacity and autonomic activity indicating increases in vagal tone and decreases sympathetic activity.

Schell, Allolio and Schonecke (1994) investigated the effects of a one hour integrated yoga class on experienced adult female yoga students (n=25) compared with age-matched controls without yoga experience. Results showed marked decreases in heart rate during and directly after yoga practice with a return to baseline levels compared with a control group that showed

a slow continuous decrease in heart rate throughout the assessment time. No significant differences were found in blood pressure between the two groups.

Nagendra and Telles (1996) measured the effects of 45 minutes of right nostril breathing compared with normal breathing in adults) (n=12) with three months yoga experience in a randomly assigned crossover trial. Significant increases were found in systolic blood pressure and significant decreases in digit pulse volume (45.7%) in the right nostril breathing group with no changes in the normal breathing group. Authors suggested that these results indicate an increase in sympathetic tone. Participants also reporting increased relaxation which is not generally correlated.

Vempati and Telles (2002) measured effects pre and post guided-yoga relaxation (GR) compared with supine rest (SR) in experienced yoga students (n=35). Results indicated skin resistance decreased by 35.6 % ($p<.05$), heart rate reduced by 9.7% ($p<.001$), high frequency heart rate variability increased by 9.8% and low frequency decreased by 15.5% ($p<.05$) in the guided-yoga relaxation. The supine rest group indicated 27% ($p<.01$) reduction in skin resistance and heart rate decreased by 6.5% ($p<.01$). Authors suggested that these results implied that both types of relaxation reduce sympathetic arousal with more significant changes arising from the yoga-guided relaxation.

Pal, Velkumary and Madanmohan, (2004) investigated the effects of yogic breathing exercises on adults (n=60), randomly assigned one of two treatments -- *kapalbhati* (rapid abdominal actioned bi-nasal exhalation with passive inhalation) (S. Satyananda, 1996) or alternative nostril slow breathing or one of two controls groups over a three month period. Significant decrease were indicated in basal heart rate ($p<0.05$) compared to baseline and control. Heart rate decreased over time significantly ($p<0.05$) after standing, after deep

breathing decreased ($p<0.001$) compared to controls. There were no significant changes in the fast breathing group over time or compared to controls. Changes imply that slow breathing improves vagal tone an indicator of the activity of the parasympathetic nervous system.

A-typical functioning in both the sympathetic and the parasympathetic arms of the autonomic nervous system functioning and its association with stress is increasingly evident in the manifestation of internalising and externalising behaviour disorders (Boyce et al., 2001; Garralda et al., 1991; K. McBurnett et al., 1991; Pine et al., 1998). Stress is also implicated in the 'switching' of noradrenalin activity resulting in diminished 'executive' behavioural control (Ramos and Arnsten, 2007). Neuropsychiatric disorders, including ADHD, appears to be particularly vulnerable to this neurochemical regulation where dysfunction in daily lives and exposure to repeated and uncontrollable stress is frequently present (Ramos and Arnsten 2007).

The yoga trials discussed in this section have predominantly found a reduction in sympathetic activity and an increase in vagal tone of the parasympathetic nervous system all of which contribute to a reduction in stress levels.

2.4.2.2.8 Muscular Relaxation and Performance

Yoga practices are claimed to induce muscular relaxation and increase muscular control, strength and performance (Bhatnangar & Anantharaman, 1977; Dhume & Dhume, 1991; Narayan et al., 1990). Research trials measuring these parameters are presented below.

Bhatingar and Anantharaman (1977) conducted a study to determine the effect of practising yoga on neuromuscular activity and muscular activity. Participants (n=20) were healthy and clinically screened for muscular and metabolic disorders who received six months of yoga training. At one, three and six month assessments, significant decreases were found in neuromuscular excitability, indicated by increases in chronaxie and rheobase, utilization time and strength-duration; a significant reduction in half-relaxation time of the archilles–reflex indicating quicker relaxation time; a significant increase in the conduction velocity of the ulnar nerve indicating faster propagation of the impulse motor nerve; and a significant decrease of the latency of the 'M" wave of the 'H reflex' indicating a faster propagation of impulse in the motor nerve. It was concluded that yoga training increased the threshold of excitability of the muscles and brought about quicker relaxation time.

Narayan et al. (1990) aimed to quantify the degree of relaxation resulting from the practice of Kundalini[7] Yoga Meditation using an Electromyographic (EMG) integrator. Participants (n=8, 4 females) were young adult students assessed before and after Kundalini yoga meditation training. EMG readings taken on the chin, recorded four minutes before and after thirty minutes of the meditation indicated a significant decreases in muscle activity in females ($p < .001$) and males ($p < .02$) with a mean decrease of 58% in chin muscle activity. Implications suggest Kundalini yoga meditation as an effective way of inducing muscle relaxation in both males and females.

Yoga's apparent efficacy in reducing the physiological parameters of muscular relaxation has relevance to muscular tension detected in children with anxiety, aggression and social problems (Rauhala, Alho, Hanninen, & Helin, 1990) and assumed muscular tension in

children who experience hyperactivity and problems with impulse control associated with ADHD (W E Pelham et al., 2005).

Dhume and Dhume (1991) investigated the comparative efficacy of dextroamphetamine (psychostimulant prescribed for ADHD) and Kundalini yogic meditation in balancing on a balance board which authors considered was an appropriate measure of wakefulness, self confidence and concentration. Participants (n=18) were medical students divided into three groups- an experienced meditators group, a group who received Dextroamphetamine and a control group who received a placebo. Each group performed the balance in five minute trials once a day for ten consecutive days. Results indicated that the meditators' performance steadily and progressively increasing throughout the period of the ten day trial with a rise of 27.8% in the balance index as compared with controls. The Dextroamphetamine group's balance time and error score (balance index) at each trial, declined with an overall percentile fall 40.6 %. The results indicate that Dexamphetamine deteriorated performance of a physical task requiring concentration. These results are in contrast to the ADHD studies that have found that psycho-stimulants improve concentration, although tasks tested required mental concentration only (Tannock, Ickowicz, & Schachar, 1995).

2.4.2.2.9 Summary of the effects of Yoga

In summary, yoga has been found to have immediate and longer term effects on the parameters of the central nervous system, the autonomic nervous system and consequent effects on muscular relaxation and performance. An increase in brain wave frequencies, alpha and theta have been found with yogic relaxation, mediation and integrated yoga programs

resulting in a more relaxed state. Glucose metabolism as been found to either increase or decrease depending on the yogic technique employed, causing either a stimulating or calming effect. Lateralising of cerebral activity is impacted by the use of various pranayama yogic breathing techniques. Neurotransmitter activity involving dopamine and noradrenalin has been found to be effected by the nasal cycle and by specific pranayama and relaxation techniques. Endocrine activity, in particular cortisol, the hormone associated with stress, has been found to be reduced with the practice of yoga. The cognitive activities of verbal and spatial performance, attention and reaction times have been found to improve with *pranayama*, yogic relaxation and mediation and integrated yoga programs. A reduction in the sympathetic activity and an increase in parasympathetic activity of the autonomic nervous system associated with stress reduction, have resulted from *pranayama*, yogic relaxation and mediation and integrated yoga programs. Improved muscular relaxation and increased performance have been found to result from integrated yoga programs and mediation. The above mentioned trials have employed a variety of research designs, involving control conditions, randomisation, appropriate measures and adequate analyses in a wide variety of clinical and non-clinical populations. However, characteristically, with such labour intensive treatments numbers tend to be small. These yoga trials have made a significant contribution to the knowledge that Yoga can have considerable impact on central and autonomic nervous system functioning and its consequent effect on behaviour.

2.4.2.3 Yoga for Specific Mental Health Disorders

The effects of yogic techniques on stress and anxiety, depression and other mood disorders both in clinical and non-clinical populations have been investigated using anxiety and mood inventories and quality of life questionnaires. Chronic diseases associated with stress have been studied extensively: bronchial asthma (Nagarathna & Nagendra, 1985), hypertension (Chaudhary, Bhatnagar, Bhatnagar, & Chaudhary, 1986; Ornish et al., 1998), rheumatoid arthritis (Haslock, Monroe, Nagarathna, Nagendra, & Raghuram, 1994) and cancer (Carson et al., 2007) are among these.

As previously discussed in section 2.1.4.1, anxiety is frequently comorbid with ADHD, ODD and CD. The presence of comorbid anxiety alters the physiological profile (Rogeness et al., 1990) indicating higher levels of stress. Emotional lability is evident as a secondary symptom of ADHD (Conners, 1997) and a primary symptom of Mood Disorders (APA, 2000). Anxiety, depression and mood disorders were prevalent to a lesser degree than externalising behaviours among the cohort of students recruited for this thesis study. However the presence of internalising disorders in children with externalising behaviours can increase with the onset of adolescence (Hazell, 2008) therefore the studies trailing yoga as a treatment are highly relevant.

2.4.2.3.1 Depression and Mood Disorders

As mentioned in section 2.1.4.2, the World Health Organisation (WHO) has recognized depression as one of the major and increasing diseases affecting the world population. For

three quarters of sufferers, treatments are either unavailable or not sought. Many yoga studies have focused on yoga as a treatment for depression and mood disorders.

Janakiramaiah, et al. (2000) compared three protocols, Impiramine, SKY (included *Yoga Nidra* relaxation) and electroconvulsive therapy (ECT) and their effect on (n=45) (ages not stated) hospitalised patients with depression. Participants were randomised into thee equal groups for a four week treatment period. SKY sessions were offered to Group 1, six days a week and a mean of 20.3 (SD 2.8) sessions were completed. ECT sessions were conducted with Group 2, three times per week with a mean of 8.9 (SD 3.3) completed. Impiramine (150 mg) was taken daily by Group 3. Results from baseline and weekly assessments on the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the Hamilton Rating Scale (Hamilton, 1960b) indicated significant improvement in all three groups (except for one patient on Impiramine). Remittance status was maintained until the end of the trial period. Additionally no seizures, confusion, cardiovascular accidents were observed during the trial period. The implications are that patients who either are non-responders or reluctant to take drug therapy or electroconvulsive therapy have an alternative yoga relaxation treatment available.

Woolery, Myers, Sternlieb, Zeltzer (2004) employed Iyengar[12] yoga techniques with young adults suffering from mild levels of depression. Significant improvements were demonstrated over time ($p<.001$) and compared to controls ($p<.01$) on the *Beck Depression Inventory*

[12] Iyengar Yoga refers to a style of yoga developed by BSK Iyengar that emphasises postural alignment and precision and advocates holding postures aided by the use of props such as bolsters, straps and blocks to facilitate better alignment and support (Spiers, 2003).

(BDI)) (Beck et al., 1961) and compared to controls group (p<.001) on the *State-Trait Anxiety Inventory (STAI)* (p<.001) (C. Spielberger, D, 1983). Significant reductions over time for the yoga group occurred on the depression, anxiety, anger, fatigue, confusion and total mood disturbance scales in the first and fifth class and on confusion and total mood disturbance at the last class on the *Profile of Mood States (POMS)* (Mc Nair, Lorr, & Droppelman, 1971).

Lavey et al. (2005) investigated the effects on mood of a yoga program modelled on a Kabat–Zinn program composing of classical yoga poses and relaxation with awareness on deep breathing and body sensations. Participants were (n=113, 52 female) psychiatric inpatients with a mean age of 27.7 years (SD 12.83 years) who attended two classes over two weeks. No control group was included. Significant improvements were reported in depression, anxiety, anger, fatigue, confusion but not in vigour on the Profile of Mood States (POMS) (Mc Nair et al., 1971). Authors conceded that improvements may have been due to the patients obliging expectations of teacher and staff, and being offered an opportunity to be in a relaxed, non-socially demanding environment away from the possibly demands of other treatment programs. This confounding factor could have been alleviated with a control group.

Shapiro et al. (2007) investigated yoga as a complementary treatment for patients with depression who were taking anti-depressants. Participants recruited for the study were 37 adults, mean age 44.8 years, between 20 and 71 years, recruited via public advertisements. Inclusionary criteria for the study required a report of residual symptoms (partial remission) while taking anti-depressants that was confirmed with a score between 7-18 on the *Hamilton Depression Scale (HAM-D)* (Hamilton, 1960a). Participants (n=17) completed a 20 session Iyengar yoga program similar to that employed by Woolery et al. (2004) specifically for depression. The most significant improvement over time was reported on the H*AM-D*

(p<.001). Less significance over time (p<.05) was reported on the State-Trait Anxiety Inventory (STAI), (Speilberger, 1983); on the expression of anger on the Anger Expression Scale (C. D. Spielberger, Johnson, & Jacobs, 1982); on the RES-F36 (Ware, 1993), which is a section of a health survey on 'emotional limitations in role activities'; and for low frequency heart rate variability. Additionally there was significant immediate improvements (p<.001) in mood after class compared with before class. Negative moods decreased, positive moods and energy/arousal moods increased (less tired, more energetic). Moods did not change over the course of the sessions with one exception: average levels of 'happiness' (pre- and post-class ratings) increased over the course of the sessions (p<.03) and increases in 'happiness' from before to after each class became greater over the course of the sessions (p<0.03). Eleven of the participants ended the study at remission levels (<7 on HAM-D). The remaining six, one showed a sizable reduction and the other five, small changes. Investigators found pre-intervention data for the participants who significantly remitted, indicated this group had less education, more exercise, lower heart rate, higher levels of high frequency-heart rate variability, lower levels of low frequency-heart rate variability.

Carlson, Speca, Patel & Goodey (2003) examined the effect of meditation, relaxation and gentle yoga on primary and secondary symptoms of cancer patients. Parameters measured included questionnaires on quality of life, stress levels and mood and lymphocytes and T-cells counts, interferon gamma and NK cells. Participants were breast cancer (n=49) and prostrate cancer patients (n=10) with a minimum of three months since surgery. The treatment program ran for eight weeks including home practice and was not compared to control condition. Significant improvements were observed for (n=42) who completed the treatment, on the *European organization for Research and Treatment of Cancer Quality of life Questionnaire (EORTCQLQ-30)* (Aaronson et al., 1991) (p<0.05) and the *Symptoms of Stress Inventory*

(SOSI) (Leckie & Thompson, 1979) ($p < 0.01$). A non-significant reduction of 13% over a low baseline level was reported on *Total Mood Disturbance* on the *Profile of Mood States (POMS)* (Mc Nair et al., 1971). No significant changes were seen in the overall number of lymphocytes or cell subsets but T-cell production of interlukin (IL-4) increased, interferon gammav (IFN-y) decreased and NK cell production of IL-10 decreased which reflects an immune profile of people not experiencing depression.

2.4.2.3.2 Anxiety Disorders and Stress

Systematic reviews on the effectiveness of yoga on the treatment of anxiety have been conducted by Kirkwood, Rampas, Tuffrey, Richardson and Pilkington (2005) and Brown and Gerbarg (2005a). Summaries of four Kirkwood's reviews (relevant to disruptive behaviour) ((Sahasi, Mohan, & Kacker, 1989; D. S. Shannahoff-Khalsa & Beckett, 1996; Sharma, Azmi, & Settiwar, 1991; Vahia, Doongaji, & Jeste, 1973) and two summaries from Brown and Gerbarg (2005a) will be discussed below along with another study Schell et al.,1994). Also included in this section is Brown & Gerbarg's (2005) neurophysiologic model of the benefits of yogic breathing on stress related physical, mental, behavioural and emotional disorders.

Vahia et al. (1973) studies employed the practices of *asana*, *pranayama*, *pratyahara*, *dharana* and *dhyana* (five of Patanjali's classic yoga practices) and compared outcomes to other practices resembling yoga to test the efficacy of treatment of psychoneurosis (term no longer used) (DSM 111) (APA 1980). Participants (n= 27) were divided (randomization not stated) into two groups–a yoga group (n=15) and a non-yoga (n=12) group who practiced for one hour, six days a week for a minimum of four weeks. No significant differences between

groups were detected prior to treatment on the *Taylor's Anxiety Scale*, (Taylor 1953). However, a significant difference between groups ($p<0.001$) favouring the yoga group was found after treatment. Vahia et al. (1973b) compared yoga treatment with anxiolytic and anti-depressant medication for patients with psychoneurosis or psychosomatic disorder. Participants (n=39) were divided into two groups (randomization not stated)-yoga (n=21) and medication (n=18), with trials lasting six weeks. Significant improvements favouring the yoga group (0.05) were reported on Taylor's Anxiety Scale (Taylor 1953).

Sahasi et al. (1989) measured the effects of a yoga program consisting of *asana*s, *pranayama* and relaxation on anxiety neurosis (DSM 111 APA (1980). Participants (n=91) were randomly divided into a yoga group, who practiced five days a week with two days of home practice (n=38) and a diazepam (n=53) group with the trial running for three months. Compared with the control group, the yoga group showed a significant improvement in anxiety reduction ($p<.05$) on the Institute for Personality and Ability Test (Cattell, 1960).

Sharma et al. (1991) investigated the effectiveness of *pranayama* techniques, *kapalbhaiti* (described above) and *ujjayi* (slow deep breathing performed by contracting the epiglottis, producing a light sonorous sound) (Niranjananda, 1994) in treating anxiety neurosis (DSM III) (APA, 1980). Participants (n=71) were psychiatric patients non-randomised into a yoga group (n=41) who practised the techniques for 10 minutes a day for 12 weeks and a placebo capsule control group (n=30). Significant improvements were reported in the yoga group at three weeks ($p<0.005$) and at six weeks ($p<0.001$) compared with the control group on the Hamilton Anxiety Scale (Hamilton, 1960a). However, the level of improvement indicated that participants were still functioning within the clinically anxious range.

Shannahoff and Beckett (1996) employed Kundalini Yoga techniques that combine physical movements with breath awareness, focal concentration and specific breathing through the left nostril as a treatment for Obsessive Compulsive Disorder (OCD) with outcomes assessed by the Yale–Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al., 1989), the Perceived Stress Scale (PSS) (J. Cohen, Kamarck, & Mermelstein, 1983) and the Symptoms Checklist (SCL-90-R) (Degogatis, 1983). Participants (n=8, 7 female) were OCD patients with a mean age of 39.4 years, who had received prior treatment without satisfactory relief. Five of the eight patients had been stabilised on fluoxetine for a minimum of three months before the commencement of the study. Patients met once a week to ensure compliance and proper use of the yogic techniques that were to be practised for one hour per day for 12 months. Results indicated improvement on the Yale-BOCS over baseline at each of the 3, 6, 9 and 12 month assessments for five completing patients. Four patients improved on the Y-BOCS measure by 83%, 79%, 65%, 61% respectively while one participant deteriorated (-18%), with a group mean improvement of +54%. Significant improvement over baseline at twelve month follow-up on the Symptoms Checklist, was found for OCD ($p<.001$), anxiety ($p< .051$), and global severity indices, ($p<.005$). Scores on Perceived Stress Scale showed significant improvement over the five test periods ($p<.001$). Of the five patients who were stabilised on medication prior to the study, three stopped medication after seven months or earlier and two significantly reduced medication, one by 25% and the other by 50%. Authors suggested that Kundalini Yoga techniques could lead to new approaches for other impulse control disorders such as ADHD.

Kirkwood et al, (2005) concluded that the results of the reviewed studies were sufficiently encouraging to warrant further investigation of yoga as a treatment for some of the anxiety disorders despite methodological weaknesses (lack of reporting on assessor bias or no

blinding, a lack of or poor randomization, high or unrevealed and unexplained attrition rates, lack of accurate analysis, inadequate reporting of participant details, inadequate sample sizes and contra-indications) in most of the studies.

The following studies were reviewed by Brown and Gerbarg (2005) but not as thoroughly as Kirkwood's reviews but are highly relevant to the current study sample. Suarez (2002) employed SKY yoga techniques as a treatment for anxiety and aggression in a non-randomized trial. Participants (n=86) aged 13-18 years were juvenile offenders who had committed violent crimes with deadly weapons and were primarily gang members. SKY instruction was given (20-25 hours per week) including 30 minutes of guided meditation and breathing three nights a week for four months. Results indicated reduced levels of anxiety, anger, fear, reactive behaviour and fighting. These results imply the application of SKY treatment in rehabilitation programs within prison system and as on going life skill when/if released to help reduce recedification.

A study by Ghoncheh and Smith (2004) compared Progressive Muscle Relaxation (PMR) (Jacobson, 1920) involving tensing and relaxing muscles with *hatha* yoga stretching (HYS) as a treatment for non-clinical stress. Participants (n=40, 25 females) were bank customer service, on the phone for eight hours a day dealing with customer complaints randomly assigned to either PMR, (n=20) with a mean age 34.50 (SD 8.98) or HYS, (n=20) with a mean age 33.45 (SD8.60), who met once a week for 30 minutes for four weeks. Instructions in the first week were given live for both groups and were given on an audio tape (to keep versions exactly the same) for the four remaining weeks. Both techniques targeted the same 11 muscle group combinations. Results on the Smith Relaxation States Inventory (SMRR) (J.C Smith, 2001) which identify 15 categories of relaxation on a 30 item "present state" self-report Likert

Scale showed significant higher levels of disengagement, physical relaxation, joy and mental quiet in the PMR group with no comparable improvements for energy and awareness from beginning to the end of the program for either group. Methodological weaknesses in this study include the live instructions being of short duration and inadequate delivery of yoga treatment. Teaching yoga stretching from an audio tape is far inferior to having a teacher present, who can ensure postures are performed correctly, re alignment, attitude and breathing. Relaxation on the other hand can be successfully administered using an audio tape as participants are lying still and mentally following instructions.

Brown & Gerbarg's (2005) neurophysiologic model of the benefits of yogic breathing (*ujjayi, bhastrika)* and *Sudarshan Kriya* yoga (SKY) on stress related physical, mental, behavioural and emotional disorders attempts to clarify the effects of yoga breathing on brain functions and physiologic parameters. The mechanisms in this model are ascribed to induce calm alertness with increased parasympathetic drive, calm stress related response systems and release neuroendocrine hormones and generate thalamic activity. Brown & Gerbarg (2005) refer to Ley's (1999) description of the relationship between breathing and emotion to support the model. The model describes involuntary and voluntary breathing as an activator of vagal afferents which are controlled via complex feedback mechanisms involving autonomic visceral networks, brainstem nuclei, the limbic system, cortical areas and the neuroendocrine system. This neural stimulation had implications for improved autonomic function, neuroendrine release, emotional processing and social bonding including the quieting of cortical areas involving executive functions (such as anticipation, worry and planning). The activation of the limbic system implied stimulation of the forebrain reward systems and emotional release and increased release of prolactin and oxytocin implied enhanced feelings

of calmness and social bonding. All the mechanisms involved in this model are implicated in impairments associated with disruptive behaviour.

Schell, Allolio and Schonecke (1994 examined psychological effects of yoga practice on stress levels in healthy, experienced, female yoga practitioners compared with healthy females without yoga experience acting as controls. Assessments were conducted before and during an hour yoga session consisting of *asana*s and *pranayama* and meditation and for the control group while reading newspapers. Significant differences between groups were demonstrated on the Freiberger Personality Inventory (FPI) (Fahrenberg, Hampel, & Selg, 1984), with higher life satisfaction ($p<.012$), less excitability ($p<.004$), less aggressiveness ($p<.001$), less openness ($p<.002$), and less emotional lability ($p<.013$) in the yoga group compared with non-significant higher scores in somatic complaints and extraversion. On the Stress Coping Questionnaire (Janke, Erdman, & Boucsein, 1978) controls had a significantly higher tendency to react with aggression ($p<0.003$) and self-pity ($p<0.05$), while the yoga group tended to reduce stress by minimising their situation ($p<0.06$). On the Adjective Checklist (Janke & Debus, 1977)–a mood profile, the yoga group reported significantly higher levels of high spirits ($p<0.001$), and extroversion ($p>0.043$) while the controls reported reduced state of activation ($p<0.032$) and were more irritable ($p<0.050$) with differences in vexation, excitation and numbness just failed to reach significance.

Granath et al. (2006) favourably compares the effects of a yoga program and a cognitive behaviour program, a treatment also employed with students with disruptive behaviour (Wicks-Nelson & Israel, 2003). The participants were employees of a Swedish company (n=26 female and n=7 male) who had self reported stress related problems. Participants were randomly assigned to one of the two treatment groups which were both lead by trained

instructors over a 10 session period. The yoga program was a type of yoga called *Kundadlini* yoga, which is characterized by exercises (*kriyas)* that are known to stimulate blood flow and energy supply to the brain, the nervous system and the glands in the endocrine system (Sing-Khalsa 1998) cited in (Granath et al., 2006). The cognitive behaviour therapy included relaxation, introduction to and discussion on home assignments, psycho-education and management techniques. Five questionnaires were administered seeking assessment of stressful life situations, daily stressors, vital exhaustion, anger and quality of life and physiological parameters measured were catecholamine in urine–adrenalin and noradrenalin, cortisol in saliva and systolic and diastolic blood pressure and heart rate. Two-way repeated analysis of ANOVA for pre and post results and independent t-tests were used when comparing groups. Both groups showed significant improvements on all questionnaires except the yoga group reduction of anger was not significant and on the quality of life questionnaire no significant improvements were found for either group. On the physiological measures noradrenalin was significantly reduced for the yoga group but not the cognitive behaviour group. Adrenalin and cortisol and heart rate and blood pressure changes were not significant for either group but reduced heart rate for the yoga group was approaching significance and reduced adrenaline and systolic blood pressure for the CBT group was approaching significance. Effect sizes for the questionnaires were medium to high and lower for the physiological measures except for noradrenalin. This is of particular relevance to ADHD, where high baseline levels of noradrenalin have been detected (Plizska et al., 1996).

2.4.2.3.3 Summary of Yoga for Specific Mental Health Disorders

In summary, Depressive and Anxiety Disorders and mental health in general have been successfully treated with pranayama, yogic mediation, yogic relaxation techniques and integrated yoga programs. Trials have employed robust designs involving control conditions, randomisation, comparison with other treatments, appropriate measures and analysis although numbers are typically generally small.

2.4.3 Summary of Empirical Investigations

The preceding summaries of the extensive research on the effects of yogic techniques *asana*, *pranayama*, relaxation and meditation on physiological, psychological, psycho physiological, neurophysiological and neuropsychological parameters contribute to the growing body of knowledge of this complementary and alternative method of improving well being and treating mental health. Changes in respiratory activity, brain wave frequencies, glucose metabolism/oxygen consumption, cerebral lateralization, neurotransmitter and hormone activity, cognitive activity and the autonomic nervous system activity have been observed.

Mental health disorders and associated diseases and mental health in general have been successfully treated with yogic techniques. Much of the research has concentrated on both generalized and specific Anxiety Disorders and Depressive Disorders. Psychometric measures have indicated improvements in cognition, quality of life and mood for both the general population and those suffering with mental health problems.

These findings bear relevance to the diverse psychopathology found in children with disruptive behaviour. Abnormalities in brain wave frequencies, glucose metabolism, endocrine activity, ANS parameters and respiratory activity have been well documented. Additionally, specific disorders such as anxiety, mood disturbances are frequently comorbid with behaviour disorders.

The following section examines studies that have focused on efficacy for children but is preceded by the yogic perspective on childhood and adolescent behaviour.

2.5 Yoga and Non-Yogic Relaxation as Treatments for Disruptive Behaviour

2.5.1 Disruptive Behaviour from a Yogic Perspective

Yogic texts refer to 'attention' in terms of the three *gunas*:- *rajasic*, *tamasic* and *satvic* (Satyananda, 1985a, 1985b) (see section 2.2.3.). *Rajasic* attention is described as reactive, restless, aggressive and scattered energy (synonymous with disruptive, challenging or externalising behaviours in educational and medical terminology) and is representative of an excess of *prana* (physical energy) and insufficient *manas* (mental energy). *Tamasic* attention is associated with anxiety, depression and lethargy and is representative of insufficient ability to transform mental energy (*manas*) into creative action. Both *rajasic* and *tamasic* states are indicative of an imbalance between the physical energy (*prana* shakti/pingala) and the mental energy (*manas shakti/ida*) whereas the *sattvic guna* state is indicative of a balance of mental and physical energy.

Facial features and cognitive application are claimed to change according to which *guna* is predominating (Satyananda, 1985b; Yogabhakti, 1985). The hyperactive child displaying a predominance of *rajasic* energy has darting eyes, frequently moving tongue and teeth and frequently changing facial expressions. This child reacts to noise with a distracted mind, quickly jumping to the next disturbance, is fidgety, superficially interested, with a short attention span and wastes energy by spending it indiscriminately. The *tamasic* child is described as having a facial expression that is dull with a slack expression, indicating a lack of interest and apathy. Eyes can be partially closed with a faraway look. This child may frown and be quite docile. The *sattvic* child is said to have eyes and facial features reflecting concentration and absorption. The concentration can result in tighter lips and drawn cheeks causing some tension. These children are described as hard working, good listeners and alert responders. Their attentiveness and calmness is associated with enthusiasm and creativity, however, a negative aspect of this type of attention can result in a child who is too conforming and too tied to routine. It is also noted that times of the school day can be of a *rajasic*, *tamasic* or *sattvic* nature. For example, a *rajasic* mood could be associated with returning to the classroom after being on the playground or when the children have been exposed to strong winds and a *tamasic* mood could be associated with Monday morning or a very hot day.

Attention and awareness are regarded as prerequisites for learning. Yogic teachings emphasis this aspect of learning particularly in regard to self-awareness and attention to physical, emotional and mental states (Iyengar, 2001; Niranjananda, 1994; Satyananda, 1981). Michelene Flak (Yogabhakti) educator and founder of Research on Yoga in Education (RYE) in 1978, advocates the development of attention and concentration in children through yoga practices to aid self-development and memory with the resultant outcome of quicker and more efficient learning (Yogabhakti, 1987).

Although a conjecture, the yogic descriptions of *rajasic* and *tamasic* types bear resemblance to ADHD subtype symptoms and symptomatic behaviours of other externalising and internalising disorders. The *rajasic* type resembles ADHD Predominantly Hyperactive/Impulsive, Oppositional Defiant Disorder and Conduct Disorder symptoms. The *tamasic* type resembles the symptoms of subtype ADHD Predominantly Inattentive, of Anxiety and of Depressive Disorders. A combination of *tamasic* and *rajasic* types resembles ADHD combined type and the combination of both internalising and externalising behaviours. The yogic way of addressing the *tamasic* child is with techniques of a dynamic active nature; for the *rajasic* child, techniques of a relaxing, calming nature; and for the *satvic* child techniques of a balancing nature which promote for relaxation and vigilance (Yogabhakti, 1987).

Yogic physiology, like the western understanding of physiology, associates the endocrine system (which is responsible for the production and distribution of hormones via glandular structures) with behavioural mechanisms. Within the endocrine system, the pineal gland is connected to the thalamus in the upper brain stem (Diamond, Scheibel, & Elson, 1985) which in yogic terms is associated with the *ajna chakra* (the seat of wisdom and knowledge) (see section 2.2.3). The pineal gland, according to yogic knowledge (Satyananda, 1985c), begins to degenerate at about the age of eight (beginning of sexual development/maturity) and is associated with increased anger, resentment and violence. In medical terminology the pineal gland contains melatonin, which has an inhibitory effect on the gonads, delaying the onset of puberty (Diamond et al., 1985). Specific yogic practices are recommended for delaying pineal degeneration and maintaining a healthy nervous system. Recommended practices are *surya namaskara* (salute to the sun which is a twelve posture movement); *shasankasana,* (the moon-

pose); *nadi shodhana*, (alternative nostril breathing practice); and *Yoga Nidra* (a relaxation practice) (see Appendix F -- *Manual of Practices*).

Yogic techniques for focusing attention include *antar mouna* (inner silence), *kirtan* (chanting) *hatha* yoga and *nada* yoga (sounds). *Antar mouna* is a technique for stilling the mind and increasing receptivity by becoming aware of all external sensory experiences, including environmental sounds. *Kirtan* (chanting) is a method of using sound to focus attention and develop aural perceptions where sounds are produced either by singing, chanting or on instruments. *Hatha* yoga, described previously (see section 2.2.2.), consists of postures, bodily attitudes, muscular contractions and cleansing practices. *Nada* (sound) yoga is defined as meditation on inner sounds but involves four aspects of sound which are audible sound, mental sound, visualised sound and transcendent sound (Janakananda, 1996).

The prescribed benefits of yoga for a child with disruptive behaviour encompass skills to develop the ability to discern body, mind and emotional changes and to gain the skills of calming, focusing and appropriately releasing frustration and anger. This can result in increased self-control and self-regulation of behaviour and improve access to classroom learning and promote healthy social relationships (J. T. Hopkins & Hopkins, 1979; L. J. Hopkins & Hopkins, 1976).

Many books have been written on yoga for young people (Carr, 1977, 1980; Chanchani & Chanchani, 1995; Nagendra et al., 1988; Rickard, 1992; Shishyananda & Maitrayananda, 1983; Vishwamitra & Kantiratna, 1996) with prescriptive lessons and techniques for children as young as three years old. Although there are many anecdotal accounts of yoga being taught in schools, mainly as an alternative to sport and as a strategy for reducing examination stress (Personal Communication Joanne Gardiner 19/2/2005, Barbara Walsh 19/2/2005, Shankari

20/8/2005, Dharmananda 18/1/2008, Marion Porter 17/3/04, Jane Gayner, 4.10.2004) the incorporation of yoga into schools as a means of supporting learning through the reduction of problem behaviours and increased attention to task is yet to be endorsed by education departments in Australia.

Empirical evidence, however, is mounting on yoga's effect on the multidimensional facets of disruptive behaviour and emotional disturbance. The remainder of this chapter will review relevant yoga studies with mention of other non-yogic relaxation techniques being trialled with young people displaying problematic behaviour. Non–Yogic relaxation techniques have been included to give credit to researchers who up to three decades ago were pursuing this approach to behaviour management.

2.5.2 Empirical Research Trialling Yoga and Non-Yogic Relaxation as a Treatment for Disruptive Behaviour

The following studies have tested the effects of various yoga techniques and some non-yogic relaxation techniques on one or more dependent variables with children and adolescents displaying disruptive and disturbed behaviour. Variables include inattention, hyperactivity, impulsivity, emotional and social impairments, self esteem, anxiety, stress and aggressive behaviours.

The majority of investigations are randomized control trials, with simple to more complex designs generally determined by the number and type of measures. Sample sizes vary from 10 to 120 participants, with ages ranged from 7 years to 16 years. Interventions generally ranged from 15 minute to 60 minute sessions although one study's program was conducted for eight

hours a day. Yoga sessions took place on a daily to weekly basis over a 3 week to 1 year period taught by yoga teachers or through tapes and videos. Treatments include yoga interventions involving *asana*s, *pranayama*, relaxation and meditation, often in combination.

2.5.2.1 Yoga Research on Inattention in Children and Adolescents

Being able to sustain, focus and divide attention is an essential aspect of the learning process and social interactions and relationships. Several studies have trialled yoga as a treatment for improving attention. Jensen and Kenny (2004), using a partial crossover, randomised control trial with 14 boys diagnosed with ADHD and stabilized on medication were taught a yoga program consisting of postures (*asanas*), relaxation, breathing and concentration practices. After 20 one-hour weekly sessions of yoga in addition to home practice, a significant improvement (p=.038) was detected on *Test of Variables of Attention* (TOVA) Response Time Variability which was not detected in the control group. This test measures variance of the time taken to give a correct response to the sighting of a given target. This result reflects improvement in attention and reduced impulsivity. Significant trends were also observed on the ADHD Score of the TOVA.. On the *Conner's Teacher Rating Scale-Revised Long Version* (1997) a positive trends were observed on the DSM IV Inattentive subscale from pre- to post-test (p=.07) when associated with the number of sessions attended.

Peck, Bray and Theodore (2005) examined the effectiveness of yoga on improving attention in (n=10, 7 female) (9 Caucasian and 1 Hispanic) primary school children aged 6-10 years, identified by school psychologists as being less than 80% on-task in the classroom, using the *Behavioural Observation Form* (Rhode et al 1993 as cited in Peck, Bray and Theodore,

2005). Children were matched for age, gender and demographics with children without attention problems in the same classroom. Yoga was taught to three grade groups for 30 minutes, two days a week for three weeks using a video. Results showed large effects ranging from 1.51 to 2.72 for the experimental groups in on-task behaviour from baseline to intervention with follow-up effects decreasing but remaining higher than baseline. The control group results remained unchanged throughout three assessment phases.

Haffner, Roos, Goldstein, Parzer and Resch (2006) employed the *Dortmund Attention Test* (DAT), a test of exactness of observation and cognitive impulsivity during tasks of visual perception, to test the efficacy of a yoga and conventional motor training program in a randomized crossover trial. Data were collected each week for six weeks pre-, mid- and post-treatment. The study sample (n=19, 7 female) were children diagnosed with ADHD ranging in age from 8 to 11 years. All students were initially randomly assigned to one of two, eight (one session per week) programs (yoga program and conventional motor training program) with a six week treatment break after which they crossed over into the other group. A yoga program consisting of *asanas,* breathing exercises and meditation exercises was compared with conventional motor training exercises consisting of games involving running, balls, agility, social interaction and concentration. Results on the DAT attention test, indicated sizable improvements with the yoga training being superior to conventional motor training (effect size = 2.66; p=.000) and an 80%increase in correct answers. The training was also found to be particularly effective for children taking medication (Methylphenidate).

2.5.2.2 Non-Yogic Relaxation Research on Inattention in Children and Adolescents

The following studies have used methods not dissimilar to aspects of yogic relaxation. They have been included to emphasis the use of relaxation as a treatment for disruptive behaviour. Some studies have also used biofeedback. However, the majority were conducted more than 20 years ago and although outcomes were positive, this research has not continued to the same extent as yoga research.

Rivera & Omizo (1980) examined the effects of relaxation training and biofeedback on attention to task in hyperactive boys (n=36) aged 7-11 years, in a randomized control trial. Hyperactivity was determined from the *Conner's Teacher Rating Scale-Abbreviated Form* (Conners', 1973). Measures used were the *Matching Familiar Figures Test* (MFFT) (Kagan, Rosman, Day, Albert, Phillips, 1964 cited in Rivera & Omizo 1980), a test measuring hyperactivity and impulsivity. The experimental group were given three sessions (with two phases) of relaxation training which consisted of tapes from the Peace, Harmony and Awareness relaxation training program (Lupin, 1997) and Electromyographic (EMG) biofeedback measuring muscular activity on the frontalis area. The control group underwent all conditions except for the treatment. There were no significant differences on the pre-test scores between groups. Post-test results indicated significant improvement ($p<.01$) in the experimental group compared with the control group in attention tasks scores on the MFFT using t-tests. Covariates of pre-test error and latency, baseline EEG, teachers rating and students' age were factored in.

Redfering and Bowman (1981) employed the Benson et al. (1975) relaxation technique to address attention problems in children with disruptive behaviour. Participants (n=18; female n=4) were recruited from two nine-member classes for disruptive behaviour. Groups were randomly assigned to a meditative/relaxation treatment group or a control group which was a simple rest instruction group. To ascertain changes in attention, behaviour observations were conducted over a five day pre-treatment period and during relaxation treatment (30 minutes each morning), with 98% inter-rater reliability. Observations were taken over the 30 minute period in 3 minute intervals and behaviour was noted as attending or non-attending behaviour. T-tests for pre- to post-test mean differences for the two groups demonstrated a significant reduction in non-attending behaviours ($p<.001$) for the treatment group compared with the control group.

From these results yoga and non-yogic relaxation techniques appear to have merit in improving attention in children with and without behaviour problems. All studies had robust designs including randomization in two studies and control groups in four studies. The yoga programs included components found in a typical yoga class (*asanas*, breathing, relaxation, meditation). Weight is added to these outcomes through the employment of different measures including two attention tests, classroom observations and two teacher rating scales.

2.5.2.3 Yoga Research on Hyperactivity and Impulsivity in Children and Adolescents

Hyperactivity is thought to be caused by neurological impairment observed originally in brain injured patients (Reichenbach, Halperin, Sharma, & Newcorn, 1992). Chemical lesions that

selectively ablate forebrain dopamine systems in rat pups were found to result in persistent of over-activity (Reichenbach et al., 1992). Hyperactivity and impulsivity are core symptoms of ADHD as discussed in section 2.1.3.3. Hyperactive and impulsive behaviours impact severely on the ability to comply with classroom procedures, routines and structures. With limited control over behaviour, the hyperactive child finds it difficult to inhibit his/her impulsive behaviour. Expectations of sitting still, not fidgeting, not talking excessively, waiting turns, working in groups are extremely difficult for the hyperactive/impulsive child and frequently results in discord with teachers and classmates and consequent behaviour management contingencies.

Two yoga studies with a rigorous design and two lacking in rigour and detail were found in the literature. The Jensen and Kenny (2004) control study engaging boys diagnosed with ADHD (see above) found a significant reduction from pre-test to post-test in the yoga group on *Conners' Parent Rating Scale-Revised: Long Version* (CPRS-R:L) subscale, Global Index Restless/Impulsive (p=.008) and ADHD Index (p=.019). For the yoga group, positive change from pre- to post-test on the *Conners' Teacher Rating Scales-Revised: Long Version* (CTRS-R:L) was associated with the number of sessions attended on the DSM IV Hyperactive-Impulsive subscale (p=.021).

The Haffner et al. (2006) study (see above) measured parental perception of their child's hyperactive and impulsive behaviour, pre and post a yoga and conventional exercises program using the FBB-HKS (Dopfner & Lehmkuhl, 2000; Bruhl et al. 2000) cited in (Haffner et al., 2006) which drew upon criteria from the DSM-IV (APA 1994) and the ICD-10 (Kewley, 1998). Both groups showed sizable reductions in parental reporting of ADHD behaviours but

the yoga training was superior to conventional motor training, with effect sizes in the medium to high range (0.60-0.97).

Because of the scarcity of studies on yoga's effect on hyperactive/impulsive behaviour, an unpublished manuscript by Renshaw (1977) cited in Seiler and Renshaw (1978) is included. Adolescent inpatients (diagnosis not stated and participant numbers not disclosed) at a mental health centre, participated in 30 minute yoga sessions four times a week for an unstated duration. Informal staff observations of participants indicated positive changes in attitude and behaviour and showed a decrease in impulsivity. In addition, increased and improved communications with staff occurred and verbal awareness of bodily functions increased.

Hopkins and Hopkins (1976) reported on outcomes from teaching yoga to children but was not a formally constructed research study. Yoga was seen to benefit children with psychomotor deficits. A yoga intervention was chosen because of its similarity to psychomotor programs and for its calming component. The calming element of the program was seen to address issues of lack of coordination and difficulty performing physical tasks in the general physical education program and for its application for students who tended to "wind up" and become "silly" when participating in physical activity. Another aspect of a yoga program, relevant to this type of children, was the a slow, controlled movements which contrast the more sporty forms of exercise which commonly involve fast, thrusting, forceful movements. Yoga was proposed as a means of increasing body awareness in relation to space and tensions. The breathing aspect of the program was seen to contribute to body awareness and a calming. Hopkins (1976) also noted that the modified program was easy for teachers to instruct and demonstrated that teachers also gained from the stretching and consequent stress

release. Anecdotal evidence from teachers at the school recognised the yoga group as being much more relaxed without knowing that they were the children doing yoga.

2.5.2.4 Non-Yogic Relaxation Research on Hyperactivity and Impulsivity in Children and Adolescents

The following are studies that employed non-yogic relaxation techniques; for example, the Jacobson Technique (Jacobson, 1920) and EMG biofeedback in hyperactive children and adolescents. Participants were students with severe emotional disturbance (Walton, 1979) and with hyperactivity (Denkowski, Denkowski, & Omizo, 1984; F. Dunn & Howell, 1982; Rivera & Omizo, 1980).

Although methodologically very weak, (small numbers, no randomization or control) Walton (1979) treated 5th and 6th grade, severely emotionally handicapped students (n=5) in a special class with EMG biofeedback and relaxation training four times a week for 15 minutes over a 16 week period. Observed behaviours in the classroom included excessive fine and gross motor behaviours, physical and verbal aggressive behaviours, self harming and other off-task behaviours. Post-test findings indicated a borderline significant reduction (p=.068) in inappropriate behaviours in three of the five students, with one student showed a small reduction with the other deteriorating. EMG of muscle tension indicated a significant reduction (p= .05).

Dunn & Howell (1982) conducted a crossover control trial to test the feasibility of relaxation and biofeedback as a treatment for hyperactivity, in 10 Caucasian boys, identified as

hyperactive from teacher and parent reports using *David's Hyperactivity Scale* (1971) (cited in Dunn & Howell 1982). EMG biofeedback equipment and a time Period Integrator (TPI) provided integrated amplitude in microvolts of muscle tension and percentage of time muscle tension exceeded 5mv. Time on task, concentration and accuracy were observed and head and limb movement measured, while boys did three different tasks: moving objects from large to smaller containers; sitting on a bean bag, listening to a taped story and standing at attention. The boys were also administered the Bender Gestalt, Digit Span and Coding Tests. The boys attended 20 sessions two to three times per week. A neutral treatment involving relationship and play therapy (with few restrictions on activity level) was administered in the first ten sessions, followed by a crossing over into the relaxation training in the last ten sessions. The parents were blind to the control phase and the timing of the treatment phase. For the relaxation training the boys were randomly assigned to one of three relaxation techniques, EMG, relaxation tape or a combination. Results indicated that there were no significant differences between pre-assessment and mid-assessment (i.e. pre- and post-neutral sessions) but significant improvement was observed after relaxation training on all variables (active task, quiet task, standing task, DHS, Bender Gestalt, Digit Span and Coding). Analysis of relaxation sessions EMG data, showed a substantial improvement for each participant. However, when relaxation was taught alone, participants learned to relax quicker but did not relax as deeply as sessions continued but when biofeedback was used alone or in conjunction with relaxation tapes, participants learnt slower but relaxed deeper with greater consistency. Parent ratings were also significantly lower and showed less hyperactivity after the treatment period. Authors suggested that these results substantiate the theory of Braud et al. (1974) cited in Dunn and Howell (1982) that muscle tension and inability to relax contribute to and exaggerate the symptoms of hyperactivity.

Denkowski et al., (1983) conducted a randomised control trial as a treatment for n=48 hyperactive students. Twenty-four (n=24) participants were taught 20-25 minute bi-weekly relaxation sessions over a 16 week period while the other students (n=24) received a neutral treatment involving "small talk". Hyperactivity was assessed using the *Conners' Teachers Behaviour Rating Scale- Abbreviated form* (CTRS-A) (Conners 1973). Muscle tension in the frontalis facial muscles (FFM) was monitored pre, during (for experimental group only) and post each session and 2 weeks after the last session, using Toomim 502A electrometers. The experimental group was exposed to the visual numerical display and was required to attempt to reduce the displayed digital number-EMG feedback. Tension in these muscles is known to be difficult to dissipate and FFM have been a reliable indicator of overall relaxation (Schandler &Grings, 1976; Stoyva & Budzynski, 1974 cited in Denkowski et al., 1983). The locus of control, an index of self-control was measured using the *Nowicki-Stickland Scale* (Nowicki-Stickland, 1973). This index ascribes personal orientation in terms of Rotter's (1966) (cited in internal/external locus of control of reinforcement. Self-esteem was measured using the *Coopersmith Self- Esteem Inventory Form B* (Coopersmith, 1967). Maths, language and reading performance were tested in standardised tests administered by a teacher at pre- and post-treatment. All measures mentioned have been cited in Denowski et al., 1983. Significant ($p<.01$) differences between the two groups were demonstrated on post-treatment measures of EMG, locus of control, reading and language achievement favouring improvement for the relaxation group two weeks after treatment had ceased. Post treatment maths and self esteem measures, did not demonstrate any significant differences. Investigators suggested that EMG assisted relaxation training generalizes to promote scholastic performance and that the outcome of this study supported (Douglas, 1974) theory that

hyperactive children must require inhibitory control before their attentional gains can derive educational benefits.

In summary, yoga and non-yogic relaxation trials indicate that the slow conscious yogic movements, breathing practices and guided relaxation with and without biofeedback contribute to a reduction in restless, impulsive and hyperactive behaviour with consequent increase of on -task behaviours.

2.5.2.5 Yoga Research on Anxiety, Stress, Emotional and Social Problems in Children and Adolescents

Within the heterogeneous cohort of students participating in the trials in this thesis study, 58.9% were presenting anxiety, depression and emotional problems comorbid with externalising behaviours and 12.2% had internalising behaviours. Children diagnosed with comorbid disorders frequently present with more severe symptoms (R Loeber et al., 2000). The literature reviewed below is of specific relevance to the current study's sample.

The body's reaction to stress can cause impairments in prefrontal cortex functioning and the consequent modulation of neurotransmitter activity prepares the body physiologically for the fight or flight response through the activation of the sympathetic nervous system (Ramos & Arnsten, 2007). It is noted (Stovik, 2000), 'that prolonged activation of sympathetic arousal can either lead to a recovery of homeostasis or an increasing of internal distress and fatigue. 'Stress leads to depletion of energy supplies and to disruption of physical and mental health'. Yoga is regarded as an intervention that helps to establish self-control and break patterns of depletion associated with chronic arousal' (Stovik, 2000, p.493). Stovik suggests that these patterns of depletion are associated with stress arising from: an inability to establish distance

between the self and the stressful stimuli; thinking that combines past and future worries and fears; and somatic symptoms of, for example, pain, and muscle tension

Researchers have trialled yoga practices as interventions for children with a variety of problems that often include underlying anxiety. Jensen and Kenny (2004) found significant reductions in oppositional behaviour (p=.003) and emotional lability (p= .001) with a trend towards significant reduction in anxious /shy behaviour (p=.072) on the CPRS-R: L of ADHD boys compared to controls.

Sensory (visual) perception and motor performance can be effected by stress and manifest in impaired functioning of the peripheral and central nervous systems (Brozek & Keys, 1994, Knox 1950, Corren & Gigus, 1978, cited in Raghuraj and Telles, 1997). A study assessing the effects of yoga and physical exercise on motor and sensory (visual) performance (Raghuraj & Telles, 1997) involved school aged girls aged between 12 and 16 years. Maladjusted girls (n=60) from a community home (CH) were randomly assigned to either a yoga group (CHY) or a physical activity group (CHP) for six months. Girls (n=60) comprised of girls living at home (HG) acted as controls. The tests used were hand grip strength as an indicator of muscle strength; two tests of visual perception - an optical illusion ("di") test and critical flicker fusion frequency (CFF) test; and tweezer dexterity test to assess motor skills. No evidence was given for the reliability or validity of the measures chosen and no pre-assessment data was collected which weakens the study. Results using ANOVA repeated measures showed that the CHP had a significantly lower CFF ($p<.001$), higher degrees of optical illusion for ($p<.05$) and no significant difference in hand grip strength compared with the HG. The CHY group had a higher CCF ($p<.001$) and lower degrees of optical illusion ($p<.05$). Investigators referred to studies (Brozek & Keys, 1994) cited in Raghuraj 1997), which negatively

correlated CCF with physical stresses, for example in conditions of nutritional deficiency, fatigue during physical work and with emotional stress levels (Knox 1950, cited in Raghuraj, 1997). Investigators also referred to studies where “di” factors have been negatively correlated with cognitive factors such as the experience, hypotheses and strategies of judgment (Corren & Gigus, 1978, cited in Raghuraj and Telles, 1997). The hand grip strength and tweezer dexterity did not differ significantly between the three groups. Conclusions reached suggested that yoga practice to some extent can modify the stress levels which are effecting the functioning of peripheral and central nervous systems and seen to reduce sensory perception.

Kalayil (1989) (in a Dissertation Abstract /International) describes the effects of yoga in reducing state anxiety, heart rate and other medical conditions related to stress. These parameters were viewed as a multi-dimensional with physiological, behavioural, and psychological components. The aim was to compare the impact of yoga meditation (YM), Progressive Relaxation Training (PRT), Catnap (CAT) and Magazine Reading (MR). Measures used were the State-Trait Anxiety Inventory for Children (STAIC) (Spielberger, 1973) and a Heart Rate (HR) Monitor Scale (source not stated) and a self rating scale (SRS) (name of scale not given) of overt behavioural symptoms of headache (H), insomnia (I), and general tension (GT). Eighty (80) students from middle school (ages not stated) were randomly assigned to one of the four conditions. The groups had equivalent pre-test measures of HR and SA, and there was no significant correlation between these two measures. No statistical data was provided but in summary the author reported that yoga meditation was more effective than progressive relaxation technique, cat napping and magazine reading in reducing heart rate, state anxiety, headache, insomnia and general tension

The Hopkins and Hopkins (1976) report on yoga benefits for children (see above) considered the spinal stretching exercises as particularly useful for tense students with the breathing practices contributing to body awareness and a calming effect. It was also noted that the modified program was easy for teachers to instruct and demonstrated that teachers also gained from the stretching and consequent stress release. Older children also indicated benefits of relieving tension and improved muscle tone.

Sahaja Yoga Meditation (SYM) was trialled (Harrison, Manocha, & Rubia, 2004) in a six week program where parents and their ADHD children (n=26) attended a bi-weekly clinic. In each clinic, participants were given two 5-15 minute meditation sessions with the opportunity to share their experiences. Measures employed for the children were *Conner Parent Rating Scales–Short Version* (CPRS: S) (Conners, 1997a) measuring parental perceptions of ADHD symptoms; the *Burnett Self Scale* (Burnett, 1994) measuring parent perception of child's and child's self report of self–esteem; and *The Peabody Picture Vocabulary Test* (L. M. Dunn, 1997) (pre-test only) measuring verbal comprehension; and child interviews about meditation experiences and effectiveness. Parental benefits were measured on the *Child-Parent Relationship Scale* (CPRS) (Pianta, 1990). This measure assesses the quality of the parent/ child relationship and perceived efficacy of the meditation program on their own well-being. Demographic baseline data revealed that parent reports confirmed the presence of ADHD. Significant improvement (p=.001) on the CPRS: S, from pre- to post-treatment (p=.001) was demonstrated and was found not to be influenced by prescribed psycho-stimulants. Medication was reduced and persisted for most of the participants according to post-treatment interviews. Interviews with parents revealed a 92% agreement that their child had benefited in the area of confidence, sleeping patterns, cooperation, behaviour at school and school work. Anecdotal evidence from children described being more relaxed, and calmer, with less

headaches, less panic, more energy, better sleep and more focus. Child parent relationships were also shown to significantly improve (p=.01) which was mainly attributed to less conflict. Child self-description and self-evaluation ratings did not change significantly but scores were relatively high at pre- and post-test. Similar findings in self- reports re self esteem have been reported in (B. Hoza et al., 2002).

The following research (Suwanna, 1996) was accessed through Google Scholar and was not accessible through university databases. Suwanna (1996) looked at the effects of neo-humanist based *asana* and meditation practices on aggressive behaviour of students (http://www.chiangmai.ac.th/abstract1998/Abstract/edu/abstract/edu980668.html).

The sample comprised of 30 Mathayom Suksa 3 students (assumed Year 3 students) of Ban Na In School, Uttaradit Province, Thailand. The samples were drawn by using a simple sampling method (not described) and pairing the experiment group of 15 students with their counterparts in a control group. The experiment group practiced nineteen, 40-60 minute sessions of *asana* and meditation program over a four week period. The instruments were an aggressive behaviour test (name of test not given) and a practice evaluation form (no details). Statistics used to analyse the collected data included means, standard deviation and t–test. Aggressive behaviour of yoga students significantly decreased (p=.01) and had significantly less aggressive behaviour (p=.05) than students who did not practice.

2.5.2.6 Non-Yogic Relaxation Research on Anxiety, Stress, Emotional and Social Problems in Children and Adolescents

Reading difficulties have been found to be alleviated with autonomic training and relaxation exercises developed by Schulz (1970) cited in (Frey, 1980). Reading disabilities in children are associated with high levels of anxiety, tension, mood swings, poor attention and a reduced ability to concentrate (Frey, 1980). Schulz's training was found to reduce feelings of insufficiency and anxiety, to stabilize moods and to increase concentration and retention. Frey (1980) investigated whether this technique in conjunction with some exercises in concentration (Unterscheidungstraining-Training in Discrimination-Weber 1975 cited in Frey, 1980), could improve the reading and the orthography of reading in disabled children. Thirty pairs of children matched for age, sex, anxiety level, intelligence and reading and orthographic were randomly assigned to either an experimental group (reading program plus autogenic training) or a control group (reading program). One hour sessions with the control (n=8) and experimental groups (n=8) took place once a week, for a school year. At post-test, fewer errors were recorded on the reading and spelling test (DRT-4-5) in the experimental group (26.4) compared with the control group (15.30). Significant improvements were indicated for the experimental group on the KAT (*Kinderangsttest*) anxiety test ($p<.01$) compared to control group. On the KANES (*H a mburger Neuttttrotiziismus und Extraversionsskala fur Kinder and Jugendliche*), a test of neuroticism significant improvement ($p<.01$) favouring the experimental group, was demonstrated. All measures were cited in Frey, (1980). Author noted that because teachers in the experimental group also underwent the relaxation training, a more relaxed attitude may have influenced results. Frey concluded that reductions in anxiety and neuroticism had positive effects on the personality

and self-esteem. Authors acknowledged that although teachers were not qualified to teach autonomic training they could still incorporate relaxation exercises, music and imaginative experiences into the curriculum.

Rauhala, Alho, Hanninen & Helin, (1990) conducted a control study with the aim of reducing psycho physiological activity as an effect of relaxation combined with physical activity in community home boys with severe emotional and social problems (n=37), aged 14-17 years. The control participants were healthy boys attending mainstream schools (n=24). The community home boys' problems included anxiety, fear and aggression. The experimental group were exposed to four months of relaxation training involving contracting and relaxing muscle groupings throughout the body and physical exercise involving swimming, cross-country skiing, jogging and gravitational traction. The physical exercises component of the study increased its attractiveness and enhanced motivation. At pre-test, the community home boys EMG activity was significantly higher in all muscle groups (indicative of stress) compared with controls in standing position but not in prone position. At post-test the level of EMG, in standing and prone position for the community home boys, was significantly lower than the controls and compared with baseline levels. Systolic and diastolic blood pressure (a parameter associated with stress) in the community-home boys, significantly decreased compared to baseline, but the decrease was not significant compared with the control group.

The results of these studies on the efficacy of yoga and other mind body interventions indicate that reducing stress and tension can help reduce anxiety, aggression and overall emotional disturbance which improve children's sense of well being and social acceptability with possible consequent effects on learning outcomes.

These studies have employed psychometric and physical measures to assess yoga and non-yogic relaxation in children and adolescents with disruptive behaviours and comorbid problems. Although in some studies numbers have been small, most have demonstrated a robust study protocol. All have demonstrated that the practice of controlled movement (*asana*s) and relaxation and meditation techniques (some in conjunction with biofeedback) have been effective compared to controls and in some cases physical exercise programs in reducing the symptoms of problematic behaviours and consequent impacts on social and academic functioning. When it is considered that stress plays a role in causation of many psychiatric disorders including behaviour disorders (Ramos & Arnsten, 2007) treatments and interventions that reduce stress need to be considered as a choice of teachers, therapists etc. The yogic and the like treatments reviewed all found reductions in the symptoms of inattention, hyperactivity/impulsivity, anxiety, and on psycho physiological parameters. Therefore it could be concluded that these treatments were both effective in improving learning capacity and reducing stress.

From this research we cannot conclude optimum duration or frequency for yoga and non-yogic relaxation interventions but regular practice on an ongoing basis is integral to the principles and practices of yoga.

2.5.2.7 Yoga Research on Self Esteem

Self-esteem may be impaired in young people with behavioural and emotional problems due to poor learning outcomes, poor social relationships and personal ineffectiveness (Barber et al., 2005; G. A. Fabiano et al., 2006; B. Hoza et al., 2004; B Hoza, Pelham, Milich, Pillow, &

Mc Bride, 1993). However, self-esteem, as self-reported by young sufferers has been found to be inflated (B. Hoza et al., 2002) especially in the domains of greatest impairment (e.g. academic and behaviour). Explanations for over-inflation in ADHD boys have been attributed to protecting themselves from admitting failure in many domains of impairment as a coping mechanism or a conscious effort to project themselves positively or it could be an inaccurate perception of themselves (B. Hoza et al., 2002).

Studies by Omizo, (1980), Denowski et al (1983), Denowski et al (1984) and Harrison et al. (2004), found that self-esteem levels at baseline were either within normal range or overinflated and did not change over the course of yogic and non-yogic relaxation interventions. However, Omizo (1980) found significant reduction in levels of anxiety, improvements in levels of aspiration, identification versus alienation, leadership and initiative. Compared to other similar interventions the duration of Omizo's (1980) treatment was very short (three sessions) and it is possible that other factors contributed to these findings. The same method was employed by Denkowski et al. (1983) with the same relaxation technique but over a longer duration. However, a different measure of self-esteem was employed and in contrast no significant changes in self-esteem were found. In conclusion measuring self-esteem may be an ineffective means of gauging change in this population due to normal baseline levels or inflated levels of self-perceptions.

2.5.2.8 Yoga Research with Intellectually Challenged Children.

The following study has been included because intellectually challenged students, frequently display disruptive behaviour (Antshel, Phillips, Gordon, Barkley, & Faraone, 2006; Dykens & Dykens, 2000; Pearson et al., 2000).

Uma, Nagendra, Nagarathna, Vaidehi and Seethalakshmi (1989) conducted a randomized control trial with (n=90) children with mild, moderate and severe intellectual disability. Three groups were matched for age, sex, school, and degree of intellectual handicap that is mild (Mi), moderate (Mo) and severe (S) and randomly assigned to a control or treatment group. The treatment group was taught an integrated yoga program for one hour per day, five days per week for one year. The measures employed were i) *Binet Karmarth* (BK) (IQ) (Standardised for Indian version and reportedly widely accepted), ii) *Seguin Form Board Mental Age* (IQ) (SFB) (both measures of intellectual ability), and iii) *Vineland Social Maturity Scale Social Age* (VSMB) (Malin's adaptation- administered to teachers and parents). Analysis was conducted using the two-tailed paired t-test. Results on the BK and SFB, indicated that the Mo yoga group demonstrated a significant improvement 88% ($p<0.05$), the Mi yoga group, a non-significant improvement of 50% and the S yoga group a non-significant improvement of 33%. On the VSMB a significant improvement was demonstrated in the yoga group ($p>0.01$) and in the inter-group comparison ($p>0.01$). The breakdown of the groups on the VSMB was not stated. Conclusive remarks suggested the benefits of yoga for this sample of mentally disabled children in the areas of IQ and social maturity.

Social maturity is relevant to children with disruptive behaviour who display socially inappropriate behaviour and responses, although it is noted that the causes of this immaturity may differ. However, one model of ADHD suggests a maturational lag (Clarke et al., 1998), which may not be dissimilar to intellectually disabled children in certain areas of brain functioning.

2.5.2.9 Conclusion

The findings presented in this review indicate that yogic and non-yogic relaxation can be useful techniques for increasing attention, reducing hyperactive /impulsive behaviour, anxiety and emotional distress. These behavioural outcomes may lead to improved learning skills and educational benefits (Harlem, 1975, cited in (Redfering & Bowman, 1981). A reduction in off-task behaviours is the key indicator for reintegration into mainstream education institutions for those students who have been placed in alternative settings.

2.5.3 Yoga Research in Areas Relevant to Disruptive Behaviour but Involving Children without Disruptive Behaviour

2.5.3.1 Effects of Yoga on Static Motor Performance

Telles et al. (1993) assessed the effects of yogic training on static motor performance in (n=90) children assigned to either a yoga or control group. Forty-five (9 female) with a mean age of 11.3 (SD=1.6) received yoga training for eight hours a day over ten (10) consecutive days. The control group (n=45, 24 female) were recruited from a mainstream school. Both groups were pre- and post-tested for hand steadiness using a simple apparatus that consisted of a metal plate in which there were nine holes of diameters graded between 2mm and 8mm. A metal stylus was connected to the plate in series with a counter, which was activated wherever the stylus made contact with the metal plate. The participant inserted the metal stylus in each hole, keeping the arm extended without support and holding the stylus in this position for 15 seconds, from the largest hole to the smallest hole. Results for the two groups were comparable at pre-test: 221.2 =-10.0 errors (Y) and 221.0 +-8.1 errors respectively. At post-test the yoga group showed a significant improvement ($p < .01$) with 183.3 +-7.1 errors and the control group averaged 217.8 +-8.3 errors indicating no improvement. The investigators speculated that practicing yoga postures may have improved voluntary control and eye hand coordination and that visual exercises may have improved concentration.

2.5.3.2 Yoga and Cognitive Ability

Cognitive impairments (e.g. diminished working memory) and academic underachievement is evident in ADHD and exacerbated with comorbid ODD and CD and Anxiety Disorders (Hood et al., 2005; Norris & Hoffman, 1996; Tannock et al., 1995). The types of memory being tested in the following yoga studies do not include 'working memory' (see sections 2.1.3.3 & 2.1.8.).

Madanmohan and Udupa (2003) employed the *pranayama* technique of Bhastrika13 (bellows breath) to test for improvement in visual and auditory reaction time, as an indicator of processing ability of the central nervous system and a means of determining sensory-motor association and performance (Das et al., 1997). Participants (n=22) were healthy schoolboys aged 13-16 years with a mean age of 14.5 (1.25), who had three months of yoga training. No control group was included. Significant changes over time were demonstrated on the RM 6000 polygraph for visual reaction time (VRT) ($p<.01$) and auditory reaction time (ART) ($p<.01$). Authors suggested that improved sensory-motor performance and enhanced processing of the central nervous system are possibly due to greater arousal, faster rate of information processing, improved concentration and/or ability to ignore extraneous stimuli. Authors suggested that Bhastrika may be used effectively with children with an intellectual disability who have been reported as having altered reaction times (Un & Erbahceci, 2001).

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[13] Bhastrika (bellows breath) forced abdominal contractions concurrently with forced exhalation through the nostrils, followed by a deep inhalation.

These findings could have relevance to the proposed under-aroused autonomic nervous system in children with externalising disorders (Boyce et al., 2001; Rogeness et al., 1990).

A randomised control trial conducted by Naveen, Nagarathna, Nagendra and Telles (1997) involved (n=108) school children practicing *pranayama* forced nostril breathing and breath awareness over 10 days to test for improvements in verbal and spatial memory. Participants were divided into age groups and randomly assigned to one of four breathing groups. Controls (n=27) were used to monitor retest effect in the tests of spatial and verbal memory. Four delayed recall tests involved ten images (recalled both in writing - verbal and in drawing form – spatial) and ten nonsense words (recalled in writing -verbal) and ten geometric shapes (recalled in drawing - spatial). Data were analysed using the t-test for paired data. Results showed a significant increase in spatial memory scores (R 90% $p<.001$; L 86% $p<.001$; AN 79% $p<.001$; and BA 81 % $p<.001$) and a less significant increase in verbal memory scores (R 21% $p<.05$; L 25% $p<.05$; AN 31% $p<005$; BA 29% $p<.05$)

The following studies (Nagendra & Telles, 1996) were conducted at the Vivekananda Kendra Yoga Research Foundation (VKYRF), Bangalore, India and self published. Naveen and Telles (1997) (see above) was one of these studies. These studies examined the effect of yoga on auditory, visual, audiovisual and short term and long term memory. The results reported were derived from data from non-standardised tests.

One study measured auditory, visual, audiovisual and memory before and after yoga training employed large numbers with a pre-test/post-test, multiple baseline design. The non-randomised trial involved (n=74) students between the ages of eight and eighteen years who participated in a yoga program (n=38, 12 female) or a control group (n=38, 12 female). The yoga program involved postures (*asana*s), breathing practices (*pranayama*), prayers and

relaxation practiced over ten days. Assessments were conducted at pre- and post-test. Visual verbal memory was tested by recalling 10 words (shown previously) out of 17 words with a 5 minute delay. For spatial memory a similar test was given except patterns (irregular line drawings) instead of words were shown. For audiovisual memory, a similar test to the visual verbal memory test was given except the words were read out as well. Audio memory was tested by reading out 20 words after which words were recalled in writing. Pre- and post-tests were similar and matched for abstract and naming words and length of words. Paired t-test analysis indicated over time, significant improvements in all types of memory tested-: auditory ($p<.001$, 19%); visual verbal ($p<.001$, 16%); audiovisual ($p<.05$, 5%) for the yoga group and significant decreases for the control group in all tests. Two factor ANOVA results of the VV test showed a significant improvement, favouring the yoga group ($p<.001$). For the VS test a significant difference favouring the yoga group was also reported ($p< 001$). The researchers noted that the control group appeared to be as motivated as the yoga group initially but decreased scores on retesting may have been attributed to decreased motivation. However, no objective measure was utilised to ascertain motivation levels. Suggested explanatory factors for higher scores in the yoga group were increased awareness, increased ability to focus attention as well as decreased anxiety levels. However, none of these parameters were objectively measured and therefore these findings need replication.

A second study conducted a pre-test/post-test trial to test the effect of an integrated yoga program on memory, used the Wechsler Memory Scale (WMS) (Wechsler, 1987). (It is not clear whether the authors used the Children's Memory Scale, since the norms for the WMS begin at 16 years). One hundred and eighteen (118) school children aged between 11 and 14 years practised yoga for 10 days. Results showed significant increase in memory scores over

time. However, greatest improvements were noted on Part 4 (recollecting details of a story) and Part 6 (visual reproduction).

The application of yoga techniques for improving cognitive activity, in particular memory, in children, has obvious implications for students with disruptive behaviour. However, compliance and commitment to a *pranayama* program (which requires sitting still for extended periods of time), would need to be assessed for acceptability in this population.

2.6 Hypotheses

Table 2: Hypotheses

Measure	Rationale	Hypotheses--Yoga will:	Instrument
1.Attention	Cognitive Functioning - Selective attention, sustained attention and attentional control can be impaired in ADHD children. (Manly, Nimmo-Smith & Anderson 1999; Sutcliffe, Bishop and Houghton, 2006) and can be diminished in children with externalising and internalising behaviour problems (Halperin, Matier, Bedi, Sharma, & Newcorn, 1992).	Increase attention to task	*Test of Everyday Attention for Children* (TEA-Ch) (Manly, Nimmo-Smith & Anderson 1999; Selective/focused Attention, Sustained attention Attentional/shifting Control
	Attention deficits are evident in the symptoms of inattention defined within DSM-IV diagnostic criteria for ADHD. For example: doesn't pay close attention to detail, difficulty sustaining attention to task,		*Conners Teacher Rating Scales –Revised : Long Version* (CTRS-R L) (Conners', 1997): Subscales- Cognitive Problems ADHD Index DSM-IV –Inattention DSM-IV- Symptoms-Inattention

	sustaining attention to task, difficulty organising tasks, easily distracted (APA, 2000).		*Conners Parent Rating Scales –Revised : Long Version* (CPRS-R: L) (Conners', 1997):Subscales- Cognitive Problems ADHD Index DSM-IV –Inattention DSM-IV Symptoms-Inattention
			Behaviour Assessment system for Children–Portable Observation Program (BASC-POP) (Reynolds & Kamphaus, 1992 In classroom In yoga class
			Behaviour Observations by School Staff
2. Awareness and Self regulation	Awareness of and control over physical, emotional and mental states is lacking in children with externalising and internalising behaviour problems (Greene et al., 1996, Zeman et al., 2002).	Increase awareness of body, emotions and thoughts and actions. Increase self-regulation of body, emotions and thoughts and actions.	The yoga program Active and passive participation
			Behaviour Observations by School Staff
			Physical, Emotional and Mental State (PEMS) (Walsh, 2005
3. Hyperactivity	Hyperactive symptoms are included in DSM-IV diagnostic criteria for ADHD. For example: fidgety, often out of seat, talks excessively	Decrease hyperactivity	CTRS-R: L:Subscales- Hyperactivity DSM-IV – Hyperactive/Impulsive DSM-IV Symptoms- Hyperactive/Impulsive
			CTRS-R: L:Subscales- Hyperactivity DSM-IV – Hyperactive/Impulsive DSM-IV Symptoms- Hyperactive/Impulsive

			BASC-POP (Reynolds & Kamphaus, 1992 In classroom In yoga class
4. Impulsivity	Impulsive symptoms are included in DSM-IV diagnostic criteria for ADHD. For example: blurting out answers, not waiting turns	Decrease impulsivity	CTRS-R: L: Subscales- Global Restless Impulsive DSM-IV –Hyperactive/Impulsive DSM-IV Symptoms- Hyperactive/Impulsive
			CPRS-R: L: Subscales- Global Restless Impulsive DSM-IV – Hyperactive/Impulsive DSM-IV Symptoms- Hyperactive/Impulsive
			BASC-POP –Behaviour Observation System (Reynolds & Kamphaus, 1992 In classroom In yoga class
5. Oppositional Behaviour	Oppositional behaviour is: a key behaviour in DSM IV for Oppositional Defiant Disorder (ODD) frequently comorbid with ADHD frequently a precursor of Conduct Disorder	Reduce oppositional behaviour at home and in the classroom and in the yoga class	CTRS-R: L: Subscales- Oppositional
			CPRS-R: L: Subscales- Oppositional
			BASC-POP –Behaviour Observation System (Reynolds & Kamphaus, 1992 In classroom In yoga class

6. Self-Esteem/Concept	Self-esteem/concept is claimed to suffer in children with behaviour problems reflected in attitude towards academic success for example maths and reading ability and general attitude to school; and non academic for example- physical appearance and abilities, relationship with peers and parents (Harada, Yamazaki, Saitoh, 2002; Cotugno, 1995, Barber et al., 2005) (Barber et al., 2005).	Improved self esteem/concept in academic, social, and personal spheres.	*Self-Description Questionnaire* (SDQ) I and II. (Marsh, 1990)
	Social Problems are frequently an aspect of low self esteem (Conners, 1997).		CTRS-R: L (Conners, 1997): Subscales Social Problems
			CPRS-R: L (Conners, 1997): Subscales Social Problems
	Perfectionism is an aspect of low self esteem (Conners, 1997).		CTRS-R: L (Conners, 1997): Subscales Perfectionism
			CPRS-R: L (Conners, 1997): Subscales Perfectionism
7. Anxiety	Anxiety is frequently comorbid with externalising behaviour ((J. Biederman et al., 1995; J Biederman, Newcorn, & Sprich, 1991; P S Jensen et al., 1997; Milberger et al., 1995).	Decrease anxiety	*State-Trait Anxiety Inventory-Y* (STAI-Y) (Spielberger1983); *State-Trait Anxiety Inventory for Children* –Trait (STAIC/T) - (Speilberger 1973).
			CTRS-R: L (Conners, 1997) Subscale Anxious/Shy
			CPRS-R: L Subscales (Conners, 1997) Anxious/Shy Psychosomatic

8. Improved Mood and Self-State	Mood swings and emotional and mental instability are frequent secondary symptoms of disruptive behaviour (Garralda et al., 1991; Zeman et al., 2002).	Improve mood and self-state immediately after yoga classes	*Feelings Faces Scale* (FFS) (Jensen, 2004) Happiness Scale Calmness Scale
			Yoga Survey (Jensen, 2004) questions related to: Energy levels Anger levels Mood swings Calmness/relaxation Strength and flexibility
			Physical, Emotional and Mental State (PEMS) (Walsh, 2005)
			Self Description Questionnaire I and II (SDQ1&2) (Marsh, 1990) Emotional Stability
			CTRS-R: L: (Conners, 1997) Subscales Emotional Lability
			CPRS-R: L: (Conners, 1997) Subscales Emotional Lability
			Behaviour Observations by School Staff
9. Attitude towards and response to treatment	Levels of participation are an indicator of attitude and motivation (Beauchaine, Katkin, Strassberg, & Snarr, 2001; Wise, 2004).	Produce a positive attitude towards and response to treatment	Behaviour Observations by School Staff On-task descriptors Off-task descriptors
			FFS (Jensen, 2004) Enjoyment Scale
			Behaviour Observations by School Staff
			Individual Assessment in Yoga Competence
10.Competence in accessing treatment	Levels of competence assess the suitability of a treatment program for the sample	Increase competence in accessing treatment	Behaviour Observations by School Staff
			Individual Assessment in Yoga Competence (Jensen, 2004)

			FFS Competence scale
11. Motivation	Motivation for learning is frequently lacking in children with disruptive behaviour (Beauchaine et al., 2001; Wise, 2004).	Promote motivation to learn about yoga and participate in yoga classes.	Behaviour Observations by School Staff Attendance and participation in treatment sessions *Individual Assessment in Yoga Competence*
12. Breathing Patterns	Breathing patterns have been found to be unstable in children with anxiety (Pine et al., 2006) and suspected by researchers of this study in children with behaviour problems due to abnormal functioning of the autonomic nervous system (Boyce et al., 2001; Garralda et al., 1991; Rogeness et al., 1990; van Lang et al., 2007; Zahn & Kruesi, 1993) (XX) which affects respiration (Ramos & Arnsten, 2007).	Stabilise breathing patterns during and after *Yoga Nidra* relaxation.	*Summit IP™* Respiratory Inductive Plethysmography *(RIP) (Compumedics, 2000)*
13. Relaxation	Students with behavioural problems have been found to have high levels of tension (Denkowski et al., 1983, 1984; F. Dunn & Howell, 1982; Rauhala et al., 1990)	Develop the ability to relax	*Individual Assessment in Yoga Competence* Behaviour Observations by School Staff *Summit IP™* Respiratory Inductive Plethysmography *(RIP) (Compumedics, 2000)* *Yoga Survey* *FFS: Calmness Scale*

3 Methods

3.1 Design

The initial design of this trial was a control study where students from different schools were to act as their own controls before participating in a yoga intervention. However, some schools were unwilling in be involved in a control phase. Consequently, three schools acted as their own control (control then yoga) and six schools participated in the yoga intervention only. A third group eventuated, consisting of students who withdrew from the yoga intervention and moved into the control group.

Whist it would have been methodologically preferable to randomise students, this type of design was not feasible for the following reasons:-

1. Ethically, all children satisfying inclusion criteria needed to have the opportunity to treatment.
2. Eligible participants per school were restricted due to limited enrolment numbers (n=24) at behaviour schools. Therefore, a greater number of schools were required to fulfil the sample size.
3. Because the eligible behaviour schools were located across the Sydney metropolitan region, the geographical distance between schools prohibited return visits to the same school to offer a second round of intervention.
4. Numbers available at the eligible schools were further reduced due to some secondary students not being available for the study due to other school commitments.

5. Smaller trial participant numbers would have reduced the power of the study and would not have allowed for participant loss or dropout during the study.

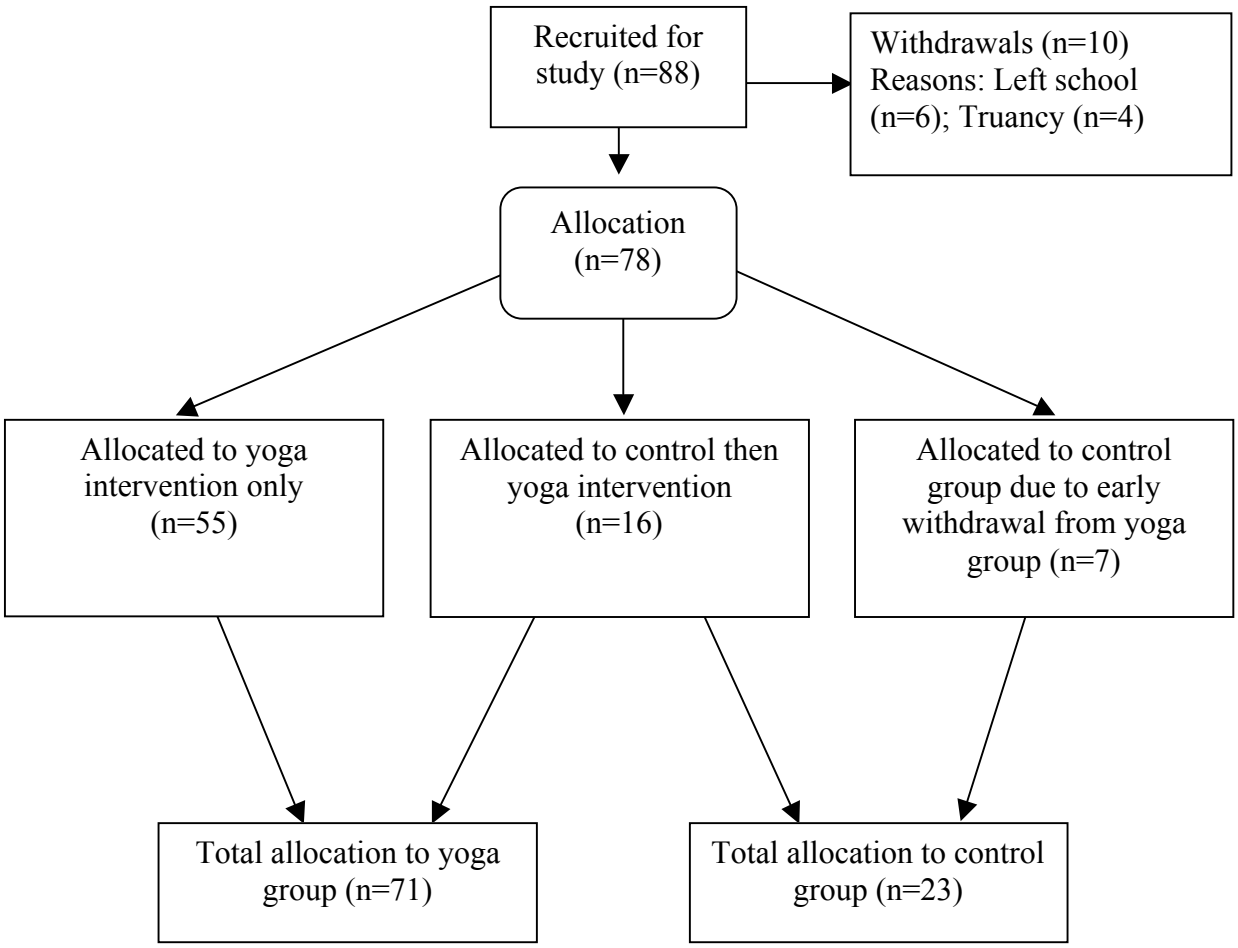


Figure 1: Details of Participant Numbers - Initial Recruitment; Withdrawal; Relocation;

3.2 Participants

3.2.1 Recruitment

The principals of 15 special schools in Sydney Metropolitan area were invited to participate in the study. Eleven of these principals expressed interest. They were sent a letter outlining the details of the study (see Appendix A). After principals discussed the study with their staff, introductory talks were given by researchers and nine schools chose to participate. Parents of students who met inclusionary criteria were given a Participant Information Sheet (PIS) (see Appendix B) and a simplified pamphlet version of the PIS (see Appendix B). Parents were assured that participation was voluntary and that their child could withdraw at any time without it affecting their academic standing or relationship with the school. Parents who failed to respond received a follow up phone call from the school to see if they were still interested. Schools distributed and collected consent forms if the parents were interested. Consenting parents completed forms giving researchers permission to observe behaviour, take photographs and videos and access medical information of their child (see Appendix B).

3.2.2 Sample Size

Eighty-eight (88) students, (5 female) were initially recruited to the study. Ten withdrew, six before completing the control phase and four within the two weeks of beginning the yoga phase due to either leaving the school or truancy. Of the remaining 78 students, 16 students acted as their own controls by participating in the control then the yoga phases, 55 participated in yoga intervention only and seven were in the control condition only (these

students withdrew within two weeks of beginning the yoga intervention but were still willing to act as controls). In total, 71 students participated in the yoga intervention and 23 participated in the control condition.

A sample size of 50 in each group was thought to be sufficient to give a power of 80% at alpha =. 05 to detect an effect size of .33 which, according to Cohen (1977) constitutes a medium effect size.

3.2.3 Description of Participants

All students were enrolled at a NSW Department Education and Training (DET) special school (n=9) for disruptive and/or emotionally disturbed behaviour. Placement in a DET special school was determined by a DET regional welfare team consisting of counsellors and executive staff from special schools and followed behaviour intervention from a specialist behaviour teacher in the student's mainstream school. Once enrolled at a special school the school's counsellor assessed the student according to DETs Disability Criteria (see Appendix D). This process can result in a Mental Health diagnosis of an internalising, externalising or a dual assessment.

The cohort was represented by students diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), and/or Conduct Disorder (CD). Comorbid internalising disorders such as Emotional Disorder (ED) and Anxiety Disorder (AD) in addition to Learning Disorders (LD) and Aspergers Syndrome were also evident in

all these conditions. The remainder of the students had a DET Mental Health assessment or were displaying undiagnosed problematic behaviour.

The students recruited for the study (n=88) had a mean age 11.97 years (SD: 2.09 years). The students who participated (n=78) had a mean age 11.99 years (SD 2.15 years). The students (n=71) who participated in the yoga intervention had a mean age of 12.2 years (SD 2.31 years. The students (n=23) who participated in the control condition had a mean age of 11.21 years (SD1.81years). Table 2 provides behavioural classifications of all participating students.

Table 3: Participant Information on Mental Health Status of All Recruited and Participating Students

Behaviour Classification	n=88	n=78
Paediatrician Mental Health Diagnosis	65.9%	70.5%
School Counsellor Assessment Only	15.9%	17.9%
No Diagnosis	18.1%	11.5%
Students with Paediatrician Mental Health Diagnosis		
ADHD (2 female)	7	5
ADHD with comorbidity (DBD-ODD ,CD, Anxiety Disorders, Aspergers, LD	22	22
ODD	5	5
ODD with comorbidity (DBD, Anxiety Disorders, Depression, LD, ED	9	9
CD	6	6
CD with comorbidity (Anxiety Disorders, LD)	2	2
Anxiety Disorders	7	6
Depression	1	0
Subtotal	58	55
Students with School Counsellor Assessment Only		
Mental Health 1 Internalising	0	0
Mental Health 2 Externalising	6	6
Mental Health 3 Combination of Internalising and Externalising (1 female)	8	8
Subtotal	14	14
Students with No Diagnosis		
No Diagnosis or Mental Health assessment (2 female)	10	5
No Diagnosis available	6	4
Subtotal	16	9
Total	88	78
Internalising and Externalising Classification		
Internalising behaviours	3.8%	5.1%
Externalising behaviours	42.5%	51.3%
Externalising and Internalising behaviours	20.8%	32.1.%
No classification	16%	9.4%

Note: DBD- Disruptive Behaviour Disorders: ADHD-Attention Deficit Hyperactivity Disorder; ODD-Oppositional Defiant Disorder; CD Conduct Disorder; & LD- Learning Disorder.

Twenty-eight percent (28.20%) of the participants were taking medication, which included psycho-stimulants (methelphenidate, dexamphetamine and concerta) and anti-psychotic medications (Risperdone) and alpha agonists (Catapress); 51.28% students were not taking

medication, either due to refusal or because they were undiagnosed by a paediatrician; for the remaining 20.51%, medication status was unknown. Table 4 shows the incidence and type of medication taken by participants.

Table 4: Medication Status of Participants

Medication Status (n=78)	Frequency	Percent
Medication:		
Ritalin	8	
Dexamphetamine	6	
Concerta	2	
Risperdel	2	
Zyprexine	1	
Catapres	1	
Other	2	
Medication Total	22	28.20
No medication	40	51.28
Unknown	16	20.51
Total	78	100%

3.3 Inclusionary and Exclusionary Criteria

Participants who met inclusionary criteria were:-

1. Students attending a NSW DET school for behaviour disorder. This includes those with or without a diagnosed behaviour disorder and with or without comorbid disorders.

2. Aged between 8 and 16 years. Students younger than 7 years are regarded as not ready to formally practice yoga (Chanchani & Chanchani, 1997). Children and adolescents

between these ages represent the population of students at schools for disruptive behaviour.

3. Fluent in English for instructional purposes.

4. Not exposed to other forms of treatment. Being on any other form of treatment would have been an extraneous factor and could compromise the results of treatment.

5. Enrolled at the school for at least two months prior to being recruited (to allow time for effects of special school placement on participant's behaviour).

Participants who met exclusionary criteria were:-

1. Displaying prodromal symptoms of psychosis. This exclusion was included to satisfy DETs advice that some yoga practices are contraindicated for psychosis.

3.4 Procedures

3.4.1 Ethics Approval

Ethics approval was gained from Human Research Ethics Committee (HREC) University of Sydney (USYD) and the Strategic Research Directorate (SRD) of the New South Wales Department of Education and Training (DET) (see Appendix C for approval documents).

Approval for additional physiological measures was sought eight months into the study. The HREC gave approval but the SRD did not. Lengthy appeals to the SRD resulted in approval for two out of three of the measures requested. Reasons for refusal to grant permission for the

one measure was due to it being regarded as too intrusive despite this measure being regularly employed to measure electroencephalogram (EEG) activity in children and adults with ADHD. This delay resulted in only seven students being available for inclusion in this aspect of the study.

3.4.2 Assessment Procedures

A range of outcome measures was used because of the 1) exploratory nature of the study; 2) many aspects of impairment in this population; and 3) many claimed benefits of yoga. The battery of measures included behavioural observations and psychometric measures including behaviour rating profiles and an attention test, self-reports including an anxiety inventory and a self -concept questionnaire and physiological instruments.

Students self-reported under the supervision of researchers or teachers. Teachers and parents completed the behaviour rating profile as soon as convenient before and after the control and experimental phases of the trials. Psychologists, independent of the school, administered the attention test to individual participants in a quiet room within the school. Experienced school teachers and a postgraduate psychology student received training to conduct behaviour observations in the classroom and of the yoga classes, using a computerised behaviour observation system.

All assessments took place within the school setting except for the parent's behaviour rating profile which parents completed at home or over the telephone with the assistance of a teacher. Contact between researchers and parents was not permitted by the school authorities.

Information about the students was gathered from school records and from the school counsellor. This included age, date enrolled at the school, diagnosis, medication status, medication dosage and IQ, if known. Interviews were conducted with the principal or counsellor to obtain background information on each child. Researchers relied on school counsellors for medical records (due to paediatricians being too widespread), diagnostic information, medication status, dosage and compliance and the presence of a DET Mental Health assessment. Medical information was not consistently available, which resulted in gaps in the study samples' details. This is unavoidable when dealing with a highly vulnerable population coming from often highly dysfunction backgrounds. To exclude participants due to a paucity of formal diagnosis and diagnosis particulars would have limited the study numbers and be regarded as unethical. The rigorous assessment procedure required for students to be deemed eligible for enrolment at a DET special school was therefore construed as sufficient justification for these children to qualify as participants in this study.

Blinding was not possible for teachers who assessed students for the following reasons:

1. Teachers were aware of school allocation to treatment or control groups.

2. Teachers taught the students.

3. Teachers were part of the recruitment process.

4. Teachers were often present in the yoga class as part of DET supervisory requirements.

5. Teachers often took observation notes in the yoga class.

Parents were uninformed of the condition phase their child was involved in (i.e. control or yoga) but complete blinding was not guaranteed. Behaviour observers of the classroom behaviour were blinded to the treatment status of both the school and the child they were observing and only entered the school to do observations. They had no other interactions with schools or staff. One of the behaviour observers (the yoga teacher and the researcher, PJ) of the videoed yoga classes was aware of treatment stage (beginning and end) but the other observers were not. The psychologists who conducted the attention test were blinded to treatment status and only entered the school to conduct testing.

The *Summit* ^{TM} *Respiratory Inductive Plethysmography* (RIP) data was collected individually, while participants were in a still, prone position (lying on the back on the floor) before, during and after a relaxation technique. The RIP bands were placed on the chest and abdomen over the student's clothes. This process took place in the same location as the daily yoga sessions in the student's school. A qualified technician was responsible for setting up the equipment and explained the requirements for its successful use to the researchers and participants.

3.4.3 Attendance and Participation Details

Attendance details for each yoga class were recorded each lesson. Reasons for absenteeism were noted (e.g. suspension, work experience, home school visit, absent from school). Attendance details were not collected for the control group. Students who participated in yoga classes were rated by the yoga teacher immediately after the class according to their level of participation. Levels were classified as follows: 1. *Participated all the time*; 2. *Participated most of the time*; 3. *Participated half the time*; 4. *Participated some of the time*.

Records were also kept on the content of each class taught (see Appendix F). Postures were categorised under headings related to their claimed benefits to ensure the students were taught some postures from each category every lesson (see Appendix F).

3.4.4 Time Line for Study

Table 5: Time line for study

Time Line		
Time 1	School contacted via telephone and email. Letter to Principal sent to all interested schools.	Introductory talk to staff describing the design, the expectations of staff and students, measures and assessment procedures and requirements
Time 2	After schools agreed to participate permission was gained from parents for their child to participate in the study	
Time 3	Either a control condition or a yoga condition allocated.	Initial screening. Establish baseline for yoga group and control groups.
Time 4	Conclusion of condition	Post-test screening conducted of yoga or control condition
Time 5	For those initially in the control condition, yoga condition started	
Time 6	Conclusion of condition	Post-test screening conducted of yoga condition

Table 6 presents the number of schools, allocation of condition, date of yoga and control phases and classes offered and accepted.

Table 6: School, Allocation, Date of Yoga and Control Phase and Yoga Classes Offered and Accepted

School	Allocation	Date of Intervention	Yoga Classes Offered/Accepted
1	Yoga	3rd May - 25th August 2004	39/39
2	Control Yoga	April - August 2004 24th August - 9th November 2004	30/30
3	Control Yoga	April - August 2004 25th August - 3rd November 2004	35/33
4	Control Yoga	August - December 2004 9th March - 23rd July 2005	37/37
5	Yoga	9th March - 16th July 2005	34/34
6	Yoga	30th March - 17th July 2005	31/23
7	Yoga	11th August - 24th November 2005	30/30
8	Yoga	16th August - 2nd November	34/31
9	Yoga	15th August - 28th November 2005	32/32

Although it was intended to deliver the same number of classes to each school this did not eventuate. One school (School 3) cut back classes to once a week in the last month. The yoga teacher could not deliver three classes a week to the last three schools (Schools 7-9) so delivered two classes one week and three classes the next. Two schools (1&4) were offered more classes because of the degree of absenteeism.

3.5 Intervention

3.5.1 The Yoga Intervention

Yoga sessions took place at each of the nine (9) participating schools in as suitable (that is, quiet, spacious) a space as the school could provide. Each school was offered a thirteen (13) week yoga program. Three 30-40 minute sessions a week were offered to six of the schools and three 30-40 minute sessions one week and two 30-40 minute sessions another week were offered to the remaining three schools. This discrepancy was due to time restraints and distance between schools. In total, students were offered from 32 to 39 yoga classes. Average length of session depended on the behaviour of the participants and the number of students willing or able to attend on the day. The number of students in each session differed due to absenteeism but generally no more than five students attended each class. On average, two sessions were conducted at each school on the days the program took place.

A *Manual of Practices* was produced by researchers (see Appendix F). A consistent program structure (see Appendix F) was applied throughout the intervention. The daily program was displayed in both text and graphics to foster student engagement and knowledge of expectations of the day's session. All yoga sessions were taught by the same qualified yoga teacher who was also a support teacher for behaviour working in the public school system. Each session was comprised of a short relaxation, joint and spinal warm ups, *asanas*-(posture), breathing practices, single sounds chanting and *Yoga Nidra*, (a longer relaxation) (see Appendix F). The practices were taken from the teachings of *Satyananda Yoga* (Saraswati, 1990) and the Vivekananda Yoga Research Foundation (Nagendra et al., 1988). A similar program was used by authors in a previous study (P. S. Jensen & Kenny, 2004).

The yoga teacher instructed according to the yoga philosophy of the *yamas* (restraints) and the *niyamas* (observances). The *yamas* (restraints) and *niyamas* (observances) in practical terms describe the maintenance of positive conduct and relationships (see section 2.2.2 for description). The yoga teacher practised the *yamas* and encouraged the *niyamas* by 1) responding to verbal or physical aggression in a non-violent way; 2) talking to the students in a truthful way, not using coercion or intimidation; 3) expressing contentedness when children were progressing at their own rate; 4) affirming the children when peaceful; 5) teaching the children to move with moderation, not pushing themselves to point of pain and possible injury; and 6) drawing attention to body sensations, feelings and thoughts. Extrinsic rewards for attendance in the yoga class were not offered.

The Yoga Nidra Technique

Yoga Nidra was the specific relaxation component of the intervention. In this guided practice participants gently focus on sensory input, tensing and relaxing muscles, breath awareness and various body parts in a sequence that corresponds to the sensory and motor homunculus in the cerebral cortex, while allowing various spontaneous thoughts and emotions to arise, that are simply set aside and not acted upon.

Swami Satyananda Saraswati, the founder of Bihar School of Yoga (BSY) in Munger, India simplified and systemised this ancient tantric process which he describes as a "systematic method of inducing complete physical, mental, and emotional relaxation, while maintaining waking awareness" (Satyananda, 1984).

Yoga Nidra was progressively taught over the course of the intervention. *Yoga Nidra* as applied to children and adolescents with disruptive behaviour needed to be adapted in this

study. Adaptations catered for deficits in attention involving poor listening skills, concentration, perseverance, and consequently a propensity towards boredom, agitation, restlessness, and oppositional behaviour. To this end, a shortened form of the technique was slowly taught over the13 week period during each yoga session starting with 30 seconds and slowly progressing to up to 15 minutes, taught in groups of up to five students (see Appendix F for full explanation of the *Yoga Nidra* Technique).

3.5.2 The Control Intervention

Although participants in the control group were not given any placebo treatment they were visited by the yoga teacher once a fortnight to establish familiarity. This action was intended to prevent the Hawthorne effect (Babbie, 1995).

3.6 Instruments–Behavioural, Psychometric, Self-Report and Physiological Measures

To accommodate the complexity of the disorders multiple measures for assessment were employed. Standardised commercial instruments included behaviour rating scales, tests of attention, objective measure of thoracic and abdominal breathing rates, self-report questionnaire on self–esteem, anxiety inventory and behaviour observations. Measures developed specifically for the study included: self report scales on feelings and state of being and a yoga survey. These measures were simple and specifically designed to address a short

concentration span and reading problems. Also developed was and an assessment of yoga competence. These measures provided yoga specific feedback which was not available in standardised measures.

Detailed descriptions of the instruments are listed below together with their psychometric properties (where available).

3.6.1 Psychometric Measures

3.6.1.1 *Conners' Parent Rating Scale –Revised: Long Version* (CPRS-R: L) (Conners', 1997).

Conners' Teacher Rating Scale Revised: Long Version (CTRS-R: L) (Conners', 1997).

The Conners Rating Scales are Broadband Rating Scales (BRS). BRS use rationally derived behaviour descriptions. BRS indicate very good reliability and validity particularly for assessing treatment outcomes and are sensitive to both behaviour and pharmacological treatment effects (Barkley et al., 2000; Kolko et al., 1999; Pelham et al., 1993; cited in Pelham, Fabiano, Massetti 2005).

As established in Section 2.1 (Disruptive Behaviour), many dimensions of behavioural dysfunction are accompanied by comorbid and secondary symptoms. This profile was evident in the current study sample. Evidence for the efficacy of yoga has also been demonstrated in clinical and field studies (see section 2.4) in reducing the primary, comorbid and secondary

symptoms. Behaviour rating scales were therefore, considered an important measure to include to establish the level of perceived impairment and to gauge any improvements after a yoga intervention. Dimensions of disruptive behaviour of potential significance were:

1. Inattention, restlessness, hyperactivity, impulsivity being primary symptoms of ADHD.
2. Comorbid problems such as anxiety and emotional disturbance.
3. Other dimensions of disruptive behaviour such as oppositional behaviour.
4. Secondary symptoms of behaviour problems such as social problems.

The CTRS-R: L and the CRRS-R: L included these dimensions and are considered a reliable and valid measure of behavioural dysfunction in addition to being commonly used to as an outcome instrument.

The CPRS-R: L contains 80 items and the CTRS-R: L contains 59 items. There are 13 subscales in the CTRS-R: L and 14 subscales in the CPRS-R: L. (the additional subscale is Psychosomatic). The 13 subscales in common are listed below. Explanations of the subscales as defined by Conners (1997) are included.

1. *Oppositional*: likely to break rules, have problems with authority and are easily annoyed.
2. *Cognitive Problems*-Inattention: Inattentive, organizational and concentration problems and difficulty completing tasks.
3. *Hyperactivity*: Difficulty sitting still for very long and feelings of restlessness and impulsivity.

4. *Anxious/Shy*: Having atypical amount of worries, prone to be emotional and sensitive, anxious in unfamiliar situations and can be shy and withdrawn.
5. *Social Problems*: Perception of having few friends, low self esteem and self confidence and feel socially detached from peers.
6. *Perfectionist*: set high goals, are fastidious about the way they do things and are obsessive about their work.
7. *Psychosomatic* (parents only): Report atypical amount of aches and pains.
8. *ADHD Index*: Identifies children at risk for ADHD.
9. *Conner's Global Index Restless/Impulsive*: Restlessness, impulsivity and inattention.
10. *Conner's Global Index Emotional Lability*: Prone to more emotional response/ behaviours like crying and anger than is typical.
11. *Conner's Global Index:* General problematic behaviours with high scores indicating hyperactivity.
12. DSM-IV–Inattentive: Above average correspondence with DSM-IV diagnostic criteria Inattentive type ADHD.
13. *DSM IV -Hyperactive/Impulsive* Above average correspondence with DSM-IV diagnostic criteria Hyperactive –Impulsive type ADHD.
14. *DSM IV- Total*: Above average correspondence with DSM-IV diagnostic criteria for combined Inattentive and Hyperactive-Impulsive type ADHD.

Subscales not Included were:

1. DSM –IV Symptoms subscale-Inattentive

2. DSM –IV- Symptoms subscale-Hyperactive/Impulsive

The *DSM-IV Symptoms* subscales for *Inattention* and *Hyperactive/Impulsive* are a new addition to CTRS-R: L and CPRS-R: L that corresponds to the DSM-IV criteria and differs from the above 14 scales in that they are not converted to T-scores. T-scores are standardized scores calculated from raw scores obtained from the rating scales scoring form. Each scale has the same mean (50) and standard deviation (10). T-scores allow each score to be compared to the same reference value. For example, a T-score of 90 compared to the mean average of 50, indicates the score is well above average. The DSM-IV symptoms subscales are derived from the nine diagnostic criteria for the ADHD subtype, ADHD Predominantly Hyperactive /Impulsive and nine diagnostic criteria for ADHD Predominantly Inattentive in the DSM-IV (1994). These scores give a quick indication of the level and nature of impairment. If the score is over six for either subscale, it is suggestive of an ADHD diagnosis.

The study sample displayed a wide range of psychopathology. *Conners' Global Index* (CGI) subscale was regarded by Conners' (1997) as a measure of overall psychopathology, sensitive to treatment effects and repeated measures therefore this subscale was considered an important outcome subscale for this study. The CGI comprises of *Conners' Global Emotional Labiliy Index* and *Conners' Global Restless Impulsive Index.* These two dimensions are described as representative of the hyperactive–impulsive-emotionally labile child.

The Conner's Rating Scales manual stated that the CTRS-R: L and CPRS-R: Ls internal consistency coefficients ranged from .75 to .90, with a 6 to 8 week re-test reliability, with reliability coefficients ranging from .60 to .90. According to the manual (Conners, 1997) the first seven subscales scales did not intercorrelate very highly (.34 for males and .32 for females), which suggests that each subscale was assessing independent components of behaviours being measured. A critical review by Gianarris (2001) of the Conner's Parent Rating Scales found that this scale was an effective treatment measure. Of the 38 studies Gianarris reviewed, using Conners' Parent Rating Scales as a treatment outcome measure, 14 studies had sound methodology, valid statistical procedures and accurate reporting.

Mean T-scores are reported in this thesis. T-scores in the CTRS-R: L and CPRS-R: L are categorized into five ranges:-

1. 70+ T-score-Markedly Atypical Significant Problem
2. 66-70 T-score-Moderately Atypical Significant Problem
3. 61-65 T-score-Mildly Atypical Possible Significant Problem
4. 56-65 T-score-Slightly Atypical -Borderline: should raise concern
5. 45-55 T-score-Average (typical score) (Conners, 1997b).

For treatment effects Conners (1997) recommends improvements of half a standard deviation (T-score changes of 5 or more points) as significant.

3.6.1.2 *Test of Everyday Attention for Children* (TEA-Ch) (T. Manly, Robertson, Anderson, & Nimmo- Smith, 1999)

Atypical development in attentional abilities has been documented in a wide range of childhood disorders including ADHD, Aspergers Syndrome, Anxiety Disorders and Post Traumatic Stress Disorder (Conder & Nursey, 1998, cited in Manly et al., 1999) all of which were represented in the study sample. As reviewed in previously in Sections 2.3 and 2.4 improvement in attention has been documented in yoga studies in both non-clinical and clinical adult and child populations. For these reasons a test of attention was considered an important component of the battery of outcome measures.

A continuous performance test (CPT), employed in a previous study by Jensen and Kenny (2004) was found to be unsuited to the study sample due to lack of sensitivity and a tendency to produce invalid results. Additionally the attentional processes tested in CPTs are not as comprehensive as those in such attention tests as the TEA-Ch. The *TEA-Ch* is comprised of games and graphics in nine subtests which measure children's attentional abilities. Manly et al., (1999) based the TEA-Ch on the work of Postner and Peterson (1990) who along with other researchers showed increasing evidence that distinct brain regions and networks may be involved in different types of attention. Postner and Peterson (1990) proposed three attentional systems also termed 'latent constructs' within the brain based on lesions and functional image studies. TEA-Ch tests for cognitive strengths and problems in these three types of attentional systems. These attentional systems involve 1.selective/focused attention; 2.sustained attention; 3.attentional control/shifting. Selective/focused attention describes an ability to resist distraction, sort through information and decipher important relevant

elements. Sustained attention describes an ability to retain focus until completion of a goal. Attentional shifting/control describes an ability to move attention from one focus of attention to another.

The types of attention tested and the name of the tests are listed below.

1. Focused attention -Sky Search

2. Selective focused attention - Map Mission

Tests 1 and 2 examine the efficiency with which information can be filtered to detect relevant information and reject or inhibit irrelevant or distracting information.

1. Sustained attention- Score

2. Sustained divided attention- Sky Search DT

3. Sustained attention-Score DT

4. Sustained attention response inhibition-Walk, Don't Walk

5. Sustained attention-Code Transmission

Tests 3-7 assess children’s capacity to remain attentive to a task, goal or behaviour that may be boring, repetitive or require waiting.

1. Switching attention- Creature Counting

2. Switching attention- Opposite World Same World Total

Tests 8 and 9 require an ability to perform tasks which may have more than one solution, to co-ordinate different skills and to plan to solve them.

Reliability

Re-test reliability ranged from .57 to .87 for the nine tests with 293 children completed version A of *TEA-Ch* and 55 children completing version B between 6 and 15 days later (T. Manly et al., 1999).

Validity

Concurrent validity is indicated by a high degree of convergence with other measures of attention including *Stroop* (Trennery, Crosson, De Boe, & Leber, 1989)*, Trials Test (TT)* (Spreen & Strauss, 1991) and *Matching Familiar Figures Test (MFFT)* (Arizmendi, Paulsen, & Domino, 1981).

Manly et al., (1999, p. 35) indicated sensitivity by using structural equation modelling to demonstrate that the three latent constructs of focused attention, sustained attention and attentional switching /control were independent of one another

Establishment of Norms

Manly et al. (1999) established norms with a sample of 293 (146 males and 147 female) Australian children and adolescents between the ages of six and sixteen years, stratified into

six age bands. IQ (WISC-111) (Wechsler, 1991) was found to account for very little variance in the majority of *TEA-Ch* measures within the normal IQ range ascertained through assessments of a subset of 160 children.

TEA-Ch in Clinical Populations

Heaton et al. (2001) investigated attentional deficits using the TEA-Ch with ADHD children compared with non-ADHD clinical control children and found the ADHD cohort performed significantly poorer on three out of the five subtests of sustained attention, both groups showing impairment in one out of two subsets of attentional control, and did not significantly differ on selective attention. However it was noted that these subtests do not have very demanding encoding processes but higher demanding encoding processes have been found to indicate more deficits (Ceci & Tishman, 1984 as cited in Heaton et al., 2001).

TEA-Ch was been successfully employed as an outcome measure for treatment effects of Methylphenidate (MPD) in children diagnosed with ADHD and compared with non-clinical controls. Findings demonstrated the ADHD children were significantly impaired at pre-test compared to controls and improved significantly at post-test (Hood et al., 2005; Sutcliffe, Bishop, & Houghton, 2006a).

A review by Baron (2001) pointed out features in the TEA-Ch which identified it as a workable outcome measure. These features included 1) appeal to children because of audio components similar to computer sounds and attractive visuals, 2) standardised instructions requiring children to practice and paraphrase instructions ensuring adequate comprehension; 3) ability to measure components of attention other than continuous performance tests (CPT) therefore providing a useful addition to or substitute for CPTs; 4) availability of parallel forms

enabling retesting within short time spans. Some drawbacks were that 1) guidelines were insufficient for interpreting results that differ from subtests that are purported to measure the same type of attention and that 2) the inclusion of a case study interpretations were warranted. Baron considered that unanswered questions about construct validity, positive predictive power, negative predictive power, diagnostic sensitivity and specificity and neuroanatomical correlation also needed to be addressed. The question of whether retest reliability will remain stable or improve when test A and B intervals lengthen is relevant to this thesis study because retest was approximately three months and also involved re-administering test A after approximately 6 months.

3.6.2 Self Report Measures

3.6.2.1 *Self Description Questionnaire I* (SDQ I) (Age relevant) (Marsh 1990) *Self Description Questionnaire II* (SDQ II), (Marsh 1990)

Children with behaviour problems can suffer from low self-esteem/self concept attributed to poor peer and family relationships, poor academic achievement and school experiences (G. Fabiano et al., 2001; Harada, 2002; Marsh, 1990b, 1990c). However, Hoza et al, (2002, 2004) found that children with ADHD had a tendency to over inflate self-perceptions more than controls in the scholastic, social and behavioural domains relative to teacher-rating criterion. Comorbidity subgroup analyses suggested that ADHD boys tended to overestimate in the domains in which they were most impaired. For the ADHD boys with aggression,

overestimations were detected in the social and behavioural domains, with low achievers in scholastic domains**.**

These findings left researchers cautious about including a self-concept measure. However, the SDQ I and II were selected because they were: 1) designed in Australia and normative values were established with Australian students which gave demographic relevance; 2) specific to school level; 3) tested for a wide range of dimensions; 4) presented in understandable formats and language and 5) did not specifically test for disruptive behavioural impairments .

The SDQ I (Marsh 1990) is a 76 item self-report for children and preadolescents (grades 2-6) and the SDQ II (Marsh 1990) is a 102 item self-report for adolescents (grades 7-10). SDQ II. The SDQ I and SDQ II have seven common subscales and four separate subscales which are listed below:

Common subscales:

1. Physical abilities
2. Physical appearance
3. Mathematics
4. Parent relations
5. General self
6. General school
7. Total self

SDQ I Subscales

1. Reading
2. Total Academic
3. Total non-academic
4. Peer relations

SDQ II Subscales

1. Emotional stability
2. Honesty and trustworthy
3. Same sex relations
4. Opposite sex relations

The SDQ I and SDQ II assess multifaceted construct of self-concept in non-academic and academic areas. These constructs are based on the theories of Shavelson, Huber and Stantion (1976) that define self-concept as a person's perceptions of him or herself. These perceptions are said to be formed through experience of one's environment, the influence of others and reinforcements and attributions of one's own behaviour (R. P. Brown & Gerbarg, 2005a; Kirkwood et al., 2005).

Working time for SDQ I and SDQ II is approximately 15-20 minutes. In the SDQ II, half of the items are negatively rated in order to disrupt positive response bias. SDQ norms, percentile ranks and T-scores by grade level and sex for the total combined normative sample are based on 3562 student responses for SDQ I and 5,494 student responses for SDQ II from Sydney schools, New South Wales, Australia.

For interpretation purposes, according to the manual, T-scores between 40 and 70 are within the normal range (Marsh, 1990).

SDQ I and II questionnaires partially completed or intentionally answered without reading the statements were regarded as invalid. Some students agreed to have or asked for questions to be read to them. The large number of statements resulted in some students needing more than one sitting to complete. Test conditions were therefore not standardised but necessarily adapted to the needs of the students.

Reliability

The internal consistency reliability estimates for the various scales range from .80 to .90 for SDQ I and .83 to .91 for SDQ II .The average correlation among individual self-concept scales is relatively low (mean r=.17) for SDQ I and average (mean r=.18) for SDQ II (Marsh, 1990).

Validity

The SDQ I and II claim to "relate to sex, age, socioeconomic status, academic achievement, teacher ratings of achievement and inferred self concept, peer ratings of self concept, student self attributions for the perceived causes of academic success and failures, responses to other

self concept instruments and experimental interventions designed to enhance self concept (p. 4, Marsh 1990).

Although self-concept in children with behaviour problems may be difficult to accurately measure, yoga studies have indicated that self–concept has been positively affected. Therefore researchers of the current study considered it was worthy of further investigation. Significant improvements were detected in the areas of quality of life (Carlson, 2002), life satisfaction (Schell et al. 1994) and mood (Woolery et al, 2004) in clinical and non-clinical populations. In children with hyperactivity, Omizo (1980) found significant changes after a relaxation technique, in levels of anxiety, aspiration, alienation, leadership and initiative.

3.6.2.2 *State-Trait Anxiety Inventory* (Form Y) (STAI-Y), (Spielberger, 1983) *State-Trait Anxiety Inventory for Children* (STAIC), (Spielberger 1973)

Anxiety was not initially considered by researchers of the current study as a variable to measure with students with disruptive behaviour. However evidence of anxiety was revealed in paediatric and counsellor assessment of the recruited students. Additionally, anecdotal evidence from conversations with the teachers of recruited students indicated the presence of anxious behaviours. Reduced anxiety has been a target outcome of many yoga trials (Muris et al., 2002) therefore the inclusion of a measure of anxiety was considered relevant. This measure was introduced after the commencement of the intervention therefore students from six schools only were assessed.

The *State-Trait Anxiety Inventory* (Form Y) (STAI-Y), (Spielberger, 1983) and State-Trait Anxiety Inventory for Children (STAIC), (Spielberger 1973*)* STAIC are anxiety questionnaires frequently used in research and clinical practice (Arnold et al., 1997). The State-Trait Anxiety Inventory (Form Y) (STAI) and the State-Trait Anxiety Inventory for Children (STAIC), (Spielberger 1973) are comprised of a State (S)-Anxiety scale and a Trait (T)-Anxiety scale. The S-Anxiety scale assesses how people feel "right now" and the T-Anxiety scale assesses how people generally feel. The T-Anxiety Scale was selected for this study because it is relatively impervious to conditions under which it is given (Spielberger, 1973). This aspect was regarded as important because the inventory was generally completed in a classroom environment that was unpredictable and subsequently potentially influential in affecting children's 'state' moods.

According to the STAI manual (Spielberger, 1983, Pp.13-14), the alpha coefficient for 'trait' anxiety was high at 0.90 for male (n=202) and female (n= 222) high school students based on normative samples. The internal consistency provided by item-remainder correlations was .54 for high school students and .30 for both sexes in normative samples. The test-retest coefficients ranged from .65-75 and the median co-efficient was .695. Validity of the STAI was evidenced with concurrent, convergent, divergent and construct validity examinations of correlations between the T-Anxiety scale and the S-Anxiety scale (.72 males, .64 females). Correlations of the T-Anxiety scale were established with other measures of trait anxiety, other widely used measures of personality and adjustment and with other aptitude and achievement measures.

The State-Anxiety Inventory for Children (STAIC) (Spielberger 1973) was developed from the original State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch & Lushene, 1970) in an attempt to develop a research tool for the study of anxiety in elementary children. According to the Manual for the STAIC (Spielberger, 1973, Pp. 12-15), reliability was based on a normative sample of 246 fourth, fifth and sixth grade students. The alpha coefficient for trait anxiety was 0.78 for males (n=114) and 0.81 for females (n=132). The internal consistency provided by item-remainder correlations was .35 for males and .48 for females. The test-retest coefficients ranged from 0.65 (females) to 0.71 (males) over a six week interval and the median co-efficient was 0.695. Concurrent validity of the STAIC (tested on n=75 children) was evidenced with two other widely used measures of trait anxiety-the *General Anxiety Scale for Children* (Sarason et al., 1960) and the *Children's Manifest Anxiety* (Castenanda, et al,1956) with correlations of 0.63 and 0.75 respectively. Reliability and validity data for the STAIC suggest its feasibility in assessing state and trait anxiety in delinquent populations (Lira, White & Finch 1977). Muris and colleagues found STAIC scores correlated with internal consistency at .91 with five other questionnaires measuring anxiety. The STAIC was also found to be substantially connected to an index of depression using a sample of 521 adolescents (240 males).

Both the STAIC and the STAI consist of twenty statements (see Appendix I Tables 22 & 37 for list of items) with three levels of response (1-hardly ever; 2–sometimes; 3- often. The STAI statements differ from the STAIC in that half of the statements indicate the presence of anxiety and the other half indicate the absence of anxiety.

According to established norms for the STAIC and STAI-Trait, a raw score of 20 (T-score 20) indicates the absence of anxiety and a raw score of 60 (T-score 80) indicates extreme anxiety. The mean raw score for a sample of 1554 (817 male) elementary school children, on the STAIC T was 36.7 (SD 6.32) (T-score 48) for males and 38.0 (SD 6.68) (T-score 50) for females (Marsh, 1990, p11). Established norms for STAI-T for high school aged adolescents indicate a raw score of 40.17 (male) (T-score 51) and 40.97 (female) (T-score 50) ((Marsh, 1990, p.4).

3.6.3 Behaviour Observations

3.6.3.1 *Behaviour Assessment System for Children - Portable Observation Program* (BASC-POP) (Reynolds & Kamphaus, 1992)

Behaviour observations in both clinical and natural settings are regarded as valid and reliable indicators of symptoms of disorders such as ADHD and ODD, provided targeted behaviours are established, observers are blind to treatment phases and are independent and trained to observe according to a set of established codes (H. Abikoff, Gittelmann-Klein, & Klein, 1977; H. B. Abikoff et al., 2002; W E Pelham et al., 2005).

BASC-POP is a computerised observation program. The targeted behaviours are entered into the program and appear by abbreviated name in a grid. The observer places the curser on the targeting behaviour by clicking on the behaviour and the observation is entered into the system. The externalising disruptive behaviours of inattention, hyperactivity and impulsivity associated with ADHD primary symptoms (DSM–IV-TR) and oppositional behaviours

associated with primary symptoms of ODD (DSM–IV-TR) were identified as targeted behaviours. The inattentive behaviours observed were 'Easily Distracted' and 'Listening to Instructions'. The hyperactive behaviours observed were 'Out of seat', 'Fidgeting' and 'Talking Excessively' and the impulsive behaviours were 'Blurting out', 'Interrupting' and 'Not Waiting Turn'. The oppositional behaviours observed were 'Losing Temper', 'Annoying Others', 'Refusing to Follow Instructions', 'Anger' and 'Blaming Others'.

BASC-POP enables momentary time sampling during observation and rating periods and systematic coding during observation and rating periods. This provision facilitates consistency among observers. The length of each observation was set at 15 minutes and targeted behaviours were recorded each time they were observed within 15 second time periods. For example, if a student was *out of his seat* for the total of 15 seconds he was scored once. If he was up and down from his seat three times in the 15 second period he was scored three times. If he was *talking excessively* for the 15 second period he would be scored once but if he *blurted out* then stopped and *blurted out* again he would be scored twice.

Observations took place at pre- and post-test in the classroom and also at the beginning and the end of the yoga program via videoed yoga sessions. On- and off-task behaviour observations were also conducted of the videoed yoga classes over a 15 minute period in 10 second intervals. If a child was off-task for all or a substantial part of the 10 second period s/he was recorded as being off-task. Off-task behaviour was regarded as behaviour that was non-compliant with teacher instructions, was noisy, distracted, hyperactive, unmotivated and/or aggressive and on-task behaviour was the absence of these. Videoed classes enabled multiple observations by multiple observers to ascertain inter-rater reliability and accurate

observations. Videoing classroom behaviour was not possible for ethical reasons, due to the presence of students not in the study.

Observations were conducted by qualified teachers, a student psychologist and a psychologist given training in the BASC-POP and who were independent and blind to student study status. Observations of the yoga classes were also conducted by the main researcher. Inter-rater reliability for the yoga class observations was conducted with two independent raters and the main researcher.

3.6.3.2 School Staff Observation Notes

Teachers and teachers' aides were requested to record observation notes on each student in each yoga class in a notebook. Observers were instructed by the researcher to note both on- and off-task behaviours (terms familiar to all staff at participating schools). Each yoga lesson was visually displayed with text and graphics and presented in sequence (see Appendix F, for an example). This sequence was written by the staff member in the notebook and observational notes on each student were recorded beside the appropriate component of the class (see Appendix H, for example of original version and typed version).

Notes were typed and examined by researchers for descriptor words and phrases linked to on-task and off-task observational comments then numerically compared. 'On-task' behaviours included descriptors such as *participating, joining in, being compliant, doing well, trying, relaxed, and still,* while 'off-task' behaviours included *non-compliance, restlessness, not*

listening, silliness and aggressive. This observational tool provided extensive, detailed information about each student's yoga class behaviour.

Staff descriptions were content analysed for on–task/positive and off-task/ negative statements about behaviour during the sessions. Single word descriptors and phrases were coded. For each participant, a ratio of on-task to off-task statements was computed. Data were utilized in two ways: (i) the observational comments about 16 randomly selected students were extracted and divided and on and off-task columns (see Appendix H); and (ii) on and off-task behaviour descriptors for all participants were categorised into subgroups and numerically totalled. Subgroups were labelled compliant, for example- *participating and joining in,* and compared with non-compliant-*not participating, unwilling*; settled- *calm, relaxed* compared with hyperactive/impulsive-*talkative, fidgety* and satisfaction-*did well, excellent* compared with aggressive-*teasing, threatening.* Subtotals were then totalled for all on-task and off-task behaviours. Analysis for the whole group is admittedly less precise than the methodology used for the subgroup but it served to emphasis the predominance of *on-task* comments in addition to indicating the predominating aspects of *off-task* behaviours.

3.6.4 Non Standardised Self-Report Measures

3.6.4.1 *The Feelings Faces Scale* (FFS)

The *Feeling Faces Scale* (FFS) (see Figure 3) is a self-report measure adapted by researchers from *The Faces Pain Scale* (Bieri, Reeve, Champion, Addicoat, & Zeigler, 1990; Spagrud, Piira, & von Baeyer, 2003) which is designed to enable small children to communicate pain to

clinicians in ways that can be reliably interpreted (1976). The FFS is similar to the *Faces and Feeling Scale* by Andrews and Withey (1976) which uses facial expressions as a non-verbal index of emotions. Like the *Faces Pain Scale* and the *Faces and Feeling Scale,* the *Feelings Faces Scale* it is easy to explain. Such scales are liked by the children, are inexpensive and administered quickly and with ease. They cater for children with limited reading ability and short attention spans. The *Feeling Faces Scale* comprises scales on general mood, enjoyment of and competence with yoga. Three out of four of the scales display five drawn stylised faces which represent polar opposite emotions for three emotional dimensions (happiness/sadness; calmness/anger; enjoyment /shyness). The fourth scale measures competence ('I can do all the postures' with sliding scale to 'I can do none of the postures'). A score of five (most positive) to one (least positive) were assigned to each scale. The *Feeling Faces Scale* was completed by students after the last yoga class each week.

3.6.4.2 *Physical, Emotional and Mental State* (PEMS)

The PEMS is a non-standardised, verbal self-report measure assessing current physical, emotional and mental states on a 10 point scale. The PEMS was developed for use with disadvantaged youth by Walsh (2005). Walsh found this measure helpful in gauging the mood of her students, structuring her yoga class appropriately and enabling students to become aware of their own and other students' state of well being.

Examples of extreme ends of the scale for physical state included energetic or strong (high ratings) compared with feeling tired, lazy, restless or hyperactive (low rating); for emotional

state, included feeling happy, without worries and concerns (high rating) compared with feeling angry or sad (low rating); for mental state included thinking clearly (high rating) compared with feeling confused and mentally tired (low rating). Each child's response was recorded at the beginning and the end of the yoga session with understanding of these states being regularly reinforced. In addition this measure provided daily data to help address a lack of post-intervention data due to absenteeism.

3.6.4.3 Yoga Survey

The Yoga Survey (see Appendix E) was a simple, brief survey devised to measure students' perceived benefits from yoga, administered at the end of the program to a subgroup of students. The survey included the questions "Do you have more energy? Are you a calmer person? Are you more flexible? Do you feel stronger? Are you able to relax easier? Do you have less mood swings? Do you experience as much anger?"

Two components of the survey tested for valid responses:-

1. To test for consistent responses six out of the seven questions required a *YES* answer and the remaining question required a *NO* answer to indicate a beneficial effect.
2. To test for response bias the second and the seventh question were similar and therefore should have elicited the same response.
3. The survey was deemed invalid if inconsistencies or bias were detected.

3.6.5 Individual Assessment in Yoga Competence

A subgroup of students from two schools was assessed individually (videoed) while performing a required set of techniques (see Appendix E). The lesson assessed was taught in the last week of the program. On the last day of the program students executed the program without teacher instruction, within the group setting, by following the visually displayed class plan (see Appendix E). They were then assessed individually with the same visually displayed class plan within the following two days. Marks were assigned to each section of assessment and were allocated by yoga teacher and recorded on a form (see Appendix E). Students were allotted marks (in brackets) for:-

1. Attendance over the course of the program (10 based on records).
2. Attitude over the course of the program (20 based on records). Attitude was ascertained by daily assessment based on level of participation (i.e. participated all the time; most of the time; or some of the time).
3. Ability to concentrate and focus in posture correctly held for five breaths (28-4 per sequence).
4. Performing the warm ups slowly and with awareness (6).
5. Ability to hold relaxation pose after posture where required (6).
6. Ability to relax for 3-5 minutes (10).
7. Ability to remain calm/quiet throughout program (10).
8. Ability to do breathing practices (5).
9. Ability to calmly chant. (5).

3.6.6 Physical Measure

3.6.6.1 *The Summit™ Respiratory Inductive Plethysmography* (RIP)

The *Summit™ Respiratory Inductive Plethysmography* (RIP) was employed to measure breathing patterns while participants (n=7) were in a still, prone position (lying on the back on the floor) for five minutes before, ten minutes during, and five minutes after the *Yoga Nidra* relaxation practice. This measure was employed at the end of the yoga program after the participants had received training in the technique during the course of the intervention.

The manufactures Compumedics (2000) explanation of the *Summit ™ Respiratory Inductive Plethysmography* (RIP) is as follows:

> *'Plethysmography is the study of variation in size of the body or blood volume. Inductance is the resistance to change in current flow in an alternating current circuit. The elastic respiratory bands that are used in inductive plethysmography have insulating wires sewn into them. The Summit ™ RIP produces a square wave excitation signal of 32.7 kHz for the thoracic and abdominal channel, of approximately 2.8 V peak-to – peak through the coils by frequency oscillator circuit. As the bands are stretched during respiratory movement, the coils change area and since the current is held constant, the magnetic flux changes in proportion to the velocity of the change in the band length. The varying amplitude of the signal produced is then demodulated to produce an amplified voltage relative to the respiratory band movement. The signal output goes through a 5Hz (-3dB) filter to remove the excitation /carrier signal. The change in voltage, is directly related to change in respiratory band length, therefore, is directly and*

linearly proportional to the change in thoracic and abdominal volume. This provides a semi-quantitative signal that reflects true change in breathing volume.'

3.6.7 Case Studies

In view of the overall null results on the standardised measures and observations of the very wide variability in standard deviations around the means of these measures, it was decided to do case studies on a subsample of four children to ascertain positive and negative responses to the program. The four children selected as case studies, differed in their diagnosis and were observed as having both positive (Case Studies 1, 2, 3, & 4) and negative responses (Case Study 4) to treatment on the non-standardised measures and demonstrated a variety of responses on the standardised measures. Case studies are presented in the same format as the results for the larger groups but more detail is provided about yoga class behaviour provided by school staff notes.

3.7 Data Analysis

SPSS was used to conduct general linear modelling using repeated measures analysis to compute the significance of changes over time, pre- to post-intervention, between groups. An interaction term was included to assess whether rate of change was different between the two study groups. The dependent variables measuring the impact of the yoga intervention on the behaviour, attention, anxiety, self-concept and self-state levels of the participants were each analysed separately. Means plots were produced to help interpret the P values. Independent t-

tests were used to compare the post-intervention mean values between the two groups and to obtain effect sizes as mean difference and 95% confidence intervals.

To include all children in the analyses, results from the children who completed the control study arm were compared with results from the children who completed the yoga study arm of the trial. Thus, a total of 16 children who completed both arms (19% of the sample) were included in both groups. This had the effect of making the results from the control and yoga arms more alike and therefore may have produced conservative effect sizes and P values that are biased towards the null.

Subgroup repeated measures analysis over time was conducted for children who attended more than 20 yoga classes and for the children who acted as their own controls. The results of children who attended more than 20 yoga classes were compared with the total group. The results of children who acted as their own controls were analysed initially with polynomial orthogonal contrast analyses to ascertain significant effects. If there was a significant effect, Simple contrasts were conducted to ascertain whether significant change occurred between the pre-yoga to post-yoga condition.

Where measures were not repeated, means and standard deviations served to indicate levels of response. For the *Individual Assessment of Yoga Competence*, mean percentage was calculated. For the FFS mean rating over the course of the intervention was calculated. For the *Yoga Survey*, percentage of positive to negative responses was calculated. For the staff observations of yoga classes, a ratio of on-task to off task behaviours was calculated.

Descriptive and frequency statistics were calculated for participant diagnostic status, medication status, attrition, attendance and reasons for absenteeism.

In order that the results of the study to be definitive, that significant effects were not overlooked, and that any null results were interpretable, power was set a .80, as recommended by Cohen (1977), to detect a medium effect size (i.e. [mean1 – mean 2]/SD1=.05). Power was calculated using results obtained from a previous study (Jensen & Kenny, 2004) as there were no other precedents on which to determine the required statistic. This was the mean change scores and their standard deviations. Type 1 error rate was set at .05. It was calculated that 50 children were needed in each arm of the study.

Analysis of the *Summit* ^{TM} *Respiratory Inductive Plethysmography* (RIP) was conducted using Polyman EDF+ software to display data exported from Compumedics "Profusion PSG" Software. Data were analysed from the observations of one minute screen shots and screen shots for pre (5 minutes), during (10 minutes) and post (5 minutes) *Yoga Nidra*. From screen shots, variations in patterns of breathing effort were identified as unstable or stable. Unstable breathing was identified as fluctuations in rate/s of breathing effort, amplitude, cessation of breath, and thoracic or abdominal predominance

4 Results

4.1 Attendance and Participation

Of the 88 students (5 female) initially recruited, 10 withdrew before completing the control phase -- six students left the school and four were truant. The seventy-eight students remaining in the study were divided into three conditions. Sixteen students participated in a control condition followed by the yoga intervention (i.e. acted as their own controls). Fifty-five students participated in the yoga intervention only and seven students were in the control condition only. It was initially intended that all participating students from each of the nine schools would act as their own control. An assessment phase would have been followed by no intervention then another assessment would have preceded the implementation of the yoga intervention. However, six schools opted out of the control phase -- they wanted to commence the yoga program immediately and consequently control numbers were reduced, which substantially reduced the numbers in the comparison group.

Students were taught between 23 and 39 yoga classes. Variations were unavoidable due to schools' cancellation of classes because of teacher absences or other school events or public holidays. The complex logistics of travelling between schools for the yoga teacher also influenced the number of classes offered. The program was also interrupted by two weeks of school holidays.

The frequency of attendance was considered an important factor for treatment efficacy. Table 7 details the frequency of attendance for all students.

Table 7: Yoga Classes Attended and Frequency Of Attendance

Classes Attended	Frequency	Percent	Cumulative Percent
7	1	1.4	1.4
8	8	11.3	12.7
9	1	1.4	14.1
10	2	2.8	16.9
11	1	1.4	18.3
12	5	7.0	25.4
13	2	2.8	28.2
14	4	5.6	33.8
15	6	8.5	42.3
16	5	7.0	49.3
17	4	5.6	54.9
18	4	5.6	60.6
19	4	5.6	66.2
20	1	1.4	67.6
21	2	2.8	70.4
22	3	4.2	74.6
23	3	4.2	78.9
24	2	2.8	81.7
25	3	4.2	85.9
27	2	2.8	88.7
29	1	1.4	90.1
30	2	2.8	93.0
32	1	1.4	94.4
33	3	4.2	98.6
35	1	1.4	100.0
Total	**71**	**100.0**	

It was hypothesised that students would develop a positive attitude and response towards treatment and that they would be motivated to learn and participate in the yoga classes.

Of 71 participants in the yoga group 12 (16.9%) attended from 7 to 10 classes; 36 (50.5%) attended from 11 to 20 classes and 23 (32.5%) attended from 21 to 35 classes.

It was considered that attendance in the yoga classes would be reasonably high due to the intervention location being a school environment where attendance was compulsory and many children were taxied to school. However, attrition and absences from the yoga classes were higher than expected. Researchers kept a daily record for each student of reasons for absences which is presented in Table 8. Also presented are attrition numbers and reasons for attrition.

Table 8: Details of Attrition, Attendance, Lack of Interest, Classes Offered in Yoga Group and Attrition in the Control Group.

School	Yoga Group											Control Group	
	Attrition				Attendances, Absences and Classes Taught								
	Attrition Attended ≤10 Classes	Reason for Withdrawal			Numbers of Students Attending 10 or more Classes	Absences from yoga classes					Classes taught	Attrition	Continuers
		Absent	LOI	Absent and LOI		ST	SE	LOI	S	Total			
A (High School)	2	2	0	0	7	33	36	18	2	89	154	0	0
B (Primary & High School)	1	0	1	0	4	8	11	38	4	61	102	0	2
C (High School)	4	0	0	4	6	48	8	42	11	109	155	2	2
D (High School)	2	2	0	0	6	53	6	5	1	65	168	3	0
E (Primary School)	1	0	1	0	10	11	10	55	3	79	288	0	11
F (Primary & High School)	1	0	0	1	5	18	16	7	12	53	140	1	0
G (Primary School)	1	0	1	0	10	19	19	138	1	177	234	0	1
H (Primary School)	0	0	0	0	5	10	6	18	7	41	150	5	6
I (Primary School)	0	0	0	0	6	30	1	4	2	37	138	0	1
Total	12	4	3	5	59	230	113	325	43	711	1788	11	23
%	16.9	33.33	25	41.66	83.1	32.35	15.89	45.71	6.04	39.76 Absent		32.35	67.65

Note: ST: Sickness or truancy; SE: School events; LOI: Lack of interest; S: Suspension

Mean number of classes taught was 30.73 (SD 6.9) and the mean number of classes attended was 17.8 (SD 7.26). Students were absent for 39.76% (711 days) of offered yoga classes. Absences were due to (i) sickness and truancy (these were combined because it was difficult to distinguish the true cause of absence), 32.35% (230 days), (ii) lack of interest, 45.71% (325 days), (iii) work experience, home school visits or other school programs, 15.89% (113 days), and (iv) suspension from school, 6.04% (43 days). Of the 33 students in the control group, 32.35% (n=10) discontinued due to either leaving the school (n=6) or truancy (n=4) and 67.65% (n=23) remained in the control group.

Attendance rates do not indicate the level of participation of the students in the yoga classes. To monitor participation levels, the yoga teacher ranked all students immediately after each class. These rankings were 1. *Participated all the time*; 2. *Participated most of the time*; 3. *Participated half the time*; 4. *Participated some of the time.* Table 9 details percentage levels for each ranking for students from each school.

Table 9: Yoga Class Participation Level Percentages by School

School	**Participation levels %**			
	All the time	**Most**	**Half**	**Some**
1. (High School)	46.93	32.65	4.08	16.32
2. (Primary & High School)	78.87	7.04	7.04	7.04
3. (High School)	63.47	18.26	7.8	10.43
4. (High School)	93.33	1.14	3.8	0.95
5. (Primary School)	62.77	18.81	3.46	15.58
6. (Primary & High School)	69.51	6.09	9.75	14.63
7. (Primary School)	80.81	16.58	1.55	1.03
8. (Primary School)	61.32	23.58	3.7	11.11
9. (Primary School)	50.00	30.23	6.97	12.79
Total	**67.45**	**17.15**	**5.35**	**9.99**

The average percentage of students who ‘fully participated’ was 67.45%. Percentages varied from school to school with a minimum of 46.93 % to a maximum of 93.33 %. However, when the ‘fully participating’ category was combined with the ‘participated most of the time’ category, the percentage rose to 84.6%.

The outcomes of students’ attendance and participation, partially supports the hypotheses that students would develop a positive attitude and response towards treatment and would be motivated to learn and participate in the yoga classes. However, commitment to the program waned over time for several students and interest levels fluctuated. Additionally non-attendance for reasons other than a lack of interest reduced exposure to treatment.

4.2 Assessment

Not all students were assessed on each measure at pre and post due to (i) lack of response (from parents), (ii) absent at time of assessment, (iii) refusal to be assessed, (iv) the introduction of new measures after commencement of the intervention, (v) delay in gaining approval of one measure, (vi) leaving the school.

Table 10 gives details of the number of students assessed on each measure.

Table 10: Details of the Number of Students Assessed on Each Measure

Measure	**Yoga Group (n=71)**	**Control Group (n=23)**
Conners Teacher Rating Scales –Revised : Long (CTRS-R: L)	64	20
Conners Parent Rating Scales –Revised : Long (CPRS-R: L)	16	10
Test of Everyday Attention for Children (TEA-Ch)	40	19
State-Trait Anxiety Inventory (STAI-Y)	10	
State-Trait Anxiety Inventory for Children (STAIC/T)	29	
Self-Description Questionnaire I (SDQ I)	23	16
Self-Description Questionnaire (SDQ II)	21	
Behaviour Assessment system for Children–Portable Observation Program (BASC-POP) in the Classroom	19	16
Behaviour Assessment system for Children–Portable Observation Program (BASC-POP) in the Yoga Classes	22	
Staff Observations of Students in Yoga Classes	≤71	
Feelings Faces Scale (FFS)	≤35	
Physical, Emotional and Mental States (PEMS)	≤13	
Yoga Survey (YS)	27	
Individual Assessment of Yoga Competence (IAYC)	11	
Summit™ Respiratory Inductive Plethysmography (RIP)	7	3 (not matched for age or gender)

4.3 Results from Psychometric Measures

Group and Subgroup Analyses

Results on outcome measures were assessed in the following way:

1. Pre-test differences between groups.
2. Pre- to post-test differences within groups for the yoga and control groups.
3. Group by time interaction, change over time between groups and post-test differences between groups.

Supplementary subgroup analyses

1. Repeated measures analysis for Time 1 (pre-control) Time 2 (post-control/pre-yoga) Time 3 (post–yoga) for n=12 who acted as their own control. Post hoc analysis was also conducted to determine whether significant outcomes were due to differences between Time 1 and Time 2 or Time 2 and Time 3.

Table 11: Measures: Range and Direction

Measure	Lowest	Highest	Direction of Improvement
CTRS-R : L T-Score	41	90	Low scores
CPRS-R : L T-Score	41	90	Low scores
TEA-Ch Age Scaled Score	1	19	High scores
STAI-Y Raw Score	20	80	Low scores
STAIC/T Raw Score	20	60	Low scores
STAI-Y T-Score	31	88	Low scores
STAIC/T T-Score	20	78	Low scores
SDQ I T-Score	2-6	66-73	High scores
SDQ II T-Score	5	75	High scores
FFS	1	5	High scores
PEMS	1	10	High scores

When examining the data in the following sections on psychometric measures it must be emphasised that these results were collected at the end of the intervention at each school. Due

to poor attendance which in some cases became attrition (see section 3.1) varying periods of time lapsed before data collection. Up to 10 weeks lapsed for students who did less than ten classes. Up to six weeks for students who attended between 11 and 20 classes. In an attempt to account for these delays, subgroup analysis was done for students who attended more than 20 classes and in some cases more than 25 classes but this did not always rectify the delay problem considering that from 23 to 39 classes were taught in the schools (difference explained in section 4.1).

4.3.1 Conners' Teacher Rating Scales -Revised: Long (CTRS-R: L)

It was hypothesised that yoga would improve attention to task, reduce levels of hyperactivity, impulsivity, oppositional behaviour, social problems and anxiety as measured on the CTRS-R L.

CTRS-R L measures several dimensions of behavioural impairment designed for detecting the primary, secondary and comorbidity symptoms of ADHD. Although only 37.17% of participating students were diagnosed with ADHD, 35.89% had comorbid symptoms of ADHD and 17.94% were assessed with MH2 and MH3 (Department of Education and Training Mental Health Status).

As was expected, teachers perceived high levels of impairment for students in both the control and the yoga groups at pre-test. There were no significant differences between the groups at baseline, except for Emotional Lability ($F_{1, 90}$ =8.66, p=0.004), where the control group (mean 83.14; SD 9.41) scored higher than the yoga group (mean 75.76; SD 14.680) (lower scores

represent direction of improvement within 41-90 range). Scores however for both groups were in the 'Markedly Atypical Significant Problem' range.

For the yoga group, over time, the Oppositional subscale indicated significant improvement ($F_{1,63}$ =3.98 p=0.050, Eta^2 =0.015). Mean T-scores at pre-yoga, were 79.25 (SD 12.9) and at post-yoga 76.7 (SD=13.76). However, the scores remained within the Markedly Atypical Significant Problem range. The remaining subscales indicated no significant change. The control group indicated no significant change in any of the subscales. A table of all results for the CTRS-R: L for effect over time is presented in Appendix I. There was no significant change indicated in group by time interaction in any of the subscales between the yoga and control groups. A table of these results is presented in Appendix I. It is to be noted that standard deviations are consistently high for both groups at pre- and post-test.

The outcomes on the CTRS-R: L support the hypotheses that yoga would reduce oppositional behaviour tested although behaviour remained significantly problematic. A null effect was found on attention to task, hyperactivity, impulsivity, social problems and anxiety.

4.3.2 Conners' Parent Rating Scales-Revised: Long (CPRS-R: L)

It was hypothesised that yoga would improve attention to task, reduce levels of hyperactivity, impulsivity, oppositional behaviour, social problems and anxiety as measured on the CPRS-R L.

The CPRS-R: L measures the same behavioural dimensions as the CTRS-R: L except for the Psychosomatic subscale. Of the 78 participant parents, 32 responded at baseline. Fourteen forms were received from the control participant parents and 30 from the yoga participants'

parents. The discrepancy in numbers is due to 12 controls also participating in the yoga program. At post-test 23 parents responded, 11 responses were at post-control and 22 were at post-yoga. These numbers differ from analysed data numbers due to some parents responding at pre-test and not at post-test and visa versa. Table 12 presents the pre- and post-yoga results for the yoga and control groups for participants who had both pre- and post- test data on these scales. When interpreting the scores the higher the T-score the more severe the behaviour.

Table 12: Pre- and Post-Test Means, SD, F and P on the CPRS-R: L

CPRS-R :L Subscales	Yoga Group n=16					Control Group n=10				
	Pre-test Mean (SD).	Post-test Mean (SD).	F	p	Eta^2	Pre-test Mean (SD).	Post-test Mean (SD).	F	p	Eta^2
Oppositional	76.63 (10.56)	80.75 (9.71)	3.20	0.094	0.18	81.90 (8.30)	74.10 (13.22)	7.13	**0.026***	0.44
Cognitive Problems- Inattention	67.56 (9.28)	66.13 (11.02)	0.65	0.43	0.04	66.10 (11.34)	59.80 (11.00)	9.81	**0.012***	0.52
Hyperactivity	77.63 (10.83)	80.44 (11.93)	1.88	0.08	0.08	75.50 (15.62))	67.30 (15..94)	8.88	**0.015***	0.50
Anxious/Shy	59.75 (11.66)	60.50 (10.25)	0.12	0.74	0.01	63.90 (16.42)	55.80 (14..37)	12.18	**0.007***	0.01
Perfectionism	58.56 (12.47)	62.00 (12.91)	2.48	0.14	0.14	63.40 (16.25)	59.00 (15.03)	4.70	**0.06#***	0.34
Psychosomatic	59.44 (15.59)	58.56 (15.55)	0.19	0.67	0.01	71.80 (20.79))	63.40 (20.13)	6.26	**0.034***	0.14
Social Problems	73.63 (16.23)	79.81 (15.64)	3.20	0.09	0.18	63.20 (21.66)	59.50 (19.61))	1.48	0.150	0.41
ADHD Index	69.00 (8.80)	72.44 (8.61)	3.81	**0.070#**	0.07	66.00 (9.69)	62.00 (10.80)	1.94	0.170	0.2
Global Index Restless/Impulsive	73.81 (8.67)	74.31 (12.44)	0.03	0.86	0.002	70.10 (12.99)	66.30 (13.09)	3.53	0.090	0.09
Global Index Emotional Lability	70.50 (10.47)	73.88 (8.89)	3.80	0.07	0.20	73.70 (11.79)	68.60 (14..58)	2.68	0.140	0.23
Global Index Total	74.56 (9.67)	75.75 (11.12)	0.29	0.59	0.02	72.50 (11.44)	68.20 (13.45)	3.83	0.080	0.08
DSM 1V- Inattentive	66.75 (8.93)	70.00 (11..39)	2.10	0.17	0.12	65.70 (12.04)	60.10 (11.82)	8.54	**0.018***	0.48
DSM1V Hyperactive/Impulsive	78.69 (10.12)	81.44 (10..35)	6.15	**0.02***	0.29	77.80 (13.71)	70.40 (15..24)	5.26	**0.048***	0.47
DSM-1V Total	71.56 (11.90)	76.44 (10.42)	4.31	**0.05***	0.05	72.80 (13..50)	65.60 (13..53)	11.06	**0.009***	0.55
DSM-1V Symptoms Inattentive	2.81 (2.31)	3.59 (3.03)	1.60	0.22	0.10	3.40 (3.47)	2.00 (3.09)	7.44	**0.023***	0.08
DSM-1V Symptoms Hyper/Impulsive	3.31 (2.62)	3.88 (2.26)	1.88	0.2	0.11	3.70 (2.59)	2.20 (2.66)	8.34	**0.018***	0.37

Note :.70+ t-score -Markedly Atypical Significant Problem; 66-70 t-score Moderately Atypical Significant Problem; 61-65 t-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

At pre-test, parents of both groups perceived behaviour in the 'Markedly Atypical Significant Problem' range (70+ T-Score) in the primary symptoms of ADHD subscales. These subscales included Hyperactivity, DSM IV Hyperactive/Impulsive, DSM IV Total and Global Restless/Impulsive. Secondary and comorbid symptoms of ADHD were also perceived in the 'Markedly Atypical Significant Problem'. These subscales included Global Emotional Lability, Global Total and Oppositional behaviour. The primary symptoms in the 'Moderately Atypical Significant Problem' range (66-70 T-Score) were DSM IV Inattentive and ADHD Index. Differences between the yoga and control groups were in the secondary symptoms. Perfectionism, Anxious/Shy and particularly the Psychosomatic subscales were rated higher for the control group and Social Problems was rated higher for the yoga group.

Table 12 also presents the effects over time for the yoga and control groups. The higher scores represent more problematic behaviour. The control group over time displayed significant improvements in the primary, secondary and comorbid symptoms of ADHD. The subscales included Hyperactivity, DSM IV Inattentive, DSM IV Hyperactive/Impulsive and DSM IV Total in the primary symptoms. Secondary symptom subscales included Psychosomatic and the comorbid Oppositional subscale. The DSM-IV Symptoms-Inattention subscale and DSM-IV Symptoms-Hyperactive/Impulsive subscale also indicated significant improvement but values below six are regarded as insufficient symptoms for an ADHD diagnosis. For the yoga group, over time, no significant improvements were indicated. However, deterioration was perceived in the primary symptoms subscales of DSM -IV Hyperactive/Impulsive subscale and the DSM IV Total subscale and borderline deterioration occurred in the ADHD Index.

Group comparisons of post intervention mean scores, mean differences, significant change over time and time by group interaction are presented in Table 13.

Table 13: Post-Intervention Difference, Change Over Time And Time by Group Interactions for CPRS-R: L for Yoga and Control Groups

CPRS-R: L Subscales	Post-Yoga Group n=16 Mean (SD)	Post-Control Group n=10 Mean (SD)	Mean Difference 95% CI	p for post intervention differ	p for change over time	p for time x group interaction
Oppositional	80.75 (9.7)	74.10 (13.22)	-5.93	0.18	0.33	**0.004****
Cognitive Problems- Inattention	69.13 (11.02)	59.80 (11.00)	-10.03	0.02	0.12	**0.013***
Hyperactivity	80.44 (11.93)	67.30 (15.94)	-13.8	0.01	0.16	**0.007****
Anxious/Shy	60.50 (10.25)	55.80 (14.37)	-1.50	0.77	0.04	**0.014***
Perfectionism	62.00 (12.91)	59.00 (15.03)	-3.36	0.53	0.77	**0.022***
Psychosomatic	58.56 (15.55)	63.40 (20.13)	-0.65	0.92	0.20	0.430
Social Problems	79.81 (15.64)	59.50 (19.61)	-13.90	0.05	0.67	**0.009****
ADHD Index	72.44 (8.61)	62.00(10.80)	-10.89	0.01	0.86	**0.028***
Global Index Restless/Impulsive	74.31 (12.44)	66.30 (13.09)	-8.94	0.08	0.40	0.279
Global Index Emotional Lability	73.88 (8.89)	68.60 (14.58)	-3.51	0.45	0.60	0.**016***
Global Index Total	75.75 (11.12)	68.20 (13.45)	-7.56	0.11	0.35	0.108
DSM 1V- Inattentive	70.00 (11.39)	60.10 (11.82)	-10.36	0.03	0.47	**0.012***
DSM1V Hyperactive/Impulsive	81.44 (10.35)	70.40 (15.24)	-12.16	0.02	0.80	**0.001****
DSM-1V Total	76.44 (10.42)	65.60 (13.53)	-11.61	0.02	0.50	**0.001****
DSM-1V Symptoms Inattentive	3.81 (3.03)	2.00 (3.09)	-1.99	0.10	0.73	**0.047***
DSM-1V Symptoms Hyper/Impulsive	3.94 (2.26)	2.20 (2.66)	-1.755	0.07	0.27	**0.011***

Note: significance= p>0 .05, borderline significance= p> 0.1

Note 70+ t-score -Markedly Atypical Significant Problem; 66-70 t-score Moderately Atypical Significant Problem; 61-65 t-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

Significant improvement in group by time interaction favouring the control group was indicated in ADHD primary symptoms subscales of Cognitive Problems/Inattentive, ADHD Index, Hyperactivity, DSM-IV-Inattentive, DSM-IV Hyperactive/Impulsive, DSM-IV Total. Secondary symptoms subscales of Perfectionism, Social Problems and Emotional Lability; and comorbid Oppositional and Anxious/Shy behaviours also significantly improved. DSM-IV Symptoms Hyperactive/Impulsive subscale also indicated significant improvement but values below six are not suggestive of an ADHD, DSM-IV diagnosis. No change occurred in the remaining three subscales. As can be seen in Tables 6 and 7, standard deviations are very high for both the yoga and control groups. This indicates a wide variance of response and with small numbers this can skew results.

Reasons for improvements in the control group may have been due to the effect of the behaviour school on behaviour. Control group data was collected prior to yoga data. The children in these groups had been enrolled in a behaviour school from two to eight months at the beginning of the intervention. The initial impact of the behaviour school on their child's behaviour may have been noticed by parents.

These outcomes do not support the hypotheses that parents will perceive improvements in their child's attention to task, hyperactivity, impulsivity, social problems and anxiety as a result of practicing yoga. However, large improvements were seen in the control group which may have been due to the behaviour school's initial effect on student behaviour otherwise this outcome is difficult to explain.

4.3.3 Test of Everyday Attention for Children (TEA-Ch)

It was hypothesised that students would improve attention to task on the three types of attention-focused attention, sustained attention and attentional control tested on the TEA-Ch.

Pre-test subtest scores did not differ by more than three age-scaled points between the control and the yoga group (significance is indicated with differences of at least five age-scaled points, Manly, 1990). The number of students completing pre- and post-test assessment on the TEA-Ch was reduced due to children either refusing to do the test or children not being present on one or more occasions when the psychologist visited the school. Table 14 presents the pre- and post-test results for the yoga and the control groups. When interpreting scores the higher the score the more improved is the attention.

Table 14: Pre- and Post-Test Means, SD, F And P on The TEA-Ch for Yoga and Control Groups

TEA-Ch Subtests	**Yoga Group**						**Control Group**					
		Pre-test	**Post-test**					**Pre-test**	**Post-test**			
	n	**Mean (SD)**	**Mean (SD)**	**F**	**p**	**Eta^2**	**n**	**Mean (SD)**	**Mean (SD)**	**F**	p	Eta2
Focused attention -Sky Search test c	40	8.08 (5.65)	9.92 (3.38)	21.78	0.001*	0.36	18	7.00 (3.05)	8.22 (2.84)	2.90	0.11	1.46
Focused attention -Sky Search test g	40	8.22 (3.71)	9.50 (3.06)	6.19	0.017*	0.14	19	7.17 (3.20)	8.83 (3.30)	5.18	0.036*	0.23
Focused attention - Map Mission test u	38	8.05 (3.32)	9.55 (3.26)	7.72	0.009*	0.17	18	7.06 (3.11)	8.41 (2.76)	5.94	0.027*	0.27
Sustained Attention - Score test h	40	7.62 (3.23)	7.17 (3.47)	0.42	0.52	0.01	18	8.24 (3.38)	6.12 (2.97)	7.02	0.07	0.30
Sustained Divided Attention - Sky Search DT test t	37	6.70 (4.20)	8.19 (3.25)	3.46	0.07#	0.08	15	4.14 (3.98)	7.00 (2.63)	6.25	0.027*	0.32
Sustained Attention - Score DT test x	37	8.02 (3.57)	8.24 (3.55)	0.11	0.74	0.01	17	8.50 (3.95)	7.62 (3.72)	0.84	0.36	0.06
Sustained Attention Response Inhibition -Walk, Don't Walk test y	37	7.54 (4.19)	8.89 (3.38)	4.05	0.52	0.10	17.00	6.81 (3.53)	8.62 (4.11)	6.55	0.022*	0.30
Sustained Attention - Code Transmission test bb	32	6.41 (3.76)	7.91 (3.99)	2.77	0.046*	0.12	15.00	6.43 (3.59)	6.21 (3.91)	0.05	0.83	0.01
Switching Attention - Creature Counting test i	38	9.71 (3.20)	10.34 (2.95)	1.27	0.27	0.03	17.00	8.94 (2.27)	11.69 (2.65)	13.25	0.002*	0.47
Switching Attention - Creature Counting Timing test l	35	7.83 (4.39)	8.31 (3.72)	0.82	0.45	0.02	16.00	7.87 (2.45)	9.20 (3.4)	2.43	0.14	0.15
Switching Attention -Opposite World Same World Total test z	37	7.91 (4.41)	7.95 (3.34)	0.002	0.96	0.01	18.00	7.29 (3.10)	8.00 (3.04	1.26	0.28	0.07
Switching Attention - Opposite World Total test aa	37	7.45 (4.56)	8.13 (3.58)	1.67	0.20	0.04	18.00	7.59 (2.55)	8.65 (3.24)	1.56	0.23	0.09

Note :Significance *p>0.05; Borderline Significance # p>.0.1

For the yoga group, Sky Search and Map Mission (focused attention) and Code Transmission (sustained attention) scores showed significant improvement. Borderline significance was seen on Sky Search DT (sustained divided attention). No change occurred in the remainder of the subtests. The control group improved significantly on the, Sky Search, Sky Map Mission and Search DT (focused attention) and Walk, Don't Walk (sustained attention/response inhibition) and Creature Counting (switching attention). Borderline significant deterioration was seen in Score (sustained attention). No change occurred in the remainder of the subtests.

Significant change for group by time interaction, favouring the control group was demonstrated in Creature Counting (Switching Attention) ($p=0.05$). Mean age-scaled scores at post-test for the control group were 11.58 (SD=2.62) and at post-test for the yoga group of 10.23 (SD=2.89) which is a difference of 1.36. No other significant group by time interaction interactions were indicated. Results are presented in the Appendix I.

It is to be noted that according to Manly (1990), author of the TEA-Ch that a difference of five points or more is required for clinical significance. None of the differences seen in the T-score results in Table 6 or table in Appendix I indicate differences in this range. However repeated measures ANOVA indicated statistical significance.

The hypotheses proposing that yoga would improve attention to task on the TEA-Ch was not substantiated. Although significant improvement in focused attention, sustained attention for yoga students did occur, significant improvements were also seen in focused attention, sustained attention and attention switching in the control group. Therefore, results are inconclusive.

4.3.4 State-Trait Anxiety Inventory - Y (STAI-Y) and State-Trait Anxiety Inventory for Children - Trait (STAIC/T)

It was hypothesised that yoga would reduce the students' anxiety levels as measured on the STAI and STAIC -- Trait.

Anxiety was found to be a common comorbid symptom in the study sample by teacher and parent perceptions on the *Conners Rating Scales*. The STAI and the STAIC were chosen to measure the children's perception of their anxiety levels.

Table 15 presents results for the STAI-Y and STAIC/T. When interpreting results the higher the raw and T-score the higher the anxiety.

Table 15: Pre- and Post-Test Means, SD, F and P on The STAIC/T and STAI-Y in a Subgroup of the Yoga Group

Trait Anxiety Inventory	Pre-test Mean Raw Score (SD)	Pre-test Mean T-score (SD)	Percentile	Post-test Mean Raw Score (SD)	Post-test Mean T-score (SD)	Percentile	F	p	Eta^2
STAI (n=23)	45.74 (9.45)	55.52 (8.80)	69th	46.26 (12.40)	56.04 (11.59)	71st	0.05	0.82	0.002
STAIC (n=10)	32.40 (5.6)	43.00 (8.07)	22nd	31.30 (5.62)	41.10 (9.55)	18th	0.52	0.49	0.05

Table 16 presents STAI-Y and STAIC/T Trait normative raw and T-scores to enable comparisons with the subgroup who completed the STAI-Y and STAIC/T in the study sample.

Table 16: Normative Scores for STAI-Y and STAIC/T

Trait Anxiety Inventory	N	Mean Raw Score (SD)	Mean T-score	Percentile
STAI	202	40.17 (10.53)	50	54th
STAIC	817	36.7 (6.32)	47	41st

Baseline T-scores on the STAIC/T and STAI-Y were collected after completion of control data collection therefore no control data on the STAI-Y or the STAIC/T is available. Mean pre-test T- scores were within the normative range for both the primary school (STAIC) students and the secondary school students (STAI-Y). Although the mean percentile ranking for the yoga group on the STAIC/T (22^{nd} percentile compared with the norm of 47^{th} percentile) is suggestive of a low anxiety level a small difference in T-score translates as a large percentile difference. On the STAI, the mean percentile ranking was at the 69^{th} percentile compared with the normative 50^{th} percentile. This suggests slightly higher anxiety levels than the norm but T-Scores differences were minimal.

Results over time on the STAI-Y and the STAIC/T indicated no clinical change, with scores remaining within the normative range. However, results for the STAI-Y slightly deteriorated from pre- to post-yoga, indicating slightly higher levels of anxiety and higher levels compared with the norm. Results for the STAIC/T slightly improved indicating slightly lower anxiety.

Table 17 presents the mean T-scores on the STAI-Y and STAIC/T, according to diagnostic status.

Table 17: Post-Test Means and SD on the STAI-Y and STAIC/T for Yoga Students by Diagnosis

Diagnostic Status	**STAI-Y**			**STAIC/T**		
	n	**Post-test Mean T-Score**	**SD**	**n**	**Post-test Mean T-Score**	**SD**
No diagnosed behaviours	5	53.20	16.60	1	57.00	
Internalising	2	65.50	2.12	0		.
Externalising	10	58.20	6.16	6	43.83	3.82
Internalising and Externalising	3	50.67	13.28	3	33.33	10.10
Aspergers	3	52.67	19.55	1	35.00	.
Total	23	56.04	11.59	11	41.36	9.10

STAI-Y results indicate that adolescents with internalizing behaviour problems scored expectedly higher than the other diagnostic groupings and exceeded the norm by one and a half standard deviations. On the STAIC/T, six children with externalising disorders and one child without a diagnosis had higher anxiety than levels than the children with combined internalising and externalising problems and the child with Aspergers. However, numbers were small in all groupings and caution needs to be exercised in drawing conclusions.

The hypothesis that student's anxiety levels as measured on the STAI-Y and the STAIC/T would be reduced was not supported. However pre- and post-test test levels of anxiety remained within the normal range.

4.3.5 Self Description Questionnaire I and II (SDQI & II)

It was hypothesised that the students' self concept levels would improve as measured on the SDQ I and SDQ II although measuring self–concept in this population is claimed to be difficult measure using self-reports (Barber et al., 2005; B. Hoza et al., 2004; B. Hoza et al., 2002). However, because children with disruptive behaviour are claimed to have low self-concept (G. Fabiano et al., 2001; Harada, 2002; Marsh, 1990b, 1990c) researchers considered that yoga may have some influence.

At baseline the yoga and control groups T-scores did not significantly differ on the SDQ I (primary school students). At post-test neither group showed significant change over time. Most scores for the yoga and control groups were in the 40s and low 50s range which is within the norm. Scores below 30 are indicative of low self-concept. No scores were in this range however Parent Relations remained in the mid 30s in the yoga group. Because no change over time occurred with either control or yoga groups on the SDQI, no group by time analysis was necessary. For the subgroup of students who acted as their own controls no significant changes were detected over time. A table of the pre- and post-test T-Scores are presented in Appendix I.

No secondary school students that were in the control group completed the SDQ II. Pre-test T-scores for the yoga group were in the in the 40s and low 50s range which is within the normative range. Post-test T-scores were found to increase indicating a move in a positive direction but were not significant A table of the pre- and post-test T-Scores are presented in Appendix I. It is also to be noted that standard deviations were high for both the SDQ I and SDQ II results.

The hypothesis that student's self-concept as measured on the SDQ I and II would improve was found for the secondary students but was not significant but was not supported for the primary school students. However, pre- and post-test test levels of self-concept remained within the normal range.

4.3.6 Subgroup Analyses

Subgroup analysis was conducted after most outcomes on the standardised measures failed to reach significance. It was considered that 1.larger doses of treatment; 2.a more powerful comparison of results for children who acted as their own controls; and 3. very high levels of commitment and interest on behalf of teachers and students at one school, may produce greater support for the hypotheses.

On the CTRS-R: L, in the subgroup (n=14) who acted as their own controls, repeated measures ANOVA indicated significant improvement in the Oppositional subscale ($F_{1,13}$ =3.45, p=0.047). This mirrored the effect for the total yoga group but the subgroups results were more significant. The mean pre-control T-score was 74.86 (SD 12.89), the mean post-control/pre-yoga T-score was 75.21 (SD 11.42) and mean post-yoga T-score was 69.36 (SD 9.71). Follow-up tests showed a significant improvement between time 2 (post-control/pre-yoga) and time 3 (post–yoga) ($F_{1,13}$=6.13, p=0.028). Mean T-scores for the Oppositional Subscale indicated a movement from the 'Markedly Atypical Significant Problem' range after the control condition to the 'Moderately Atypical Significant Problem' range after the yoga condition. Some other measures showed significant improvement over time (i.e. lower scores) on the repeated measures ANOVA, but follow-up tests revealed these changes occurred only

during the control phase. In the interests of clarity these are presented in Appendix I rather than here. On the CPRS-R: L, in the subgroup (n=4) who acted as their own controls, repeated measures ANOVA indicated significant improvement in one subscale – Global Restless /Impulsive ($F_{1, 3}$ =10.1, p=0.012). This contrasts the total yoga groups result on this subscale that remained in the 'Markedly Atypical Significant Problem' range (70+). The mean pre-yoga T-score was 74.25 (SD14.15), the mean post-control/pre-yoga T-score was 71.00 (SD14.72) and the mean post-yoga T-Score was 64.25, (SD 11.76). Follow-up tests showed a significant improvement between time 2 (pre-yoga) and time 3 (post–yoga) ($F_{1, 3}$ =9.63, p=0.053). Some other measures showed significant change over time on the repeated measures ANOVA, but follow-up tests revealed these changes occurred only during the control phase. These are presented in Appendix I.

On the TEA-Ch, in the subgroup (n=10-12) who acted as their own controls, repeated measures ANOVA indicated significant improvement in one subtest of focused attention--Sky Search ($F_{1,10}$=7.67, p=0.003). The mean pre-yoga T-score was 7.33 (3.28), the mean post-control/pre-yoga T-score was 9.08 (SD 2.5), and the mean post yoga T-score was 10.33 (SD 2.10). Follow-up tests showed a significant improvement between time 2 (pre-yoga) and time 3 (post–yoga) ($F_{1,10}$=6.02, p=0.032). Significant improvement was also seen in a subtest of Switching Attention -- Opposite World Same World Total ($F_{1,10}$ =8.12, p=0.002). The mean pre-control T-score was 8.08 (2.02), the mean post-control/pre-yoga T-score was 8.75 (SD 2.1), and the mean post-yoga T-score was 10.92 (SD1.78). Follow-up tests showed a significant improvement between time 2 (pre-yoga) and time 3 (post–yoga) ($F_{1,10}$ =6.09, p=0.032). Several other subtests showed significant change over time on the repeated measures ANOVA, but follow-up tests revealed these changes occurred only during the control phase. In the interests of clarity these are presented in Appendix I rather than here.

These outcomes do not support the hypothesis anymore than the total groups' results where significant improvement were seen in both the yoga and controls results over time but not in group by time interaction (except for one test out of eleven, p=.05).

Dose (yoga classes) was considered to have a positive correlation with efficacy. Additionally the time delays between student's last yoga class and the collection of data jeopardised effect therefore sub-analysis was conducted for students who attended ≥20 yoga classes (n=23) and ≥25 (n=13) classes. In the subgroup of students who attended ≥20 yoga classes on CTRS-R: L, significant improvement from pre- to post-test, was seen in the Oppositional subscale ($F_{1,21}$ =5.24, p=0.029). The mean pre-yoga T-score was 73.57 (SD13.52) and mean post-yoga T-score was 68.57 (SD=15.24). This improvement indicates a movement from the Markedly Atypical Significant Problem range to the Moderately Atypical Significant Problem range. In the subgroup of students who attended ≥25 yoga classes on CTRS-R: L, significant improvement from pre- to post-test, was not seen in any subscales however on the Oppositional subscale, the mean pre-yoga T-score was 72.23 (SD 14.19) and mean post-yoga T-score was 68.69 (SD=16.66) but this was not significant ($F_{1,11}$ =1.79, p=0.206). This improvement also indicates a movement from the Markedly Atypical Significant Problem range to the Moderately Atypical Significant Problem range. Results for the remaining subscales are presented in Appendix I. In the subgroup of students who attended ≥20 yoga classes, on the TEA-Ch, significant improvement from pre- to post-test, was in the focused attention subtest of Sky Search ($F_{1,15}$ =7.33, p=0.016). The mean pre-yoga T-score was 8.52 (SD=3.5) and the mean post-yoga T-score was 10 (SD=3.62). Borderline significant improvement from pre- to post-test, was seen in the sustained/divided attention subtest of Sky Search DT ($F_{1,15}$ =3.75, p=0.072). The mean pre-yoga T-score was 5.87 (SD=3.63) and the mean post-yoga T-score was 7.87 (SD=2.3). Outcomes on the remainder of the subtests,

which are presented in Appendix I indicated no change. These results indicate that an increased dose contributed to achieving better outcomes in attention to task and reduced oppositional behaviour to a greater degree than found in the total group.

One school demonstrated a high rate of interest from teachers and students and high attendance rates in the yoga classes and all enrolled students participated. For these reasons a subgroup analysis was run for this school. Borderline significant improvement was demonstrated on the CTRS-R: L subscales of Anxious/Shy ($F_{1,5}$ =4.9, p=0.069). The mean pre-yoga mean T-score was 60.57 (SD=12.2) and the mean post-yoga T-score was 48.43, (SD4.72). DSM-IV Inattention subscale also indicated borderline significant improvement ($F_{1,5}$ =4.69, p=0.073). The mean pre-yoga mean T-score was 62.14 (SD 16.1) and the mean post-yoga T-score was 56.71, (SD 15.89). These results contributed to the hypotheses that yoga would improve outcomes if motivation was stimulated.

4.4 Behaviour Observations

4.4.1 Behaviour observations using Behaviour Assessment System for Children - Portable Observation Program (BASC-POP)

It was hypothesised that observations of classroom and yoga class ADHD behaviours of inattention, hyperactivity, impulsivity and oppositional behaviour would improve over time and in comparison to controls. It was also hypothesised that on–task behaviours in the yoga classes would be high.

Behaviour observations using the BASC-POP were considered a valuable addition to the measures used because specific behaviours could be customised to suit the predicted problematic behaviours of the sample.

Table 18 presents t-test results for the control and yoga groups at pre– and post-test on the BASC-POP.

Table 18 Group Interaction (Pre-Test) and Group by Time Interaction (Post-Test) Means, SD, F and P on the BASC-POP in the Classroom for the Yoga and Control Groups

BASC-POP Behaviours	**Group**	**Pre-test**					**Post-test**				
		N	**Mean**	**SD**	**F**	**p**	**N**	**Mean**	**SD**	**F**	**p**
ADHD											
Inattentive Total	Control	15	5.46	5.301	.088	0.77	16	3.75	3.9	.091	0.76
	Yoga	21	5.57	5.767			20	5.45	4.7		
Hyperactive Total	Control	15	14.62	14.235	2.34	0.13	16	8.75	6.5	2.93	0.10#
	Yoga	21	10.14	7.445			20	7.00	4.1		
Impulsive Total	Control	15	5.65	6.299	2.18	0.14	16	4.94	5.2	1.44	0.23
	Yoga	21	5.76	4.110			20	3.25	3.4		
ADHD Total	Control	15	22.07	16.425	1.26	0.27	16	17.50	11.5	4.66	0.50
	Yoga	21	21.76	13.168			20	15.90	9.7		
ODD											
ODD Behaviours Total	Control	15	3.31	4.823	.82	0.37	16	2.81	4.6	9.64	0.004*
	Yoga	21	2.00	4.012			20	1.05	2.1		

Note: 1.Significance= p>0 .05, Borderline Significance= p> 0.1

2. ADHD: Attention Deficit Hyperactivity Disorder; ODD: Oppositional defiant Disorder.

Classroom behaviours observed on the BASC-POP did not differ significantly at pre-test for the yoga or control groups. Significant group by time interaction reductions favouring the yoga group were found for ODD behaviours and there was a trend for a reduction in Total Hyperactive behaviours.

Table 19 presents *p*re- and post-test means, SD, F and p values on the BASC-POP in the classroom for the yoga group

Table 19: Pre- and Post-Test Means, SD, F and P on The BASC-POP in the Classroom for the Yoga Group

	Yoga Group n=19						
BASC-POP Observations	**Pre Test**		**Post Test**		**F**	**p**	**Eta^2**
	Mean	**SD**	**Mean**	**SD**			
ADHD							
Inattentive Total	6.00	5.9	5.26	5.0	0.1	0.66	0.01
Hyperactive Total	10.8	7.4	7.47	4.2	3.2	**.089#**	0.15
Impulsive Total	6.00	4.2	3.32	3.4	6.3	**.022***	0.26
Total ADHD Behaviour	22.8	13.2	16.05	9.6	3.2	**.079#**	0.16
ODD							
Total ODD Behaviour	2.11	4.2	1.11	2.19	1.17	0.29	0.06

Note: * significant =p<.05 # borderline significant= p>.100

For the yoga group, significant improvements were noted over time in BASC-POP classroom observations in Total Impulsive behaviours and borderline significance in Total ADHD and Total Hyperactive behaviours (see Table 19). For the control group no significant changes occurred in any of the observed behaviours over time (see Table 20).

Table 20: Pre- and Post-Test Means, SD, F and P Values on the BASC-POP in the Classroom for the Control Group.

	Control Group						
BASC-POP Observations	**Pre-test**		**Post-test**		**F**	**p**	**Eta^2**
	Mean	**SD**	**Mean**	**SD**			
ADHD							
Inattentive Total	6.	6.07	3.75	3.9	1.95	0.18	0.11
Hyperactive Total	10.13	6.26	8.38	6.85	0.56	0.72	0.13
Impulsive Total	5.69	5.18	4.94	5.21	0.65	0.96.	0.00
Total ADHD Behaviour	22.07	16.42	18.8	10.84	0.60	0.45	0.60
ODD							
Total ODD Behaviour	3.63	5.56	2.81	4.66	0.13	0.72	0.009

Observing behaviours in the yoga classes was considered important for detecting the levels of ADHD and ODD behaviour problems and for comparisons with classroom behaviours. The same set of behaviour criteria was used. Table 21 presents results for student behaviour in the yoga classes on the BASC-POP.

Table 21 : Pre- and Post-Test Means, SD, F and P Values on the BASC-POP in the Yoga Class.

BASC-POP Behaviour Observations n=22	**Pre-test**		**Post-test**		**F**	**p**	**Eta^2**
	Mean	**SD**	**Mean**	**SD**			
ADHD							
Inattentive Total	3.23	3.08	2.36	4.46	0.61	0.445	0.03
Hyperactive Total	2.45	0.34	1.14	0.25	2.76	0.111	0.12
Impulsive Total	1.73	2.77	0.86	1.46	3.89	**0.062#**	0.16
Total ADHD Behaviour	7.5	7.07	4.64	6.31	2.147	0.158	0.09
ODD							
Total ODD Behaviour	0.32	0.78	0.5	0.15	0.28	0.605	0.13

Note: #p>0.10 borderline significance

Borderline significant improvement was seen in Total Impulsive behaviours from the beginning to the end of the program with all other behaviours showing non–significant improvements.

Table 22 presents pre- and post-results for the yoga students on the BASC-POP in the classroom and the yoga class. This comparison was made to detect the behavioural differences between environments both at pre-test and post-test for the yoga groups. It was hypothesised that yoga would improve on-task behaviour and it was expected that classroom behaviour would also improve as a result of yoga treatment but not to the same degree due to transference complexities. These include the inexperience of students to apply yogic skills

outside the yoga environment and the lack of support in promoting yogic skills from teachers and parents without yoga experience.

Table 22: Pre- and Post-Test Means, SD, F and P on the BASC-POP in the Classroom and the Yoga Class (Second And Last Class) for the Yoga Students

BASC-POP Observations	Pre-test n=13						Post-test n=11					
	Yoga		Classroom		F	p	Yoga		Classroom		F	p
	Mean	SD	Mean	SD			Mean	SD	Mean	SD		
ADHD												
Inattentive Total	4.17	2.65	5.0	5.79	0.325	0.58	1.8	3.22	5.1	4.7	6.44	0.032*
Hyperactive Total	3.08	2.84	10.33	8.66	11.83	.006**	1.8	3.42	8.3	4.81	23.4	0.001**
Impulsive Total	1..92	3.12	5.85	4.18	12.32	.004**	1.27	1.79	3.27	3..52	2.06	0.182
Total ADHD Behaviour	9..58	6.15	21.5	13.15	15.4	.002**	4..5	6..38	16.8	10.35	15.4	0.002**
ODD												
Total ODD Behaviour	0.85	1..34	1.62	3.01	0.598	.454	1.27	2.68	1.27	2.7	1.34	0.274

Note:* significant p> .05 ** highly significant-p> .005

The comparison between yoga class behaviour at the beginning and towards the end of the yoga program with classroom behaviour pre and post the yoga program indicated some significant differences. Reductions favouring the yoga class students' behaviours are indicated in Total Inattentive behaviours at pre-test, in Total Hyperactive behaviours at pre-test and post-test, in Total Impulsive behaviours at pre-test and in Total ADHD behaviours at pre-test and post-test. ADHD and ODD behaviours in yoga classes were overall less evident than pre-yoga ADHD and ODD behaviours in the classroom.

The hypotheses that classroom behaviours would improve over time and in comparison to controls, as measured on the BASC-POP was demonstrated. The hypotheses that students would be more attentive, less hyperactive, impulsive and oppositional and more on-task than off-task in the yoga class was also demonstrated on the BASC-POP.

On- and off-task behaviours were also observed in the yoga classes. On- task behaviour was recorded by raters in the absence of off-task behaviours. Off-task behaviours were identified as ADHD and ODD behaviours but no distinction was made between them as in the previously reported BASC-POP results. This was an easier to conduct observation and potentially furnished greater accuracy. Table 23 presents the on- and off-task behaviour percentages on the BASC-POP at the beginning, middle and end of yoga classes for students who were videoed .

Table 23: Percentage of On-Task Behaviour During Yoga Classes on the BASC-POP

	% On-Task Yoga Class Behaviour		
Student	**Beg. Yoga Intervention**	**Mid Yoga Intervention**	**End Yoga Intervention**
1	90	100	98
2	100	N/A	N/A
3	86	N/A	N/A
4	98	N/A	100
5	93	62	N/A
6	98	93	N/A
7	96	N/A	100
8	N/A	84	N/A
9	55	61	N/A
10	98	60	90
11	N/A	60	N/A
12	95	76	100
13	98	N/A	N/A
14	N/A	97	95
15	92	72	95
16	68	82	91
17	72	N/A	86
18	87	N/A	N/A
19	97	N/A	95
20	100	N/A	91
21	33	N/A	N/A
22	95	N/A	100
23	55	N/A	N/A
24	100	N/A	N/A
25	100	N/A	N/A
26	N/A	82	N/A
27	N/A	75	N/A
28	100	N/A	100
29	100	N/A	N/A
30	100	N/A	N/A
31	51	N/A	N/A
32	100	N/A	N/A
33	74	N/A	N/A
Total Mean %	86.82	77.23	95.46
SD	18.48	14.06	4.73

Note: N/A indicate that the student was not present on the day the yoga class was videoed.

Mean on-task behaviour, on the BASC-POP in the yoga classes at the beginning of the yoga classes (n=27) is high at 86.82% with, decreases to 77.32 % in the middle of the intervention (n=12) and increases to 95.46% at the end of the intervention (n=13). Standard deviations from the yoga classes decrease considerably over time.

This high percentage of on-task behaviours supports the hypothesis that yoga will improve the student's ability to attend to task, reduce hyperactivity, impulsivity and oppositional behaviour. On–task behaviour also supports the hypothesis that yoga will improve self-regulation, motivation and attitude towards treatment.

4.4.1.1 Subgroup Analysis for BASC-POP

Subgroup analysis of eight students who acted as their own controls was seen as a more sensitive indicator of the effect of yoga on behaviour. Total ADHD behaviours were compared from five assessment times (1.Pre-Control 2.Pre-Yoga 3.Yoga beginning 4.Yoga End 5.Post-Yoga). Significant changes favouring the yoga group's behaviour at the end of the intervention were seen when compared with all other phases. The reason why all times are compared with Time 4 is that this was deemed the time when students had received the maximum amount of treatment and in the environment in which they were given the treatment, therefore, the maximum effect was expected. Table 24 and Table 25 present the means, standard deviations and tests of within subject contrasts for this subgroup.

Table 24: Mean and SD on the BASC-POP for ADHD Behaviours at Pre-Control/Pre-Yoga/Begin Yoga/End Yoga/Post-Yoga

Time	**Mean**	**SD**
Time 1 Pre-Control Classroom	28.38	18.02
Time 2 Post-Control Pre-Yoga Classroom	22.00	9.83
Time 3 Yoga class Beginning	10.38	7.23
Time 4 Yoga Class End	3.88	7.18
Time 5 Classroom Post-Yoga	16.75	7.94

Table 25: Tests of Within-Subjects Contracts Using the BASC-POP

Source		**F**	**p**	**Eta^2**
Time	Time 1 vs Time 4	21.36	0.001	0.75
	Time 2 vs Time 4	18.24	0.001	0.72
	Time 3 vs Time 4	4.68	0.070	0.40
	Time 5 vs Time 4	41.65	0.001	0.86

Results of this supplementary analysis further supports the hypothesis that yoga class behaviour would be more attentive, less hyperactive, impulsive and oppositional and more on-task than off-task over time and in comparison with classroom behaviour.

4.4.2 Inter-rater Reliability

One rater that was used to calculate inter-rater reliability in the yoga classes, also did some of the classroom ratings. No figures are available for the reliability made in the classroom observations. Reliability of these ratings is inferred from the figures of the inter-rated yoga classes.

A table of ratings for three raters was complied to check for inter-rater reliability of the yoga classes (see Appendix G). The table indicates that the rating s of on-task behaviours were within 10% agreement for the majority of the 12 ratings. The averages for each rater of the 12 children's ratings indicated a maximum of 3% difference. These results indicate close agreement and strong inter-rater reliability. The more complex observations involving observing ADHD and ODD behaviours for seven children were not as close in agreement when comparing ratings for each child (largest difference is 11 counts and the smallest is 1) however the averages for each rater are within 1 count which indicates strong inter-rater reliability.

4.4.3 Teacher and Teacher's Aide (Staff) Observation Notes in Yoga Classes

It was hypothesised that teachers would observe 1.attention to, task, 2.positive mood and self-state, 3.increased awareness and self -regulation, 4.a positive attitude towards and response to yoga, 4.competence in learning yoga techniques, 5.motivation to learn and participate in yoga classes

Daily observations provided data on the children's motivation, self–regulation, competence in accessing treatment, attitude towards and response to treatment and an ability to relax which were hypothesised to developed in yoga classes.

Daily observations of all yoga classes were recorded by school staff in the form of written notes. Notes followed the class sequence and were written on individual students and class groups. A total of one hundred and fifty pages of notes were entered into a word processor for qualitative analysis. Table 26 presents an example of how the observation notes were coded, enabling identification of behaviours in each component of the yoga session. Observations were examined for on-task and off-task behaviours as described in the Section 3.6.3.2. Data was utilized in two ways which examples of are presented in Table 20 and Table 21. Table 20 is an example of how on and off descriptors were extracted and tabled into on- and off-task behaviours and numerically calculated. Table 21 is an example of how on- and of-task phases were extracted from the observation notes of 15 students and numerically calculated.

Table 26: Example of an Observation Grid Completed by School Staff

16/8/5	Participant 1	Participant 2	Participant 3
Introduction	Playing with mat: ‘What does yoga mean?’	Attentive and calm, centred and interested.	Playing with mat, follows another student’s behaviour, not looking at teacher: ‘Can we go now?’
About the program	Lying on stomach and fidgeting.		Anxious to know when it finishes, copying another student.
Relaxation	Making noise with hands on floor, kept on task.	Hands on his chest, kept on task.	
Deep breathing	Exited: ‘Can I do the bridge?’ Not on task, hand crossed over his chest, needs to be prompted.	‘Don’t touch me!’	Cooperative, on task.
Warming up joints	Lying down when doing exercises, can’t do it on his right leg (pins).	On task, very focused and calm.	‘It’s 10 o’clock.’ On task, but easily distracted.
Warming up spine	‘Can’t do the wheel’ on task.	‘Don’t feel comfortable in the bridge.’ Not doing exercise but OK about it, did rock n roll.	
Standing poses	Not so much on task, playing up: ‘It’s boring.’	Interested, on task.	‘It feel weird’ when still.
Deep breathing	On task.	On task.	Cooperative, showing his stomach.
Relaxation	Good.	Good.	Good: ‘Can we do the mat?’

Table 27 presents on-and off-task behaviour descriptors for the total yoga group taken from the staff notes recorded from daily observations of the yoga classes.

Table 27: Total On- and Off-Task Teacher Comments From All Yoga Classes (n= 419)

On–Task Behaviours		**Off-Task Behaviours**	
Section 1 – Compliance		**Section 1 –Non-Compliance**	
Participating/engaged	346	Not participating	76
Joined in	136	Not joining in	1
Interested/eager	43	Not interested	7
Following directions	205	Not following directions	19
Tired, willing, compliant, cooperative, working	282	Not compliant, reacting, refusing, resistant, unwilling, uncooperative	80
Involved	46	Not involved	3
Listening	65	Not listening	16
Attentive	31	Didn't want to	21
Concentrating/serious	54	Not concentrating	5
Did posture	385	Did not do posture	20
On task	173	Off-task	15
Sub-total	1593	Sub-total	242
% of total on-task behaviours	41.03%	% of total off-task behaviours	26.59%
Section 2–Mood		Section 2- Hyperactive/Impulsive/Inattentive	
Quiet	131	Talkative	58
Calm	40	Fidgety/hyperactive	51
Relaxed	111	Distracted	77
Settled	144	Unsettled/restless	158
Silent	31	Calling out/interrupting	23
		Playing	20
		Silly	226
		Not relaxing	11
Sub-total	426	Sub-total	624
% of total on-task behaviours	10.97%	% of total off-task behaviours	68.57%%
Section 3 – Satisfaction		Section 3 Aggressive Behaviours	
Confident	1	Aggressive	4
Successful	7	Teasing	4
Excellent	44	Angry	9

Good	605	Threatening	9
Did well	499		
Did very well	60		
Very good	26		
Effort	11		
Sub-total	1659	Sub-total	26
% of total on-task behaviours	42.73%	% of total off-task behaviours	2.85%
TOTAL and percentage of all on- and off-task behaviours	3882 (81.01%)		910 19.99%)

Mean on-task behaviours were 80.01% of all recorded behaviours. Compliant behaviour (41.03%) and satisfaction (42.73%) were the most represented in on-tasks behaviours. Hyperactive /Impulsive/Inattentive behaviours (43.87%) were the most represented behaviours in the off-task behaviours.

Table 28 presents details and results for the randomly selected subgroup of 15 students. Two students from eight of the nine participating schools were randomly selected. The notes from one school were written by the yoga teacher after the yoga class. These notes were not included in the analysed observations due to possible bias and because they were not taken during the class. Randomisation was conducted using a numerical allocation for each student from each school. The first two numbers chosen from each school determined the students selected for analysis. This group had a mean age 11.53 years, attended a mean of 22.87 yoga classes, were enrolled at a behaviour school for a mean 10.07 months and were diagnosed with behaviour disorders, anxiety disorders, learning disorders or Aspergers or were assessed with MH2 or MH3. A table divided into on- and off-task behaviours was created for each student (see Appendix H).

Table 28: Details on 16 Randomly Selected Students and On- and Off-Task Comments During Duration of Yoga Program

Student	Age	Months enrolled at school	Behaviour problems	Classes attended	On-task comments	Off-task comments	Proportion of + to -
1	9	18	MH3	22	45	2	23/1
2	10	11	MH2	25	76	32	2.25/1
3	11	5	ODD	33	79	14	5.64/1
4	11	6	ADHD, D, A,AD	29	48	17	2.82/1
5	10	6	ODD, ED	16	81	41	2/1
6	15	15	Aspergers, OCD	23	111	82	1.35/1
7	13	9	OCD, Aspergers	17	74	63	1.17/1
8	14	2	MH3	18	80	44	1.82/1
9	13	7	CD, LD, La D	18	192	27	7.11/1
10	13	3	ADHD, ODD, Aspergers	33	158	31	5.10/1
11	14	3	ADHD, ODD, CD	22	56	22	2.55/1
12	10	12	MH2	18	122	19	6.37/1
13	9	13	CD, MH3	30	47	30	1.57/1
14	11	24	ODD, A MH3	23	62	40	1.55/1
15	10	17	ODD	16	71	44	1.61/1
16	10	13	MH3	22	45	2	22.5/1
Mean (SD)	11.43 (1.93)	10.25 (6.24)		22.81 (5.77)	84.19 (42.28)	31.87 (42.16)	5.52/1 (6.99)
%					73.9%	36.41%	

Note: CD – Conduct Disorder; OCD – Obsessive Compulsive Disorder; LD – Learning Disorder; La D – Language Disorder; ADHD – Attention Deficit Hyperactivity Disorder; ODD – Oppositional Defiant Disorder; MH 2 Mental Health – Externalising; MH3 Mental Health – Externalising & Internalising; D – Depression; A – Anxiety; SD – Separation Disorder

This observational tool provided extensive, detailed information about each student's yoga class behaviour. The proportion of on- to off- task behaviours varied considerably with the highest being 23/1 and the lowest 1.7/1 with an average of 5.52/1 (6.99). This is another

indicator of the variance of response. Total on-task behavioural comments were 73.59% of total behaviours observed. The diagnostic status of these students was also representatively varied. No results can be correlated with diagnosis.

The hypotheses that teachers would observe 1.attention to task, 2.positive mood and self-state, 3.increased awareness and self -regulation, 4.a positive attitude towards and response to yoga, 4.competence in learning yoga techniques, 5.motivation to learn and participate in yoga classes, 6. develop an ability to relax was supported through the great variety and proportion of positive descriptors used by school staff in the 150 pages of on- and off-task observational notes of all students in all yoga classes and in the observed behaviours of the randomly selected students.

4.5 Self Reports

4.5.1 Feelings Faces Scale (FFS) (Jensen, 2004)

It was hypothesised that the yoga students would experience 1.an improved mood and self-state, 2.a positive response to treatment, and 3.competence in performing yoga techniques as reported weekly on the FFS.

Participants ($n \leq 35$) completed the *Feelings Faces Scale* after the last yoga class for the week. The FFS was easy to understand and quick to complete. From the yoga teacher's perception, children considered their responses. The number of respondents differed each week due to absenteeism, attrition, involvement in other school activities and a lack of willingness to participate in the yoga program on the day. Although pre- and post-responses would have provided a comparison from the beginning of the class to the end of the class, asking the students to do two written assessments within the course of 20-30 minutes may have jeopardised authentic responses due to assessment overload. Figure 3 displays an

example of a completed *Feelings Faces Scale* with scores for responses to each subscale included.

The following figure highlights the positive attitude participants reported immediately after the bi weekly yoga classes. Data was collected each week (see Appendix I) but for the sake of clarity bi- weekly data is presented in a chart. The higher the score the more positive the response.

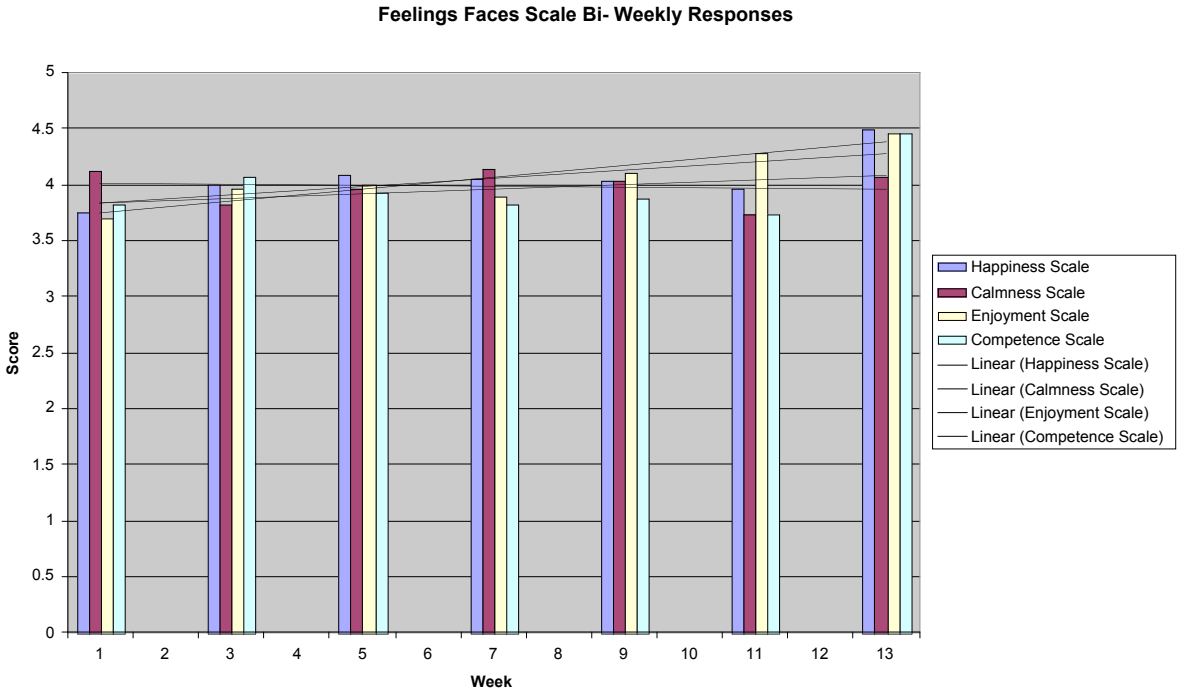


Figure 2: Feeling Faces Scale subscale results

The mean score, over the duration of the yoga program for the Happiness subscale was 4.07 (SD=1.03); for the Calmness subscale 4.04 (SD= .09); for the Enjoyment subscale 4.09 (SD=0.21); and for the Competence subscale 4.04 (SD= 1.05). The trend-lines indicate gradually improvement over time however, from the first week students were reporting positive moods and competence after doing yoga.

The hypothesis that students would experience more positive moods, a positive attitude towards and response to yoga and competence in performing the yoga techniques is supported by the findings on the *Feeling Faces Scale*.

HOW ARE YOU FEELING?_____(Please write your name). DATE:_____					
Please draw a CIRCLE around ONE face from EACH row that best describes how you are feeling. IN ROW 4 you can draw and name any other feelings you are having. IN ROW 5 read and tick the one that best describes you.					
Score	Happiness Scale				
5	 Very Happy ✓	 Happy	 Nothing	 Sad	 Very Sad
	Calmness Scale				
4	 Very Calm	 Calm ✓	 Nothing	 Angry	 Very Angry
	Enjoyment Scale				
1	 I very much enjoy doing yoga	 I enjoy doing yoga	 Nothing	 I feel shy doing yoga	 I feel very shy doing yoga ✓
					
	Competence Scale				
2	I can do all of the postures.	I can do most of the postures.	I can do some of the postures.	I can do a few of the postures.	I can do none of the postures.

Figure 3: Example of completed Feelings Faces Scale and scored responses

4.5.2 Physical, Emotional and Mental State (PEMS)

The hypothesis predicted that yoga would have a positive effect on self-state and awareness of body, emotions and thoughts and actions as measured on the PEMS. Higher ratings for physical state, indicated the students were feeling more energetic and strong. Higher ratings for emotional state indicated the students were feeling happy and without worries. Higher ratings for mental state indicated the students were thinking clearly and feeling mentally alert. The rating system of 'one' being the lowest rating and 'ten' being the highest was explained with regular reminders. Each child was willing to verbally rate himself on each of the PEM states immediately prior to and immediately after the yoga session and there were occasions where the students volunteered the information before being asked..

The following Table 29, Table 30, and Table 31 indicate the means, SD, F and p and Eta^2 for the Physical, Emotional, and Mental States of the PEMS, pre- and post-yoga sessions for up to 13 students. The 13 students attended the last two schools in the study. The ratings exceeding ten are from students who voluntarily rated themselves 'off' the scale. Analysis included higher than ten ratings to reflect the children's changes from pre- to post-responses.

Table 29 presents ratings on the Physical State component of the PEMS for up to 13 students over 15 yoga sessions.

Table 29 :Pre- and Post-Test Means, SD, F and P Values on the Physical State of The PEMS for a Subgroup of the Yoga Group

Physical State		Yoga Group						
		Pre-test		Post-test				
	n	Mean	SD	Mean	SD	F	p	Eta^2
Session 1	13	6.27	2.91	8.69	1.84	7.72	0.019*	0.38
Session 2	13	6.62	2.47	8.92	1.32	11.41	0.005*	0.49
Session 3	12	6.67	2.35	9.50	1.00	19.03	0.001*	0.63
Session 4	12	6.26	2.80	9.00	2.49	10.16	0.009*	0.48
Session 5	10	5	2.89	8.30	1.95	7.65	0.022*	0.46
Session 6	9	5.33	2.06	7.33	2.78	4.64	0.063#	0.37
Session 7	8	3.75	3.73	8.88	1.89	16.93	0.004*	0.71
Session 8	8	5.63	3.93	8.38	3.16	7.63	0.028*	0.52
Session 9	7	6	1.53	9.00	1.83	17.18	0.006*	0.74
Session10	6	5.67	4.41	9.00	2.45	5.61	0.064#	0.53
Session11	5	7.8	2.59	11.00	2.24	8.25	0.045*	0.67
Session12	5	6.2	3.56	11.00	3.24	6.74	0.060#	0.63
Session 13	5	3.6	3.91	14.60	8.08	15.31	0.017*	0.79
Session 14	3	5.25	4.11	11.75	5.5	13.7	0.030*	0.82
Session 15	3	10	0	13.33	5.77	1.00	0.423	0.82

Note: Significance= p>0 .05, Borderline significance= p> 0.1

For the Physical State (Table 29), significant improvement was seen in eleven out of fifteen sessions and borderline improvement in three. The last session where no significance was indicated had high pre-session scores The number of respondents gradually decreased overtime but the significant improvements from pre –to post session and over time continued.

Table 30 presents ratings on the Emotional State component of the PEMS for up to 13 students over 15 yoga sessions.

Table 30: Pre- and Post-Test Means, SD, F and P Values on the Emotional State of the PEMS for a Subgroup of the Yoga Group

		Yoga Group						
		Pre-test		Post-test				
Emotional State	**n**	**Mean**	**SD**	**Mean**	**SD**	**F**	**p**	**Eta^2**
Session 1	13	6.42	2.89	7.85	2.15	5.45	0.044*	0.30
Session 2	13	6.62	3.15	9.08	1.32	8.49	0.013*	0.41
Session 3	12	6	3.22	9.75	0.05	13.04	0.004*	0.54
Session 4	11	5.55	2.54	8.55	1.81	11	0.008*	0.52
Session 5	10	5.2	2.62	8.7	1.57	9.97	0.012*	0.53
Session 6	9	3.78	2.82	6.67	3.61	2.58	0.147	0.24
Session 7	8	4.75	3.01	8.63	1.85	6.05	0.043*	0.46
Session 8	8	5.38	2.62	8.13	2.64	3.86	0.090#	0.36
Session 9	7	4.57	3.41	7.00	3	3.45	0.112	0.11
Session10	6	4.5	3.27	7.83	3.49	11.36	0.020*	0.70
Session11	5	9.6	0.89	9.80	3.9	0.012	0.917	0.01
Session12	5	7	3.94	10.60	2.51	5.26	0.083#	0.57
Session 13	5	5	4.8	8.00	2.83	1.87	0.243	0.32
Session 14	4	6	4.55	11.25	5.91	4.42	0.126	0.60
Session15	3	10	0	13.33	5.77	1	0.500	0.33

Note: 1. Significance p>0 .05, Borderline significance p> 0.1

2. Although the maximum rating was 10 some children chose to give a higher rating because they had given themselves the highest rating at the beginning of the class and felt better at the end.

For the Emotional State (Table 30), significant improvement was seen in eight out of fifteen sessions and borderline improvement in one, with two sessions indicated high pre- and post-session scores and the remaining sessions showing non-significant improvement however, numbers were low in these sessions.

Table 31 presents ratings on the Mental State component of the PEMS for up to 13 students over 15 yoga sessions.

Table 31: Pre- and Post-Test Means, SD, F and P Values on the Mental State of the PEMS for a Subgroup of the Yoga Group

Mental State	**Yoga Group**							
		Pre-test		**Post-test**				
	n	**Mean**	**SD**	**Mean**	**SD**	**F**	**p**	**Eta^2**
Session 1	12	6.92	2.11	8.92	1.57	10.56	0.008*	0.49
Session 2	13	7.31	1.93	9.23	1.30	11.32	0.006*	0.49
Session 3	12	6.58	1.93	9.50	2.28	12.08	0.005*	0.52
Session 4	11	5.18	2.99	7.73	2.28	6.21	0.032*	0.38
Session 5	10	5.90	2.18	8.9	1.10	15.57	0.003*	0.63
Session 6	9	3.33	2.69	8.44	2.30	18.64	0.003*	0.70
Session 7	8	4.00	3.63	8.38	2.20	8.79	0.021*	0.56
Session 8	8	3.94	3.19	7.75	2.25	17.33	0.005*	0.69
Session 9	8	6.13	3.44	9.25	1.39	6.15	0.042*	0.47
Session10	6	5.83	3.97	9.33	1.63	8.07	0.040*	0.62
Session11	5	7.00	4.47	10.2	3.19	5.88	0.072#	0.59
Session12	5	7.40	3.71	11	2.35	7.36	0.053*	0.65
Session 13	5	5.00	4.80	8.8	2.68	4.75	0.095#	0.54
Session 14	4	5.75	4.35	11.75	5.5	8.00	0.066#	0.73
Session15	3	8.33	2.89	15	8.66	2.28	0.270	0.53

Note: Significance= p>0 .05, Borderline significance= p> 0.1

For the Mental State (Table 31), significant improvement was seen in twelve out of fifteen sessions and borderline improvement in two, with one session indicating high pre- and post-sessions scores.

These outcomes strongly support the hypotheses that yoga would improve the self-states of physical, emotional and mental wellbeing.

4.5.3 Yoga Survey

It was hypothesised that students would perceive beneficial effects on mood, self-state and develop an ability to relax.

The Yoga Survey was a simple means of gaining the children's perception of the effects of the yoga intervention. It is conceded that the questions are worded with a positively bias and this may have influenced outcomes. However, negative responses indicated the level of influence was not whole-scale. The Yoga Survey was conducted at the end of the yoga program in each school with students from the five participating primary schools. Table 32 presents the results.

Table 32: Reponses to the Yoga Survey

Question	n	Yes	%	No	%
1. Do you have more energy?	27	20	74.1	7	25.9
2. Are you a calmer person?	27	18	66.7	9	33.3
3. Are you more flexible?	27	21	77.8	6	22.2
4. Do you feel stronger?	25	20	80.0	5	20.0
5. Are you able to relax easier?	27	17	63.0	10	37.0
6. Do you have less mood swings?	26	12	46.2	14	53.8
7. Do you experience as much anger?	27	10	37.0	17	63.0

The Yoga Survey questions can be divided into physical effects (Q.1, 3 and 4) and psychological effects (Q.2, 5, 6 & 7). Six out of the seven mean responses indicated beneficial effects for 63% to 80% of the respondents. Results indicated that the greatest benefits were of a physical nature. Psychological benefits also ranked high.

The outcomes on the Yoga Survey support the hypotheses that students would perceive beneficial effects on mood and self state and develop an ability to relax although the potential of positively worded survey questions may have influenced these outcomes.

4.6 Individual Assessment in Yoga Competence (IAYC)

The hypotheses predicted that students individually assessed, would demonstrate increased attention to task, competence in accessing treatment, a positive attitude towards and response to treatment, develop the motivation to participate in yoga and the ability to relax. *The Individual Assessment in Yoga Competence* tested these hypotheses by assessing the children's ability and willingness to remember yoga poses and breathing and relaxation techniques both by name and performance.

Table 33 presents the mean scores for the subgroup (n=11) of students, from two schools who were given individual assessments (videoed) by the yoga teacher. Other schools were not included due to time restraints. A lesson with which the children were familiar was assessed by the yoga teacher, immediately following the completion of the yoga program (within two days). Scores were allocated according to the assessment task demands. For example a score of 28 was allocated for performance in the posture sequences which comprised of a large section of the class. Proportional scores were allocated to attendance throughout the program. Attitude was determined by degree of participation in each yoga class. Participation ratings were drawn from overall participation in the yoga intervention. Ratings were determined by participated in '*all of the class*', '*most of the class*', '*half of the class'* or '*some of the class*' and scores were allocated proportionally.

Table 33: Mean Scores, SD, Maximum and Minimum Scores for Students Individually Assessed

Tasks Assessed and Overall Participation (n=11)	**Score out of:-**	**Mean**	**SD**	**Max.**	**Min.**
Ability to concentrate and focus in posture correctly and hold for 5 breaths where required	28	23.36	2.90	28	18
Perform the warm ups slowly and with awareness	6	4.72	1.01	6	3
Ability to hold relaxation pose after posture where required.	6	5.45	0.52	6	5
Ability to relax for 3-5 minutes	10	8.18	1.72	10	5
Ability To remain calm/quiet throughout program	10	8.36	1.68	10	6
Ability to do breathing practices	5	3.45	1.43	5	0
Ability to calmly chant – Maximum.	5	3.63	1.50	5	0
Total on the lesson performance	70	57.15 (82.14%)	10.76		
Attendance over the course of the program.	10	8.09	1.57	9	5
Attitude over the course of the program	20	14.45	3.07	20	13
Total	100	79.69%	9.44	92	68

The students took the assessment seriously and reached a high level of performance on the day of assessment gaining a mean score of 57.15 (SD 10.76) out of 70 (see DVD for example of assessed class). Attendance over the course of the program was very good at 8.09 (SD 1.57) out of 10. A reasonably positive attitude to the program was seen in a score of 14.45 (SD3.07) out of 20. Overall performance was high at 79.72 (SD 9.44) out 100.

The outcomes on the *Individual Assessment in Yoga Competence* support the hypothesis that students individually assessed, would demonstrate increased attention to task, competence in accessing treatment, a positive attitude towards and response to treatment and develop motivation to participate in yoga and the ability to relax.

4.7 Physical Measure – *The Summit™ Respiratory Inductive Plethysmography* (RIP)

It was hypothesised that recordings of breathing patterns breathing patterns 5 minutes before, 10 minutes during and 5 minutes after *Yoga Nidra* relaxation technique recorded on the *Summit ™ Respiratory Inductive Plethysmography* would display an increase in more stable breathing patterns and be suggestive of the child's ability to relax..

Participants (n=7) were observed lying continuously motionless in a prone position for the duration of the testing. If any isolated movements occurred, these movements were labelled on the data recording. The low numbers were due to delays in approval by the Department of Education and training giving approval for this measure to be employed.

Table 34 presents the participants' mental health status, age, number of months enrolled in a behaviour school, medication status at the beginning of the main study. This sample comprised of students with predominantly externalising behaviours. Three of the seven students presented with comorbid emotional disturbance or internalising problems; one student had internalising behaviours only. The three students without disruptive behaviour were not matched for age or gender. These three students attended local high schools. Two were twins (Case study 8, 9) and inexperienced in yoga and one (Case Study10) had been practicing yoga from early childhood.

Table 34: Behaviour Status, Age, Duration of Enrolment, Diagnosis, Medication Status for all Participants

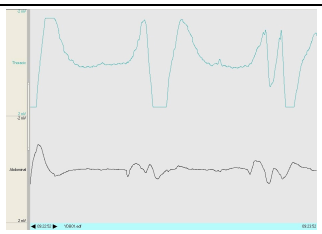
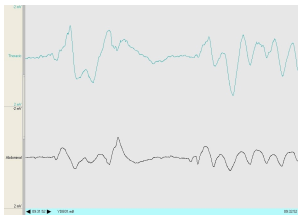
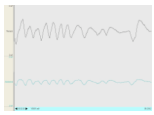
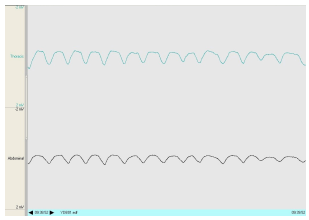
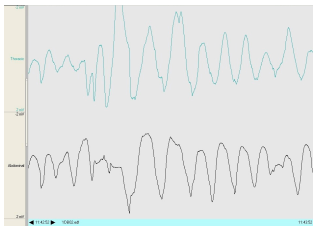
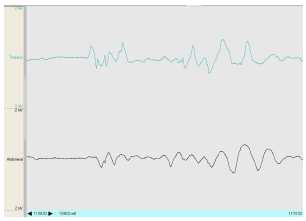
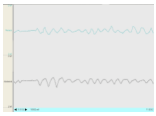
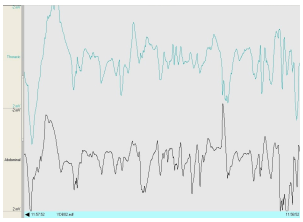
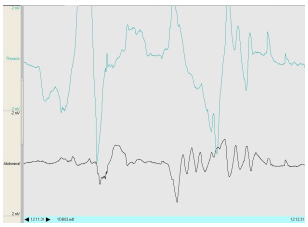
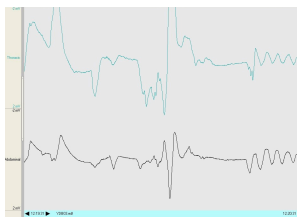
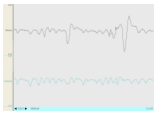
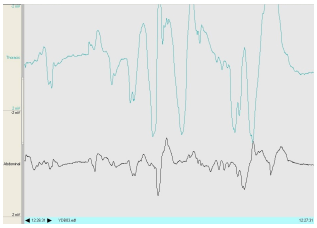
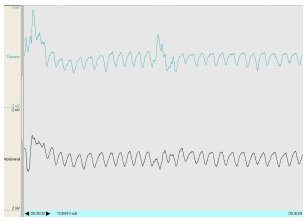
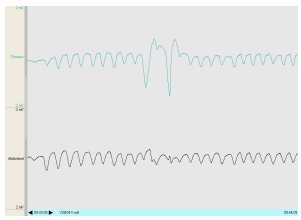
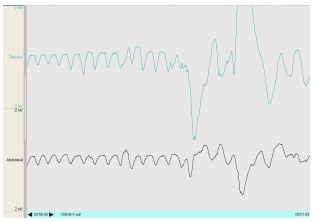
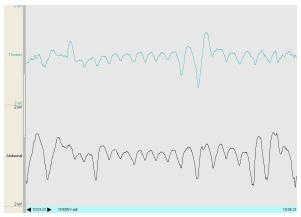
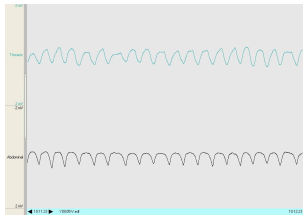
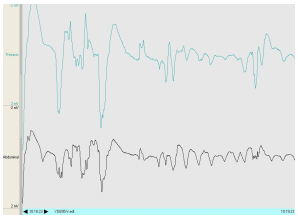
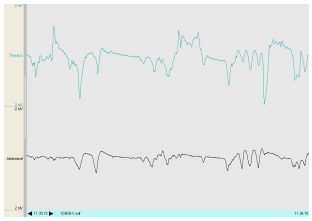
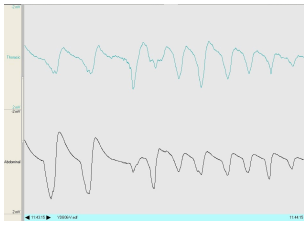
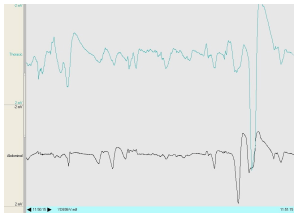
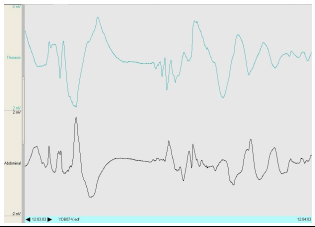
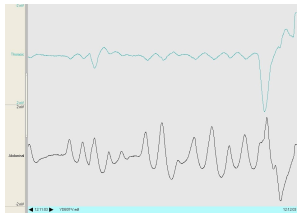
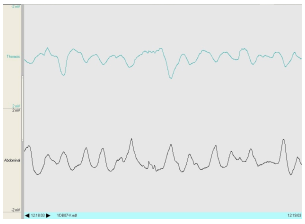
b	Disruptive Behaviour(DB) or /Control (C)	Age (Years)	Number of months enrolled at behaviour school at beginning of study	Behavioural Diagnosis/ Assessment	Medication Status
1	BD	16	16	PTSD, ED	Risperdone
2	BD	11	6	ODD ED	Ritalin
3	BD	12	8	CD	Catapres
4	BD	13	20	ADHD CD	Ritalin
5	BD	10	7	ODD,ED, LD	Dexamphetamine
6	BD	14	2	MH3	None
7	BD	12	7	CD,LD	None
8	Non BD (female)	15	Attending mainstream school	No diagnosed mental health disorder	None
9	Non BD	15	Attending mainstream school	No diagnosed mental health disorder	None
10	Non BD	15	Attending mainstream school	No diagnosed mental health disorder	None

Note: N/A –Not applicable; PSTD: Post Traumatic Stress Disorder; ED: Emotional Disorder: CD: Conduct Disorder: LD: Learning Disorder; ADHD: Attention Deficit Hyperactivity Disorder: MH3: Mental Health –Externalising and Internalising behaviours; ODD: Oppositional Defiant Disorder..

Analysis of the breath data for the students without disruptive behaviour was easy to interpret due to the regularity of both breath rate and amplitude for all three participants. These data are presented in Table 4 and 5. For the students with disruptive behaviour, although there were examples of the breath regularising before, during and after *Yoga Nidra,* it was difficult to quantify all breath rates especially in the pre-*Yoga Nidra* phase. Unstable breathing patterns generally comprised of irregular breathing rates, inconsistent amplitudes and unequal inhalation and exhalation lengths. Reporting averages would not have been accurate nor would reporting minimum and maximum amplitudes per minute been representative or a

useful measure for comparison. To convey indications of the type of patterns occurring, one minute screen shots of breathing patterns at standard times (midway through each phase of *Yoga Nidra*) are displayed in Table 34. Additionally screen shots of the five minute pre, the ten minute during and the five minute post *Yoga Nidra* were viewed to enable a general analysis for each child in Table 36. These screen shots revealed times of erratic breathing patterns and times of stabilising trends.

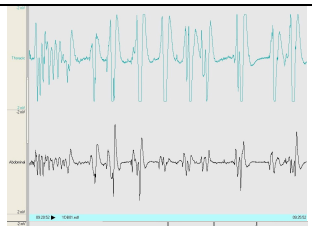
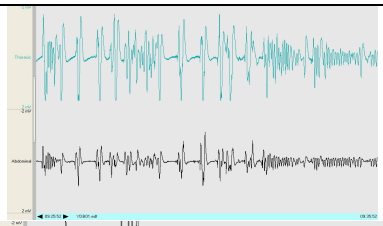
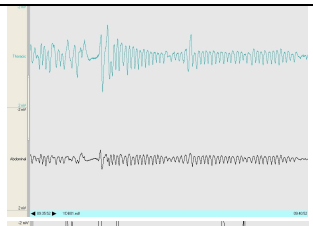
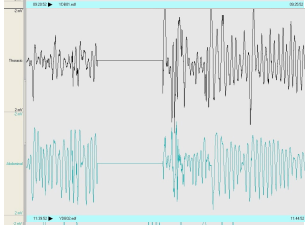
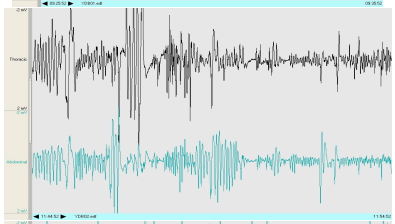
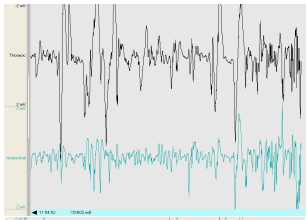
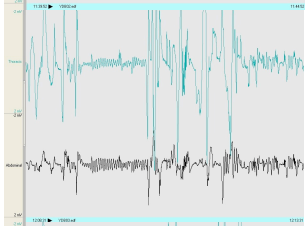
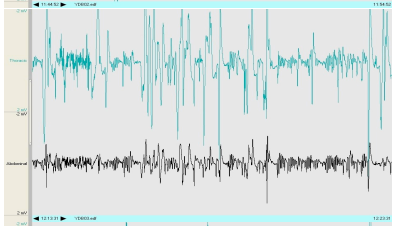
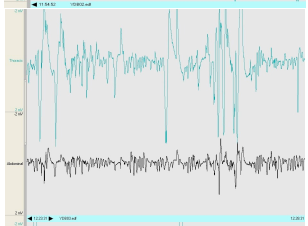
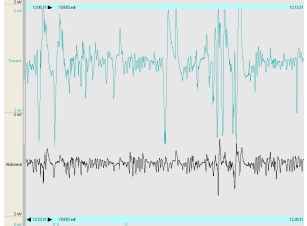
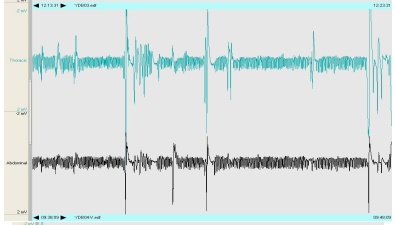
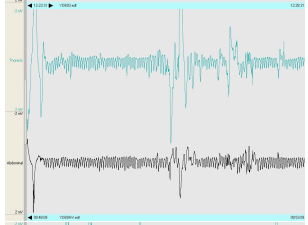
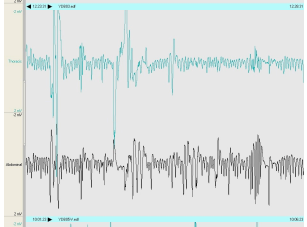
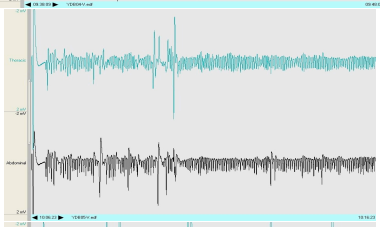
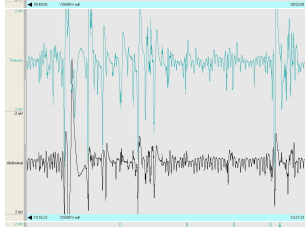
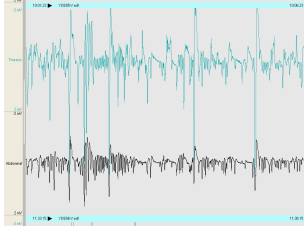
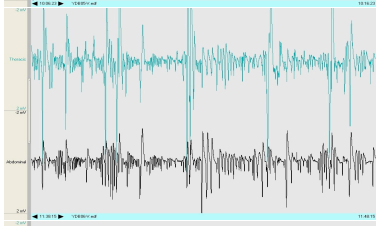
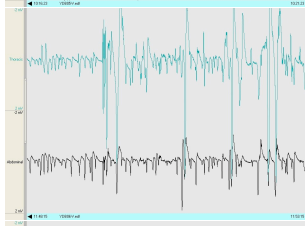
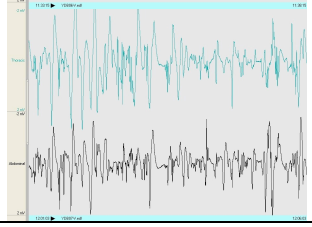
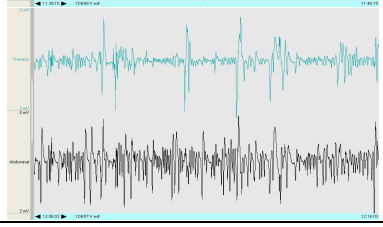
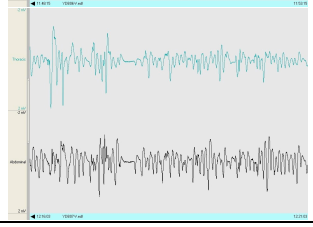
Table 35: Disruptive Behaviour Group of Mid Pre-, During and Post-*Yoga Nidra* One Minute Screen Shots

	Pre-*Yoga Nidra* 3rd min of 5min.	During *Yoga Nidra* 6th min of 10 min	8th min	Post-*Yoga Nidra* 3rd min of 5 min
1				
2*				
3*				
4*				
5*				
6*				
7				

Note: 1.Extra screen shot for participants 1, 2 and 3 indicate increased stability of breath during the *Yoga Nidra* phase.

2. Top tracer: Thoracic; Bottom tracer: Abdominal

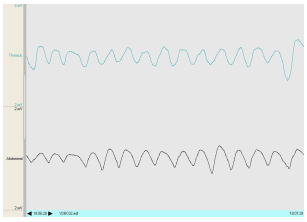
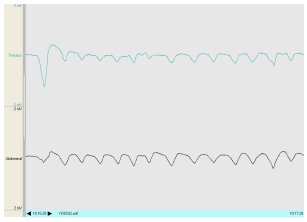
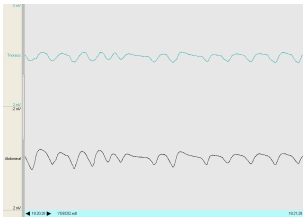
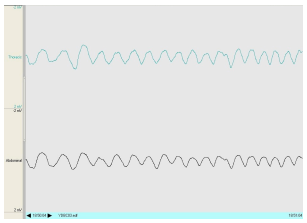
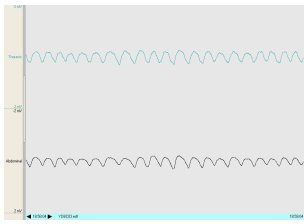
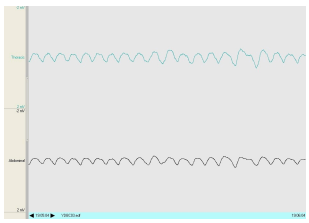
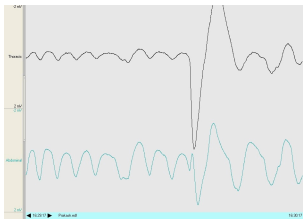
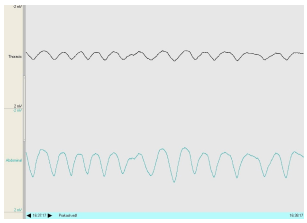
Table 36: Disruptive Behaviour Group Pre- (5 Minutes), During (10 Minutes) and Post- (5 Minutes) *Yoga Nidra* Screen Shots

	Pre-Yoga Nidra 5min.	**During *Yoga Nidra* 10 min**	**Post-*Yoga Nidra* 5 min**
1			
2*			
3*			
4*			
5*			
6*			
7			

Note: Participant 2 Pre-*Yoga Nidra* screen shot contains a section where tracer failed to register

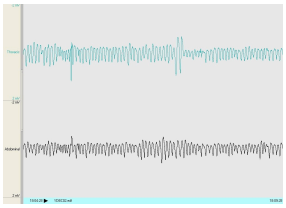
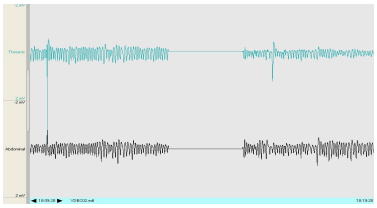
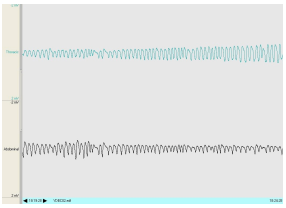
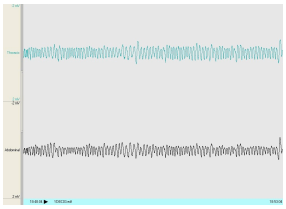
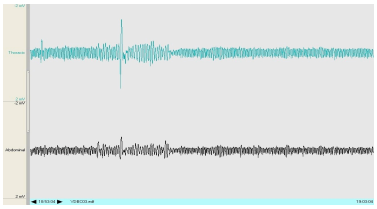
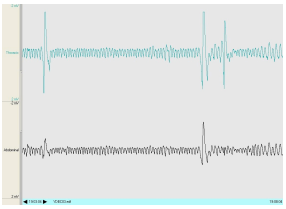
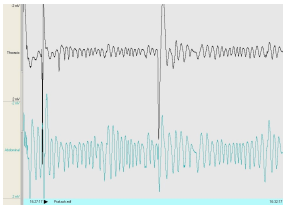
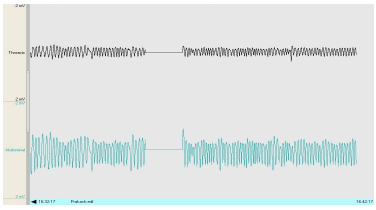
2. Top tracer: Thoracic; Bottom tracer: Abdominal

Table 37: Control Group Mid Pre-, During and Post-*Yoga Nidra* One Minute Screen Shots.

	Pre-*Yoga Nidra* 3rd min of 5min.	**During *Yoga Nidra* 6th min of 10 min**	**Post-*Yoga Nidra* 3rd min of 5 min**
8*			
9*			
10			N/A

Note: 2. Top tracer: Thoracic; Bottom tracer: Abdominal

Table 38: Control Group Pre- (5 Minutes), During (10 Minutes) and Post- (5minutes) *Yoga Nidra* Screen Shots.

Pre-*Yoga Nidra* 5minutes.	During *Yoga Nidra* 10 minutes	Post-*Yoga Nidra* 5 minutes
		
		
		N/A

Note: 1. Participant 8 and 9 during *Yoga Nidra* screen shot contains a section where tracer failed to register

2. Top tracer: Thoracic; Bottom tracer: Abdominal

4.7.1 Participant Studies

Table 34 presents one minute screen shots for each participant in the disruptive behaviour group – mid pre-, mid during and mid post-*Yoga Nidra*. Table 36 presents screen shots of the total trial for each participant in the disruptive behaviour group – pre- (5 minutes), during (10 minutes) and post-*Yoga Nidra* (5minutes). Table 37 presents one minute screen shots for each participant in the control group mid pre-, during and post-*Yoga Nidra*. Table 5 presents screen shots of the total trial for each participant in the control group participants-pre- (5 minutes), during (10 minutes) and post-*Yoga Nidra* (5minutes).

No standardised mean analysis was conducted on the data collected from the total disruptive behaviour or the comparison group, therefore, case by case reports have been complied on each student's outcomes.

Participant 1

Participant 1 was a 15 year boy who had been enrolled at a behaviour school for 16 months with a paediatrician diagnosis of Post Traumatic Stress Disorder and Emotional Disorder in addition to anxiety, acting out and violent fantasies as reported by school counsellor. He was medicated on *Risperdone*. Pre-intervention assessment indicated significant problematic behaviour in subscales Anxious /Shy, Perfectionism, Oppositional behaviour and borderline significance in Social Problems on the *Conners Teacher Rating Scales –Revised: Long* (CTRS-R: L). Participant self-rated a low total-self score (T-score 33) (SDQ-II) and heightened anxiety (T-score 65) (STAI-Y).

Breathing patterns in mid pre-*Yoga Nidra* one minute screen shot were distinguished by an extremely slow breathing rate (approximately 6 breaths per minute-BPM) with frequent breath

cessation episodes and thoracic dominance and represented the 5 minute duration. This pattern continued into *Yoga Nidra* but became quite stable in the last 3 minutes of *Yoga Nidra* (see insert Table 2) especially in the abdominal breath where the breath rate increased to within normal limits, the amplitude became regular especially in the abdominal breath and breath cessation ceased although a thoracic dominance remained This stable breath continued into post *Yoga Nidra* where the thoracic breath stabilized further and displayed a decrease in amplitude comparable with the abdominal breath and became comparable to control participants 8 and 10.

Participant 2

Participant 2 was an 11 year boy who had been enrolled at a behaviour school for 6 months, with a paediatrician diagnosis of Oppositional Defiant Disorder and Emotional Disorder; he was medicated on *Ritalin.* His pre-intervention teacher assessment indicated significant problematic behaviour on subscales Hyperactivity, Global Restless/Impulsive and Oppositional behaviour with borderline significance in Global Emotional Lability on the *Conners Teacher Rating Scales –Revised: Long* (CTRS-R: L). Participant self-rated an inflated total-self score (T-score 63) (SDQ I) and an absence of anxiety (44 T-score) (STAIC/T).

Breath rate mid pre-*Yoga Nidra* was approximately 13 BPM with thoracic and abdominal breathing comparable. The amplitude fluctuated but the inhalation and exhalation duration was generally even. During *Yoga Nidra*, the breath rate increased to approximately 18 BPM, there was a marked decrease in amplitude and breathing in the last 3 minutes of *Yoga Nidra* (see insert Table 34) with exhalation and inhalation lengths equalising although thoracic breathing predominated. Breathing patterns post *Yoga Nidra* as seen in mid one minute screen shot and the 5 minute screen shot were very erratic in relation to amplitude, inhalation and exhalation

volumes with both thoracic and abdominal breath rate too difficult to calculate. In post *Yoga Nidra* participant expressed the need to get up and became restless

Participant 3

Participant 3 was a 12 year old boy, enrolled at a behaviour school for 8 months, with a paediatrician diagnosis of Conduct Disorder. He was medicated on *Catapress.* Pre-intervention assessment by the teacher indicated minimal behaviour problems with all subscales falling within the average range on the *Conners Teacher Rating Scales –Revised: Long* (CTRS-R: L). Participant's self-rated total-self concept was inflated (T-score 63) (SDQ I) with below average anxiety (T-score 41) (STAIC/T).

Breath rate and amplitude as seen in the mid pre-*Yoga Nidra* and in the 5 minute screen shot were thoracic dominant, irregular and difficult to determine despite a small section of more regular breathing. This pattern continued into the *Yoga Nidra* phase but became more stable in the last 3 minutes (see insert Table 35) with the breath rate slowing with more regular abdominal, though still slightly irregular thoracic dominance. The rate was quite fast at approximately 20 BPM. Breathing patterns post-*Yoga Nidra* resembled patterns pre-*Yoga Nidra.*

Participant 4

Participant four was a 13 year old boy, who had been enrolled at a behaviour school for 20 months with a paediatric diagnosis of Attention Deficit Hyperactivity Disorder and Conduct Disorder and was medicated on Ritalin. Prior to the intervention, the teacher's perception indicated significant problematic behaviour in subscales Oppositional, Hyperactive, Anxious/Shy and Social Problems on the *Conners Teacher Rating Scales –Revised: Long*

(CTRS-R: L). Participant self-rated a low total-self concept score (T-score 38) (SDQ II) with no anxiety problems (T-score 52) (STAI-Y).

The breath rate and amplitude throughout the three phases remained relatively stable and unchanged particular pre and during *Yoga Nidra;* however, the breath rate was fast at 25 BPM throughout compared with norm set at between 14-20 BPM (Innocenti, 2002). This sample is unlike the majority of the other participants in the disruptive behaviour group.

Participant 5

Participant 5 was a 10 year old boy, who had been enrolled at a behaviour school for seven months with a paediatric diagnosis of Oppositional Defiant Disorder, Emotional Disorder and Learning Disorder and medicated on Dexamphetamine. When he entered the program teachers rated his behaviour within the normal range on the *Conners Teacher Rating Scales –Revised: Long* (CTRS-R: L) (CTRS-R: L). Participant self-rated in the average range for total self-concept (T-score 47) SDQ-I and without anxiety (T-score 46) (STAIC/T).

In the mid pre-*Yoga Nidra* screen shot and in the first half of the five minute screen shot, some irregular breathing patterns were evident. The breath rate as represented in the one minute screen shot was approximately 18 breaths per minute, with some fluctuation in amplitude that was more evident in abdominal breathing. Breathing patterns began to stablise in the second half of the phase with abdominal predominance. However, during the *Yoga Nidra* phase, breath rate became more stable especially in the final six minutes where thoracic and abdominal breathing equalised. In post *Yoga Nidra* the breathing pattern became unstable identified by variations in rate and amplitude more evident in the thoracic trace.

Participant 6

Participant 6 was a 13 year old boy, who had been enrolled at a behaviour school for two months with a school counsellor assessment of Mental Health 3 (Internalising and Externalising). He was described by staff at the behaviour school as emotionally disturbed, lacking social skills, frustrated by social interaction, with a tendency towards violent expression of his frustrations.

Prior to the intervention, the teacher's perception indicated significant problematic behaviour in subscales Oppositional, Hyperactive, Anxious/Shy, Social Problems and Global Restless/Impulsive on the *Conners Teacher Rating Scales –Revised: Long* (CTRS-R:L). with his carer rating him with the same significant problems apart from Social Problems (CPRS-R:L). Participant self-rated as having low total-self concept score (T-score 38) (SDQ-II) with heightened anxiety problems (T-score 61) (STAI-Y).

Pre-*Yoga Nidra* breath rate and amplitude were thoracic dominant, irregular and difficult to determine accompanied by uneven exhalation and inhalation spans. However, during *Yoga Nidra* the breath rate slowed with more regular thoracic and abdominal breathing. Breathing patterns post *Yoga Nidra* resumed an irregularity but not to the same extent as pre-*Yoga Nidra*. These trends are more clearly detected in the one minute screen shots than in the full phase screen shots.

Participant 7

Participant seven (Case Study 1-see below) was a 13 years old boy, who had been enrolled in a behaviour school for seven months. He had a paediatric diagnosis of Conduct Disorder and Learning Disorder. Prior to the intervention, the teacher's perception indicated significant problematic behaviour in all subscales on the *Conners Teacher Rating Scales –Revised: Long*

(CTRS-R: L). Participant self-rated his total-self concept within normal range (T-score 48) (SDQ-II) with some anxiety problems (T-score 60) (STAI-Y).

Breath rate was difficult to determine in the pre-*Yoga Nidra* phase as exhalation and inhalation lengths varied considerably in both thoracic and abdominal breathing. Due to this erratic pattern, amplitude was also difficult to determine. However, during *Yoga Nidra* the breath rate was easier to measure at 13 BPM in the one minute screen shot, with more consistent amplitude. Abdominal breathing also predominated in this phase. Compared with *Yoga Nidra* practice, post *Yoga Nidra* showed a breath rate of approximately 11 BPM with more regular amplitude and rate. This remained quite steady with abdominal breathing preference.

Participant 8

Participant 8 was a 15 year old girl without a mental health diagnosis who acted as a control. She was attending a mainstream school. She was not an experienced yoga student nor had she previously practiced *Yoga Nidra*. Breathing patterns pre-*Yoga Nidra* in both thoracic and abdominal arms were very stable. Breath rate in the representative sample screen shot was 16 BPM with amplitude stable. During *Yoga Nidra* thoracic and abdominal breathing continued to be stable with an abdominal dominance and breath rate slightly slower at 14 BPM with a consistent amplitude. Post *Yoga Nidra* thoracic and abdominal continued to be stable with a thoracic dominance and a slightly faster breath rate at 15 BPM and amplitude consistently stable.

Participant 9

Participant nine was a 15 year old boy and twin to the 15 year old girl control, attending a mainstream school without a mental health diagnosis in the control group. He was not an

experienced yoga student nor had he previously practiced *Yoga Nidra*. His mother reported him as being an anxious boy.

Breathing patterns pre-*Yoga Nidra* in both thoracic and abdominal arms were very stable. Breath rate in the representative sample screen shot was19 BPM which is quite fast amplitude yet stable. During *Yoga Nidra* thoracic and abdominal breathing continued to be stable and breath rate slightly faster at 20 BPM with a steady amplitude. Post *Yoga Nidra* thoracic and abdominal continued to be stable with a slightly slower breath rate at 18 BPM and amplitude.

Participant 10

Participant 10, a 15 year old boy, was one of the controls. He had no mental health diagnosis and attended a mainstream school. He had practised yoga throughout his childhood.

Breathing patterns pre-*Yoga Nidra* in both thoracic and abdominal arms were stable with abdominal predominance. Breath rate was stable at 11 BPM and with slight variance in amplitude. During *Yoga Nidra,* thoracic and abdominal breathing continued to be stable with an abdominal predominance and breath rate slightly faster at 15 BPM and amplitude slightly less in the thoracic arm than in the abdominal arm. No post *Yoga Nidra* readings were recorded due to a technical failure.

General observations

Throughout the *Yoga Nidra* practice the students' attention was drawn either to sounds or body awareness except for one minute of the ten minute practice when attention was drawn to breath awareness. Breath awareness may have contributed to documented changes regardless of participants being specifically instructed to not alter their breathing effort. However, if breathing patterns were altered through focused awareness this could be considered a legitimate means of

inducing relaxation, the core reason for testing the technique and an indication that the students were capable of developing such a skill.

Table 35 and Table 36 reveal certain trends in RIP traces in the pre-*Yoga Nidra* phase. For example instability in breathing patterns is consistently evident with difficulty in determining breath rates and often extremely fluctuating amplitude, particularly in most DB participants. Participant 1 showed pronounced irregularity with apparent breath cessation. Most had different durations of inhalation and exhalation, sometimes within one breath and when comparing one breath to another. Participant 4 and 5 display similar regularity in breathing rates though participant 5 has more inconsistent amplitude. Participant 2 displays overlapping rhythms within a regular pattern going from small to larger amplitude, but generally has a slower, deeper rhythm.

Within the *Yoga Nidra* phase 6 out of 7 students showed marked changes. For participants 4, 5, 6 and 7 these changes occurred at the beginning of *Yoga Nidra*; for participants 1, 2 and 3 these changes occurred towards the end of the practice. This involved a stabilizing of the rate and amplitude with breath rate discernibly slower and deeper in participants 6 and 7; the others had faster rates but with little discernible effort. Participant 4 was the exception showing more consistent breathing patterns throughout with irregularity at the end of the post *Yoga Nidra* phase. In participants 2, 5 and 6, during the post *Yoga Nidra* phase, noticeable instability occurred despite a period of relative stability during *Yoga Nidra*. However, the post yoga phase did not display the same degree of instability seen in the pre-*Yoga Nidra* phase. Breathing patterns in participant 2, in post *Yoga Nidra* became quite erratic compared with either pre or during phases. This student expressed a need to get up and he became agitated when he was asked to remain still.

Results indicated that the majority of boys with disruptive behaviour consistently displayed unstable breathing patterns throughout the pre-*Yoga Nidra* period, showed more stable breathing during *Yoga Nidra* and greater stability in the post-recording period compared with pre-recording period. These results in part support the hypothesis that yoga would stabilise breathing patterns and indicate an ability to relax.

4.8 Case Studies

Because the proposed hypotheses were not supported on most items in the standardised measures and wide standard deviations were observed on the means of these measures, case studies were included to explore individual outcomes in an attempt to account for the wide variability in outcomes following participation in the yoga program. Four students were selected. Three of these students displayed a positive attitude towards yoga as observed in the yoga classes and on the non-standardised measures and immediately after participation in a yoga class. These observations and self reports were not necessarily supported by perceptions of parents and teachers via the Conners' rating scales. These three students also demonstrated some positive responses on the standardised self-report measures (STAI-Y, STAIC/T, SDQI & II, TEA-Ch). The fourth student was selected to represent the children who did not consistently demonstrate a positive response to the yoga program as seen in school staff observations and the non-standardised self-report measures. The information presented in the case studies follows the same format as the results for the yoga and control groups. Measures where no data were collected are not included.

4.8.1 Case Study 1

Case Study 1 (also Participant 7 in *Yoga Nidra* Study) was a 13 years old boy, who had been enrolled in a behaviour school for seven months. He had a paediatric diagnosis of Conduct Disorder and Learning Disorder. He was not taking any medication for his disorders. He lived with both parents, had an older working brother and his father was on a disability pension.

The student missed 12 yoga classes due to being absent from school but attended all yoga classes offered (18) when he was at school. The Principal noted that the student got into fights, was abusive and oppositional towards teachers and staff and took no responsibility for his behaviour. He was seen as showing little progress in overall school performance. The Principal considered that the student did not have the reasoning skills to avoid confrontation and was considered a social isolate with poor social skills.

School Staff Observation Notes of Student in Yoga Classes

Given that the student had a diagnosis of CD he would be expected to display characteristic symptoms and although there were incidences of disruption these were not predominant, nor persistent. Positively charged behavioural descriptions outweighed negatively charged descriptions by approximately 5:1 (see Appendix H).

Summary of Staff Observation Notes

In the first week, Case Study 1 listened and talked appropriately, he was attentive and followed instructions immediately, he tried very hard to master postures and breathing exercises and was quiet and still during the relaxation. He expressed his excitement in coming to yoga and asked if we could do it everyday. In the second week he continued to try hard and participated appropriately although interacted inappropriately with two other boys in one class. For the next

four weeks, the student was absent for reasons unknown. Upon return, he settled easily and quickly into the yoga classes. Although he found some of the breathing practices and a posture difficult due to inflexibility, he didn't give up. He continued to succeed in postures, showing endurance and muscular strength and general on-task behaviour. As an example, he held one posture (the parachute) for 50 seconds. There were incidents of silliness and fidgetiness and not listening to instructions but these were occasional and not persistent. As he became more competent he volunteered to demonstrate postures and lead the class. He also responded well to relaxation sessions by being able to remain still and follow instructions for up to twenty minutes. He commented that he did the relaxation practice at home and it helped him sleep.

The positive descriptions of the student's yoga class behaviour support the hypotheses that yoga would produce a positive attitude and response to treatment, increase competence in accessing treatment and promote motivation.

Yoga Class Behaviour Observations using the BASC-POP

In the observation of student's behaviour at the beginning of the yoga program symptomatic ADHD behaviours were not excessive and no ODD behaviours were observed. In the observation at the end of the yoga program, ADHD behaviours and ODD behaviours were generally not observed. Appendix I presents a table of results. These outcomes support the hypothesis that yoga would decrease oppositional behaviour. Although ADHD behaviours were also not observed, this student was not diagnosed with ADHD.

Conners' Teachers Rating Scale-Revised: Long (CTRS-R: L)

The student's pre-yoga scores (after being at a behaviour school for seven months) were in the range of 'Markedly Atypical Significant Problem' (70+) to 'Mildly Atypical Significant

Problem' (65-70). At post-intervention and after attending 18 yoga classes, seven subscales T-scores had fallen into the 'Average' range (45-55). The seven subscales were Cognitive Problems-Inattention, Hyperactivity, Anxious /Shy, Perfectionism, DSM 1V- Inattentive, DSM 1V-Hyperactive, DSM-1V Total. Five subscales fell into the 'Slightly Atypical' borderline range. These subscales were Social Problems, ADHD Index, Global Index Restless/Impulsive, Global Index Emotional Lability and Global Index Total. The DSM-VI Symptom Inattentive subscale score dropped to the level where it was no longer suggestive of an ADHD diagnosis (<6). Oppositional behaviour did not improve and remained in the Markedly Atypical Significant Problem range however, oppositional behaviour was not observed as being a problem in the yoga classes. One limitation of these results is that different teachers reported on the behaviours at pre- and post-test but this was a vey small school where expectations of student behaviour and standards of management were seen to be constant. See Appendix I for chart of T-score results. These outcomes support the hypothesis that yoga would reduce social problems, anxiety, mood and attention to task.

State-Trait Anxiety Inventory (STAI-Y)

Results on the STAI-Y for each item are presented in a table in Appendix I. The Total T-score decreased from a relatively high anxiety level of 60 at pre-yoga to 54 at mid-yoga to 52 at post-yoga. The percentile level decreased from the 87th to the 68th to the 60th percentile. The most notable changes were in the *Absence of Anxiety* items where six out of nine items improved from the *sometimes* category to the *often* category. The student expressed greater pleasantness, more satisfaction with him self, was more rested, more cool, calm and collected, more content and found it easier to make decisions. Reductions in *Anxiety* occurred in three items moving from *often* to *sometimes.* This indicated feeling less of a failure, less worried about things that didn't

matter and less tense and stressed when thinking about what concerned him. These outcomes support the hypothesis that yoga would reduce anxiety.

Self Description Questionnaire II (SDQ II)

Noticeable improvements in the Verbal (5 points), General School (12 points), General Self (7 points) subscales occurred. The remaining subscales were unchanged except for Physical Abilities (7 points) and Same Sex Relations (8 points) which deteriorated. Perception of Physical Abilities may have been reduced due to student finding some postures quite difficult and the extra weight he was carrying could have also been a factor in perceived awkwardness. These outcomes partially support the hypothesis that yoga would improve self concept. See Appendix I for chart of T-scores for SDQ II.

Feelings Faces Scale (FFS)

Student's perception of how he felt were recorded on the FFS after the last class for the week (see Appendix I). A very positive attitude is conveyed with no incidences of feeling neutral, angry, sad or shy and on two occasions only did he feel he could only do some of the postures. In the last four of weeks of the program he rated himself in the highest ranking (5). These outcomes support the hypothesis that yoga would improve mood and competence in accessing treatment.

Physical, Emotional and Mental States (PEMS)

In all but one yoga session scores increased from pre to post or remained high. After returning from four weeks absence and the school holidays pre-scores tended to be quite low but improved with time and practice. From session nine all pre-sessions were rated seven and above. From session six (week 10) all post-sessions were rated at the highest score and in the last session, the student rated the session 20 (even though the highest was 10). See Appendix I for table and

figure of results. These outcomes support the hypothesis that yoga would improve physical, emotional and mental self-states.

Breathing Patterns Pre-, During and Post-Yoga Nidra using the Summit Respiratory Inductive Plethysmography (RIP)

The results for this student (Participant 7) are reported in Section 4.7

4.8.2 Case Study 2

This participant was diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD). He was a 14 year old, Year 9 student with above-average intelligence. He had been enrolled at a behaviour school for four months and began the yoga intervention. He was not taking any medication for his disorders. He lived with both parents.

The student attended twenty-one out of thirty-seven yoga classes offered. He participated most of the time in nineteen classes and in two classes participated some of the time. He missed classes due to being absent from school on four occasions, suspended on four occasions, unwilling to attend yoga classes on seven occasions and at a sports event once. He missed most of the classes over the last four weeks of the program but came to the last class. These absences were preceded by two weeks school holiday and the four suspensions occurred during this period. Other absences were possibly due to peer pressure, ascertained from the yoga teacher's suggestions.

Background Notes from Principal

This participant was described by his previous school as impulsive, disobedient, disruptive, a bully and violent. These behaviours led to several suspensions and consequent placement in a behaviour school.

Summary of School Staff Comments on Student's Behaviour and Attitude in Yoga Classes

Case Study 2 had a tendency to come to the yoga class unsettled but generally became very focused and enthusiastic and participated with high levels of engagement. He frequently commented on the positive effect of postures and relaxation, for example he said he wanted to do yoga every day. Comments were often impulsive turning into running commentaries (e.g. "All my bones are cracking. "I love this, it massages your back". "I love this one, it feels good. I'm a cocoon"). The physical demands of the postures suited his sporty nature and he was keen to extend himself and proved very capable of performing postures correctly and with endurance. This chatty nature generally didn't have a negative effect on the atmosphere yet did prevent an atmosphere of quietness during the posture sequences. However, during the breathing exercises and the relaxation sessions he generally settled and quietly followed instructions and appeared to relax deeply. There were times when he became annoyed and agitated by others and reacted verbally and physically which disrupted the class but generally these situations did not persist due to his response to appropriate management. He enjoyed doing the classes concluded from: his own comments, the effort he expended and his willingness to follow instructions. On a couple of occasions he volunteered to take the class with the assistance of a visually displayed lesson and the yoga teacher and did so with confidence and was able to encourage other students to participate. He was absent for the last three weeks of the program, by his own choice. He returned for the last class in the intervention, with a very calm and relaxed attitude and

participated in the whole class with only one incident of disruption. This period of absence, most likely affected assessment outcomes that were collected at the end of the intervention.

From the descriptors of teacher's observation notes on-task and off-task behaviour occurred in the proportion of 77/48 respectively. This is a positive indicator of the student's involvement in the program and the teacher's experience of his positive attitude. The on-task behaviour descriptors reflected high degrees of engagement, competence and positive mood. Off-task behaviours mainly reflected ADHD. The positive descriptions of the student's yoga class behaviour support the hypotheses that yoga would produce a positive attitude and response to treatment, increase competence in accessing treatment and promote motivation but yoga did not reduce the student's impulsivity.

Descriptors and frequency of on and off-task behaviours observed over 22 yoga classes for Case Study 2 are presented in Appendix I. An example of the comments made by the observing teacher, about Case Study 2, during three yoga classes during the intervention is also presented in Appendix I.

Behaviour Assessment System - Portable Observation Program (BASC-POP)

Pre-yoga and post-test classroom observations on the BASC-POP were discarded due to post-test observations being unreliable. In the yoga class observations impulsive behaviour of 'blurting out' was the most problematic behaviour in the yoga class, followed by the inattentive behaviour of 'easily distracted'. The 'blurting out' behaviour was generally related to the student's reaction and responses to the postures he was performing and the distracted behaviour was predominantly due to being close to the video camera but also due to the other students' unsettled behaviour. In comparison ODD behaviours were the most problematic in the classroom at pre-test. For this

boy with ADHD, ODD and CD these outcomes supported the hypotheses that yoga would reduce hyperactivity and oppositional behaviour. A table of pre-yoga classroom and beginning and end of the yoga program yoga class observations on the BASC-POP is presented in Appendix I

Conners' Teacher Rating Scale–Revised: Long (CTRS:R :L)

The Oppositional, Hyperactive, Global Emotional Lability, Global Total Index, DSM 1V Hyperactive/Implusive and DSM1V Total subscales T-scores, remained in the Markedly Significant Atypical Problem range. Perfectionism and ADHD Index and Global Restless Impulsive subscale T-scores decreased but remained in the Markedly Significant Atypical Problem range. Cognitive Problems, Social Problems DSM 1V Inattentive subscale T-scores increased but remained within the Slightly Significant Atypical Borderline Problem range. Anxious/Shy increased from the Average range to the Borderline Problem range. A lack of improvement may have been due to the CTRS-R: L being completed a month after the student stopped regularly doing yoga. A chart of the T-scores for the CTRS-R :L is presented in Appendix I. These outcomes do not support the hypotheses that yoga would reduce the primary, secondary and comorbid symptoms of ADHD.

Test of Everyday Attention- Children (TEA-Ch)

The student's scores on the TEA-Ch do not reflect any major improvements in the three types of attention tested. Considerable deteriorations are present in three test scores. As mentioned previously, the student stopped regularly doing yoga one month before post intervention assessment therefore results on the TEA-Ch may not reflect any improvements gained. These outcomes do not support the hypotheses that yoga would improve attention. A table of Case Study 2's results are presented in Appendix I.

Self Description Questionnaire II (SDQ II)

The most significant improvement on the SDQ II was seen in the Emotional Stability subscale with an increase in T-scores from 27 (2nd percentile) which indicates low self-concept to 44 (26th percentile) which is in the low average range. His relationship with his parents improved reflected in T-score increases from 35 (9th percentile) to T-score 45 (26th percentile) as did his physical appearance reflected in T-score increases from 39 (16th percentile) to T-score 44 (25th percentile). The other scales remained within average. This measure was also completed a month after student regularly stopped doing yoga. These outcomes partially support the hypotheses that yoga would improve self-concept.

State-Trait Anxiety Inventory (STAI-Y)

Appendix I presents results on the STAI-Y. Participant's level of anxiety decreased from T-score 71 (percentile 98^{th}) to 55 (percentile 68^{th}) which is substantial. Student's self-reported anxiety decreased considerably in the 'Presence of Anxiety' items and less so in the 'Absence of Anxiety' items. Overall student's self-reported anxiety levels considerably improved over the period of the yoga intervention although this assessment was also collected four weeks after completion of yoga program. A table of results is presented in Appendix I. These outcomes support the hypotheses that yoga would reduce anxiety.

Feelings Faces Scale (FFS)

The student's self-rated assessment of how he was feeling after the last yoga class for the week reflect predominantly high values. This indicates that the student's level of happiness, calmness, enjoyment and competence after yoga sessions was indicative of a positive experience for him. These outcomes support the hypotheses that yoga would improve mood and competence in accessing treatment. A chart of the results over 14 weeks are presented in Appendix I.

4.8.3 Case Study 3

Case Study 3 was diagnosed by a paediatrician with ODD and was taking psycho-stimulant dexamphetamine. He was a Year 6, twelve year old boy who had been enrolled at a behaviour school for two months before he acted as his own control in the yoga intervention. The student attended 33 of 36 classes offered in which he participated fully most of the time.

The Principal commented that student had not displayed much disruptive behaviour. However, he had a sense of excessive outrage when he perceived something to be unjust. He could become devastated by small incidents. His mother was said to constantly demean her son but tended to lie and tell stories.

Teacher's Observation Notes of Yoga Classes

From the beginning of the yoga intervention, this student demonstrated a willingness to participate in the yoga sessions. He settled quickly into each session and quietly watched and was capable of performing and holding postures alone and in group postures. He willingly learnt the breathing practices and performed them without objection. He was able to lie still during relaxation sessions and followed the guided relaxation instructions. He demonstrated an ability to stay on task at times when other students were off-task. He volunteered to demonstrate postures to the group and the group followed his instructions. Overall this student put a lot of effort into the classes, took them seriously and appeared to enjoy his successes. He also volunteered to demonstrate postures for his peers and did so with confidence. Descriptors and frequencies of on- and off-task behaviours are presented in a table in the Appendix I.

The student's on- to off-task behaviours tally was 77/15. From observation notes and descriptors, student displayed high levels on-task behaviour with few incidences of hyperactive, inattentive, oppositional and aggressive behaviour. The positive descriptions of the student's yoga class behaviour support the hypotheses that yoga would produce a positive attitude and response to treatment, increase competence in accessing treatment and promote motivation. School staff descriptions of the students on-and off-task behaviours during all yoga sessions are presented in a table in Appendix I

Classroom and Yoga Session Behaviour Observations using BASC-POP

ADHD and ODD behaviours in the classroom decreased from a high pre-control score of 33 to a close to normative score of 14 at post-control. A further decrease to 12 was recorded at post-yoga observation. ODD behaviour was evident on one occasion in the pre-control phase and two occasions at post-yoga. Fidgety and easily distracted behaviour was most prevalent at pre-control while playing indoor pool and at post-test control out of seat behaviour lesson was the most prominent in a science lesson. At post yoga, excessively talking was the most prominent but this was in a craft lesson where talking was permitted. In consistent observation locations were unavoidable. These outcomes generally support the hypotheses that yoga would reduce ADHD and ODD symptoms.

The student was fully on- task during both observed yoga sessions except for three occasions at the beginning of the program when he left his mat but he returned when requested. These outcomes generally support the hypotheses that yoga would decrease the off-task behaviours of hyperactivity, inattention, impulsivity and oppositional behaviour. A table of BASC-POP classroom and yoga class observations s are presented in Appendix I.

Conners Teacher Rating Scale –Revised: Long (CTRS-R: L)

The same classroom teacher completed the CTRS-R: L at pre-and post-control and yoga. From pre-control to post-control, T-scores remained within five T-scores and all were within the average and borderline range except for the Perfectionism subscale which increased to the Mildly Atypical Significant Problem range and DSM-IV Hyperactive/Impulsive which increased to the Moderately Atypical Significant Problem range. However, at post –yoga T-scores deteriorated in twelve out of thirteen subscales. Eight of these deteriorated into the Markedly Atypical Significant Problem range. This deterioration is difficult to explain although the student was completing Year 6 and being transitioned into Yr 7 at a mainstream school. This could have caused some disturbance. These outcomes do not support the hypotheses that yoga would decrease the primary, secondary and comorbid symptoms of ADHD. A chart for this student's results on the CTRS-R: L is presented in Appendix I.

Conners' Parent Rating Scale–Revised: Long (CPRS:R :L)

The student's mother completed the CPRS-R: L at the three assessments times-pre- and post-control and yoga.

At pre-control T-scores were in the Markedly Atypical Significant Problem range in eight subscales (Oppositional, Hyperactivity, Perfectionism, ADHD Index, Global Index Restless/Impulsive, Global Index Emotional Lability, Global Index Total, DSM1V Hyperactive/Impulsive, and DSM-1V Total subscales) and in the Moderately Atypical Significant Problem range in two subscales (Cognitive Problems-Inattention and DSM 1V-Inattentive subscales). The pre-control profile remained constant at post-control, apart from two subscales, one of which moved into the Average range (Cognitive Problems-Inattention subscale) and one into the Moderately Atypical Possible Significant Problem range (ADHD

Index subscale). At post-yoga further improvements were perceived in the ADHD Index, which moved into the Mildly Atypical Possible Significant Problem range, the Global Index Restless/Impulsive and the DSM-IV Total, which moved into the Moderately Atypical Possible Significant Problem and the DSM 1V - Inattentive which moved into the Average range. DSM-1V Symptoms Inattentive and Hyperactive/Impulsive subscale were not suggestive of an ADHD diagnosis at any assessment time but values decreased which indicates improvement. The other subscales remained stable. These improved results are in contrast to the teacher's perception at post-yoga. These outcomes partially support the hypotheses that yoga would decrease hyperactivity, inattention and impulsivity. A chart of results on the CPRS-R: L is presented in Appendix I.

Test of Everyday Attention- Children (TEA-Ch)

The student was present and cooperative for the three assessment times on this attention test. Scores indicated improvements at post-control and at post-yoga in many subtests but did not exceed four points. At least a five point improvement is necessary to indicate significant change. No conclusions can be reached from these results. A chart of the students TEA-Ch results is presented in Appendix I.

Self Description Questionnaire I (SDQ I)

The SDQ I was administered at pre- and post-control and yoga. In seven out of eleven subscales, scores deteriorated from pre-control to post-control and in six of these subscales improvement was seen post-yoga. Parent Relations and the General Self subscales scores were in the low 20s (suggestive of low self-concept) at pre–control. Both subscales improve minimally at post-control and remain improved at post-yoga. General-self considerably deteriorated at post-control phase but improved at post-yoga but did not return to the pre-control levels. Other scores

remained at a similar level or within the normative range. These outcomes partially support the hypotheses that yoga would improve self - concept. Results over the three assessment times are presented in Appendix I.

Feelings Faces Scale (FFS)

Throughout the program this student reported feeling high levels of happiness, calmness, enjoyment and competence immediately after weekly yoga sessions. postures. In the last four of weeks of the program he rated himself in the highest ranking (5). These outcomes support the hypothesis that yoga would improve mood and competence in accessing treatment. A chart of results is presented in Appendix I.

Yoga Survey

The student's responses to the yoga survey administered after completing the yoga program indicated perceived benefits on all survey questions. postures. In the last four of weeks of the program he rated himself in the highest ranking (5). These outcomes support the hypothesis that yoga would improve energy levels, increase calmness/relaxation and strength and flexibility and reduce anger and mood swings.

Individually Assessment of Yoga Competence

The student responded well to doing a class on his own. He indicated familiarity with all poses and ranked very high compared to his fellow students. A table of the student's results is presented in Appendix I. This outcome supports the hypothesis that yoga would promote a positive attitude and response to treatment, promote motivation and increase competence in accessing treatment.

4.8.4 Case Study 4

Case Study 4 was an 11 year old boy, who had been enrolled in a behaviour school for 16 months. He had a paediatric diagnosis of Oppositional Defiant Disorder and was taking Tofranil. He lived with his mother and step father.

The student missed 12 yoga classes due to being absent from school on four days, suspended on seven occasions, was unwilling to attend on two days and was involved in other school programs on three days.

Background notes from Principal

The principal reported that the student intimidated fellow students (usually younger). He was defiant towards staff and verbally abusive towards staff and physically abusive towards other students, who tended to fear him. These behaviours had been present since preschool and took place mostly in the playground and usually daily. Academically he was functioning below his age level although he had above average cognitive abilities. He saw his father every second week and was noticeably aggressive behaviour during these periods, particularly towards women. He was reported to be physically violent towards his mother. His stepfather was described as very supportive and good role model, but the school thought that he may have been smacked when he got into trouble at school.

School Staff Observation Notes of Student in Yoga Classes

Case Study 4 began yoga classes with interest and engagement but from the first class there were incidences of non-compliance, distraction and restlessness. Although he engaged in some practices he continued to show signs of restlessness in the following lessons. As lessons continued he began to demonstrate a willingness to participate but there were days when he

refused to engage, was unsettled, lethargic and talked excessively. This pattern continued throughout the intervention and may have been influenced by his reported tendency to be aggressive when he stayed with his father.

Seventy-one (71) on-task descriptors and thirty-five (35) off–task descriptors were mentioned in staff observation notes (see Appendix I for table of descriptors -- Case Study 4). Eighty (80) on-task comments and forty-one (41) off-task comments were made in staff observation notes (see Appendix I – Case Study 4).

Conners' Teachers Rating Scale -Revised: Long (CTRS-R: L)

The student's pre-yoga scores (after being at a behaviour school for 16 months) were predominantly in the range of 'Average' at pre-test. Oppositional behaviour was the only subscale in the 'Markedly Atypical Significant Problem' range. At post-intervention and after attending 18 yoga classes, Global Index Restless/Impulsive, Global Index Emotional Lability subscales T-scores indicated a deterioration into 'Moderately Atypical Significant Problem' range and the 'Slightly Atypical' borderline range respectively. The Oppositional behaviour decreased but the T-score remained in the 'Markedly Atypical Significant Problem' range. These outcomes indicate yoga was not perceived by teachers to improve this boys' behaviour.

State-Trait Anxiety Inventory (STAIC/T)

It was hypothesised that anxiety would be reduced with yoga. However, with this student, STAIC/T T-scores both at pre- and post-test (36 and 40) remained below the norm of 47, indicating less anxiety. At pre-test and post-test, in eight out of twenty statements the student reported low anxiety (i.e. hardly ever). In three statements he reported sometimes at pre- and post-test. In four items he reported more anxiety and in three items he reported less anxiety. The

items where he felt both more anxious and less anxious mainly related to mental concerns. Appendix I presents a table of results for each item in the STAIC/T.

Test of Everyday Attention (TEA-Ch)

It was hypothesised that attention to task would improve after yoga. Improvement of three to seven age-scaled scores were in seen in five subtests of focused attention, sustained attention and switching attention. Differences of more than five age-scaled scores are significant which was seen in a subtest of switching attention. Scores remained stable and within two age-scaled scores in five subtests of focused attention, sustained attention and switching attention. One subtest age–scaled score deteriorated from nine to one, however this was more than likely accounted for by not completing the subtest. Outcomes suggest improvement in all types of attention tested on the TEA-Ch but improvement was not seen in some tests measuring the same type of attention. It is difficult to draw conclusions from these results. (See Appendix I for table of results).

Self Description Questionnaire II (SDQ I)

Improvements in Parent Relations and Total Self Concept indicated some improvement in self - concept. Total-Self increased from the low 30s to the high 30s which is suggestive of improved self-concept due to scores below 30 indicating low self concept. Although General School and Maths subscales deteriorated they remained within the average range but the Physical Abilities subscale indicated a decrease from the low 40s to the low 30s. (See Appendix I for chart of T-scores for SDQ II).

Feelings Faces Scale (FFS)

Student's perception of how he felt were recorded on the FFS reflected mainly feeling positive although there were two days where he felt nothing. His competence didn't tend to improve, remaining in the "I can do some of the postures' category. (See Appendix I for chart of results).

Physical, Emotional and Mental States (PEMS)

Scores on the PEMS reflect Yoga having a positive affect on self-states in the first three sessions which tend to show inconsistent outcomes over the next five sessions. The last session indicates a positive affect for each state. These results reflect the staff observations indicating some on-task behaviour days and some off-task behaviour days. (See Appendix I for table of results).

Yoga Survey

The student's responses on the Yoga Survey conveyed that he felt he had more energy and he was a calmer and more relaxed person but he didn't feel stronger nor did he experience less mood swings and he continued to feel angry.

4.8.5 Summary of Case Studies

The first three case studies demonstrate that some children with disruptive behaviour are able to respond positively to a yoga program presented with sensitivity and respect. These children demonstrated that pro-social behaviour was in their behavioural repertoire, but this may be situationally determined (i.e. the conditions in the yoga class were very different to other settings in which behaviour occurs) even though descriptions by principals and teachers were negative based on observations in the classroom and playground. The fourth case study represented the

children who responded spasmodically to the yoga program and although pro-social behaviours were observed, the yoga program was not sufficient to alter these behaviours on a consistent basis.

YOGA AS AN ADJUVANT THERAPY FOR STUDENTS ENROLLED IN SPECIAL SCHOOLS FOR DISRUPTIVE BEHAVIOUR

Volume II

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5 Discussion

5.1 Introduction

This study examined the impact of yoga on a range of impairments in students enrolled in nine Department of Education and Training (DET) special schools for disruptive behaviour, in New South Wales, Australia. Students were predominantly displaying the disruptive behaviour disorders of ADHD, ODD and CD or were assessed by school counsellors with MH2 or MH3 (externalising or externalising and internalising). Many students had comorbid conditions, such as Anxiety Disorders, Mood Disorders, Learning Disorders and Aspergers Syndrome. The remainder of students, although undiagnosed, were displaying disruptive behaviour considered by school authorities to warrant enrolment in a behaviour school. Although a homogenous population is preferable for conducting research, this study could not have feasibly been conducted if this factor was an inclusionary criterion for recruitment.

It was intended that students from the participating schools would act as their own controls before participating in a yoga program. However, six of the consenting schools were unwilling to be involved in a control phase and wanted to commence the yoga intervention at the outset of the study. Therefore, students at only three of the nine participating schools acted as their own controls.

Eighty-eight students, (5 female) aged between 8 and 16 years were initially recruited with ten students withdrawing before completing the control phase, leaving seventy-eight students. Of the seventy-eight (78) students, sixteen (16) participated in the control condition followed by the yoga intervention, fifty–five (55) participated in yoga intervention only and seven (7) were in the control condition only. At completion of the intervention fifty-nine (59) students

had participated in over ten (10) yoga classes and twenty-four (24) students in over twenty classes (20) yoga classes.

The yoga program ran for 13 weeks with three sessions per week in the first six schools and two sessions one week and three sessions the next week in the last three schools (inconsistency due to time restraints), from April 2004 to December 2005. Sessions ran from 30 to 40 minutes at the same time of the day and on the same days of the week for each school. The program was comprised of *asanas*, breathing practices, chanting single sounds and relaxation. The PhD candidate is a support teacher for behaviour within the public school system and a qualified, experienced yoga teacher. She designed and taught all the yoga classes. The control group went about their normal school program while the yoga teacher joined in class room activities once a week to become familiar with the students and prevent the possibility of the Hawthorne effect.

All participants were pre-and post-tested on psychometric measures:

1. *Conners' Teacher Rating Scale-Revised: Long Version* CTRS-R: L) (Conners, 1997) was completed at pre and post the control and yoga phases.

2. *Conners' Parent Rating Scale- Revised: Long Version* (CPRS-R: L) (Conners, 1997) was completed at pre and post the control and yoga phases.

3. The *Test of Everyday Attention-Children* (TEA-CH) (Manly, Nimmo-Smith & Anderson, 1999) was completed at pre and post the control and yoga phases.

4. .*The Self Description Questionnaire I and II* (SDQ I & II) (age relevant) (Marsh 1990) was completed at pre and post the control and yoga phases.

5. .The *State-Trait Anxiety Inventory* (STAI-Y) (Spielburger 1983) (age relevant) and the *State-Trait Anxiety Inventory for Children* (STAIC/T) (Speilberger 1973) was completed at pre and post the yoga phase of the intervention.

6. *The Behaviour Assessment System for Children - Portable Observation Program* (BASC-POP) (Reynolds & Kamphaus, 1992) was employed to observe behaviour in the yoga classes and in the normal classroom setting.

7. Observation notes on behaviour of all students during yoga classes were taken by the students' teachers or teacher's aide during each yoga class.

8. A researcher designed self-report, the *Feelings Faces Scale* (FFS), was given to the students after the last yoga class for the week.

9. A self-report on *Physical, Emotional and Mental States* (PEMS) was collected before and after classes from students at two of the participating schools.

10. A simple yoga survey on the effects of yoga was completed by the primary school students.

11. An *Individual Assessment in Yoga Competence (IAYC)* was conducted in two schools

12. . Abdominal and thoracic breath rates were measured using *Summit Respiratory Inductive Plethysmography* (RIP) before, during and after a 10-minute relaxation session.

13. Case studies on three students were also conducted.

This extensive battery of measures was considered necessary to help inform on measures that are sensitive to the effects of yoga on children with disruptive behaviour, in this relatively unexplored field of research.

Unlike the yoga interventions in community homes for children with emotional and social problems (Raghuraj & Telles, 1997; Rauhala et al., 1990), the yoga intervention presented in this thesis represented only a small part of participants' lives. These students had many stressors and issues confronting them in both the home and at school. This factor influenced commitment levels to and benefits from the yoga intervention. Absences, due to sickness and truancy, suspension and lack of interest resulted in a number of participants withdrawing from the study or attending spasmodically. Interrupted attendance and non-completion of the program most likely resulted in the modest outcomes obtained on the psychometric measures and consequently the hypotheses relating to these measures, was generally not supported. However outcomes reported by the students in immediate proximity to the yoga classes and observation notes by the school staff and the individual assessment of a subgroup of students indicated high levels of motivation, competence, self-regulation and awareness which supported the proposed hypotheses in these measures.

5.2 The Behaviour School as a Location for Treatment Delivery

An effective means of service delivery is essential to the establishment of effective therapies. The school as a location to deliver health treatments is beyond the mandate of the NSW public schools, except for the employment of school counsellors and limited medical nurse

involvement and some mental health programs (Wyn, Cahill, Holdsworth, Rowling, & Carson, 2000). Although some special NSW Department of Education and Training (DET) schools do operate in conjunction with NSW Department of Health, these are few in number and expensive to operate. Of the fourteen behaviour schools approached by the researchers in this study to include a yoga program within their curriculum, nine were willing to commit to yoga classes and to the extra requirements of being part of a research study. The remaining five schools were receptive to the yoga program but other commitments and timing prevented their participation. This response could be considered as an indication of a need not currently being addressed for this very challenging subgroup of students. This response is also an indicator of a level of awareness about the potential benefits of yoga for students with disruptive behaviour.

Disruptive behaviour has negative impacts on both education and health. The feasibility of teaching self-regulatory treatments such as yoga in schools has several advantages such as, being inexpensive, accessible, un-intrusive, and readily adaptable to inclusion into the curriculum. Further, classroom teachers can readily be trained to practice and teach yoga in addition to their teaching skills. Considering that the delivery of psychosocial treatments to adolescents in the clinical setting has poor outcomes mainly due to poor attendance and denial of problematic behaviour (Kazdin, 1995a; Kazdin, 2003), establishing cost-effective treatments in school settings has the potential of gain higher rates of participation.

This study of yoga implemented in special schools for students with disruptive behaviour was the first undertaken in Australia. This setting was particularly suitable because the student-teacher ratio is 7:1, and each class has a teacher's aide, which enabled small groups to be taught without major reorganization of classes.

5.3 Student Attendance

Children who were motivated to attend the yoga classes, remained motivated throughout the class as concluded from participation levels (84.6% participated all or most of the time).

However, the number of attending students decreased with the length of the program. This affected timing of post-yoga assessment. Consequently, many children were assessed weeks after their last yoga class, which would have affected the results at post-test yoga on the measures-CPRS-R: L, CTRS-R: L, TEA-Ch, STAI-Y, STAIC/T, SDQ I and SDQ II. This could not be avoided for the following reasons:-1.there was no certainty regarding attendance persistence or attendance on assessment day, 2.consistent assessments time schedules needed to be maintained, 3.some assessments required the employment of behaviour observers and psychologists who needed to be hired in advance, and 4.BASC-POP observations in the classroom and the yoga class were reduced due to absenteeism on the scheduled days. However, length of overall attendance and attendance on specific assessment days was not a major assessment factor on the FFS, PEMS, RIP, individual assessments, and behaviour observations conducted by staff because these measures were taken regularly or in immediate proximity to yoga classes.

Researchers had little control over maintaining attendance. Students were absent from 40% of the classes offered. Over half of the absences were due to being absent from school, involvement with other school programs and suspension from school for gross misbehaviour. The remaining absences were due to fluctuating interest in the program. Attrition, absences and lack of cooperation on assessment days reduced the data collected and thus the power of the study.

Despite absenteeism, the school setting enabled the delivery of more classes per week and with the potential of more regular attendance than would have been feasible in any other available setting. Recruiting large numbers outside of the school system and relying on the commitment of parents, often with mental health problems and their children with severe disruptive behaviour, would have jeopardized the delivery of the program. Other yoga research studies involving children with disruptive behaviour and emotional disturbance were not conducted in behaviour schools, although some were conducted in schools. School studies took place in the mainstream school setting, where behaviours were not as severe as those of children attending behaviour schools (J. T. Hopkins & Hopkins, 1979; L. J. Hopkins & Hopkins, 1976; Peck et al., 2005). Other studies took place in the community homes, where the yoga program was delivered daily and home life was stable (Raghuraj & Telles, 1997; Rauhala et al., 1990). One study involved students in behaviour classes (Redfering and Bowman, 1981) but this study employed non-yogic relaxation techniques. However, behaviours in this study were most likely as severe and the research protocol did not include the family. Other yoga interventions that took place outside of the school environment had parental support (Denkowski et al., 1984; F. Dunn & Howell, 1982; Haffner et al., 2006; Harrison et al., 2004; P. S. Jensen & Kenny, 2004).

5.4 Results from Psychometric Measures

5.4.1 Conners' Teacher Rating Scales-Revised: Long (CTRS-R: L)

The CTRS-R: L measures the core symptoms of ADHD, which are hyperactivity/impulsivity and inattention, in addition to secondary symptoms and comorbidity (e.g. oppositional behaviour). Overall results did not support the hypothesis that yoga would reduce these symptoms.

However, pre- to post-test comparisons over a 13 week period on the CTRS-R: L, for the yoga group, indicated significant improvement on the Oppositional subscale, although this score remained in the Markedly Atypical Significant Problem range. No significant changes occurred in the remaining subscales or in any subscales for the control group. Significant improvement on the Oppositional subscale suggests that students were more compliant, less argumentative and more cooperative. Oppositional behaviour represents one of the most problematic behaviours for classroom teachers to manage. Oppositional behaviour is a main reason why students are referred to a special school for behavioural problems. This outcome is thus highly suggestive that yoga was having a modest impact on student oppositional behaviour.

The non-significant results on the remainder of the subscales are in contrast to the findings of other studies (Denkowski et al., 1983; F. Dunn & Howell, 1982; Haffner et al., 2006; Harrison et al., 2004; Walton, 1979) which reported reductions in hyperactivity after yoga or non-yogic relaxation. Findings of improved attention by Walton (1979), Rivera and Omizo (1980), Peck, et al., (2005) and Haffner et al.,(2006) also contrast these results. However,

none of the studies employed the CTRS-R: L to measure outcomes. Jensen & Kenny (2004) used the CTRS-R: L but found that teachers did not perceive significant changes in student behaviour after a yoga intervention.

Explanations as to why behavioural changes were not evident to teachers include the comparatively small dose of yoga compared with the high dose of classroom exposure in the special school for the student and the teacher which may have weakened perceived effects. The fact that teachers reported no change in the control group suggests that the behaviour school, from the perception of the teacher, was not having a positive impact on students' behaviour.

Further, an unavoidable difficulty in the collection of CTRS-R: L arose with the time lapse between the students' last yoga class and teachers' completion of the CTRS-R: L. This was caused by many students withdrawing from the program weeks before the designated end of the yoga program, without informing researchers of the temporary or permanent nature of their withdrawal. Time delays in post-test assessment do appear relevant, given the dose response effect observed in the measures taken immediately before, during and after yoga sessions. This problem could have been reduced by having a mid-intervention assessment using CTRS-R: L, but this would have been unacceptably onerous for teachers.

Teachers may not have given their full attention to completing the CTRS-R: L. Incidental observations indicated that teachers would rush through the completion of forms or only partially complete forms. Most of the behaviour schools were not relaxed environments. Teachers needed to be on their guard and ready to deal with any critical incident as it arose. This resulted in high stress levels for teachers – not a desirable environment to reflect in a measured way on subtle changes to students' behaviour. Further, there were thirty-one (31)

teacher informants from nine schools for the seven-eight (78) students in the study. For some students, different teachers completed pre-test and post-test questionnaires.

Analysis of individual schools' data revealed that one school had high attendance (apart from school absences) and involvement in the yoga classes. The teachers at this school also demonstrated consistently high levels of interest and cooperation. Additionally, all enrolled students were participants. This was not the case in the other schools. In one school only 20% of the students agreed to participate. In two other schools with enrolled secondary and primary students, only the primary schools students participated. In another three schools student interest waxed and waned, compounded by a lack of attendance due to work experience, home school visits and spasmodic school attendance. The length of classes in this high interest school tended to be longer because of the higher level of involvement. Whole-school involvement is important when assessing treatment outcomes. This factor draws attention to the efficacy of whole-school approaches to learning, behaviour management and health promotion (Fullan 2004; Wyn et al., 2000).

The complexity of factors discussed above needs be taken into consideration when interpreting the scores on the CTRS-R: L. Null results can not conclusively be attributed to a null effect.

5.4.2 Conners' Parent Rating Scales-Revised: Long (CPRS-R: L)

The CPRS-R: L measures the core symptoms of ADHD, which are hyperactivity/impulsivity and inattention, in addition to secondary symptoms and comorbidity (e.g. oppositional

behaviour). Overall results did not support the hypothesis that yoga would reduce these symptoms.

The number of respondents for the CPRS-R: L was low for pre-test (n=32) and lower for post-test (n=23, 16 yoga and 10 control), although schools made attempts to increase parental compliance. However those who did respond were the parents of students who generally did complete the yoga program. The low response rate could be partially explained by researchers being denied access to parents because of DET regulations and partially due to the low socio-economic circumstances of parents, many of whom were also suffering from mental health problems. A lack of access to parents resulted in researchers' inability to encourage, advise and assist parents in completing CPRS-R: L. Respondent numbers were increased with some teachers volunteering to complete forms for parents over the telephone; however, this process may have resulted in some teacher bias. Additionally, the short version of the Conners' Parent Rating Scales may have also been less onerous for parents to complete and the number of respondents may have increased. A critical review by Gianarris (2001) of the Conner's Parent Rating Scales found that CPRSs are an effective treatment measure, in particular the abbreviated version. However, subscales on social problems and anxiety are not included in the short version and these subscales were considered relevant to the aims of the current research.

Unexpectedly, significant improvements on ten subscales over time and on twelve subscales over time by group interaction were perceived by parents on the CPRS-R: L during the control phase of the study. Recent enrolment in the behaviour school may have contributed to improved parental perception of behaviour which may have stabilised with longer enrolment.

The group by time interaction, favouring the control phase was attributed to improvement during the control phase and some deterioration in the yoga phase. Significant deterioration and borderline deterioration over time in the yoga group was detected in six subscales but scores did not deviate from the pre-yoga problematic range. Reasons for deterioration from pre-yoga to post-yoga are difficult to explain.

The null results on the CPRS-R: L are in contrast to the studies of (Haffner et al., 2006; Harrison et al., 2004; P. S. Jensen & Kenny, 2004). Haffner et al. (2006) found that parents perceived significant changes after yoga practice both over time and in comparison with an exercise only group on an ADHD symptoms scale. Harrison et al (2004) found parents perceived significant improvement on the CTRS-A after a meditation intervention with ADHD children and their parents. Jensen and Kenny (2004) found a significant reduction after a yoga intervention over time and in comparison with a control group, in oppositional behaviour and emotional lability with a trend towards significance in anxious/shy behaviour and restless/ impulsive behaviour on the CPRS-R: L. In all of these studies the researchers had regular contact with parents and some parents were also participants (Harrison et al., 2004). This may be an important factor to consider because it ensures that parents are more sensitive to the aims of yoga and thus possibly more sensitive to the effects. However, as stated previously, parental involvement in this study was not feasible.

5.4.3 Test of Everyday Attention for children (TEA-Ch)

The hypotheses proposed that students' attention levels would be increased as measured on the TEA-Ch which tests for cognitive strengths and problems in three types of attentional systems. (i) selective /focused attention; (ii) sustained attention; (iii) attention shifting/control.

Significant changes over time were found for the yoga group and the control group on the TEA-Ch. In three out of five subtests that measured selective/focused and sustained attention, significant changes were in common. In two of these, the yoga group's improvement was more significant. The control group only, indicated significant improvement in attentional shifting/control. Sustained attention in particular, has been found to be impaired in ADHD children compared to norms (Manly et al., 1999). Because the yoga and control groups indicated significant improvement in sustained attention, no conclusions can be reached. Additionally, mean score differences from pre –to post-test did not exceed two age-scaled points in 10 out of 11 subtests and in the one remaining scores did not exceed four age-scaled points. Authors of the test, Manly et al, (1999, state that significance requires an improvement of at least five age-scaled score points (i.e. to represent 5% or less of the population). Significant improvement using group by time interaction was seen in one subtest of attentional control favouring the control group. However, the mean score difference was less than two age–scaled score points. From these outcomes the hypotheses were not supported.

Reasons for improvements over time could be attributed to maturation. Manly et al (1999) state that the attentional skills being measured by the TEA-Ch develop rapidly in childhood; therefore, retest scores from the second version of TEA-Ch obtained more than 20 days after testing with the first version should not be compared to norms. The time period between testing in this study was over three months; therefore, improved changes in attention may well be due to maturation. However, because significant improvement was not seen in all subtests, maturation alone can not fully account for results.

Reasons for lack of improvement in the remainder of the tests could be due to continuing impairment in those aspects of attention specifically tested in these subtests. Another

contributing factor, reported by the examining psychologist, was waning interest by some of the participating students as they moved through the test. Further, an unavoidable difficulty in the collection of TEA-Ch arose with the time lapse between the students' last yoga class and the completion of the TEA-Ch. This was caused by many students withdrawing from the program weeks before the designated end of the yoga program, without informing researchers of the temporary or permanent nature of their withdrawal. Time delays in post-test assessment may have been relevant given the similarity of control and yoga students' outcomes.

5.4.4 State-Trait Anxiety Inventory - Y (STAI-Y) and State-Trait Anxiety Inventory for Children - Trait (STAIC/T)

Students' self-reports on anxiety levels (STAI-Y and STAIC/T) did not reveal significant changes as a result of the yoga intervention. However, anxiety levels at pre-test were in the range of the normal population (Spiellberger 1973, 1983). These results do not reflect the diagnostic status of the participants which identified 58.9% having either internalising or combined internalising and externalising behaviour problems. Additionally, this sample could be regarded as representative of a population that is prone to comorbid anxiety (Milberger, Beiderman, Faraone & Tsuang, 1995; Beiderman et al., 1996b; Jensen et al., 1997). Results could be a reflection of inaccurate reporting, either intentionally through not wanting to admit impairment or a lack of self-awareness. These explanations have been posed by investigators in their reports of outcomes on self esteem measures employed in similar samples (B. Hoza et al., 2004; B. Hoza et al., 2002).

Results on levels of anxiety, in this study's sample, as perceived by teachers on the CTRS-R: L at pre-test, indicated levels of anxiety in the 'Moderately Atypical Possible Significant Problem' range for both the control and yoga groups and at post-test remained in the same range for the yoga group and deteriorated to the 'Markedly Atypical Possible Significant Problem' range for the control group. In contrast parental perceptions of anxiety levels remained in the 'Borderline-Slightly Atypical Possible Significant Problem' range for the yoga group at pre- and post-test and moved from the 'Mildly Atypical Possible Significant Problem' range at pre-test to the average range at post-test for the control group. It appears that in the school setting students anxiety levels as perceived by teachers were at concerning levels and more in accordance with expected levels.

The null results in the study sample contrast with Kalayil, (1989) who tested the effects of yoga meditation (YM), Progressive Relaxation Training (PRT), Catnap (CAT) and Magazine Reading (MR) on the anxiety levels of healthy students using the STAIC/T. Findings indicated that students' anxiety levels were reduced to a greater degree after practicing yoga compared with all other treatments.

Results are also in contrast to the results found in studies reviewed by Kirkwood et. al. (2005) and Brown and Gerbarg (2005a) that indicate significant reductions in anxiety in clinical patients and non-clinical adults after the practice of yoga.

Explanations for a lack of identified anxiety as perceived by participants in the study sample and no significant changes in anxiety levels after yoga could possibly be attributed to poor perception or denial. According to the literature, there is a lack of trust in self-report by adolescents with ADHD (Barkley, 1998; Wender, 1987; Hoza, Pelham, Dobbs, Owens, Pillow, 2002). But contrary to these findings is a report by, Smith, Pelham, Gnagy, Brooke,

Evans (2000). This report proposes that the lack of trust in adolescent reporting may be unwarranted because more studies are indicating that adolescents may be better sources of information about psychiatric symptoms (depression and anxiety) and covert anti-social behaviour (shoplifting and substance abuse). However there appears to be a distinction between accurate reporting of ADHD symptoms where self-reports continue to be unreliable (Hoza, Pelham, Dobbs, Owens, Pillow, 2002) and reporting on the internalising symptoms of depression and anxiety. Regarding reasons for variance between self-report by adolescents and adults Smith et al. (2000), suggests that adult perceptions are based on behaviours adolescents display in adult company and may not indicate internalised feelings. However, these conclusions do not accord with the self-reported low anxiety levels in the sample and higher anxiety levels perceived by teachers. Having a combination of internalising and externalising behaviour problems may be a factor influencing the sample's perceptions in the other direction.

Overall the mean results from the STAI-Y and STAIC/T offer no conclusions as to the effect of yoga on anxiety levels in the sample however wide standard deviations in the mean scores and results from some case studies suggest for some students anxiety was reduced.

5.4.5 Self Description Questionnaire I and II (SDQI & II)

The students' self-reports on self-concept, in this study, as measured on the Self Description Questionnaire (SDQ1 &2) did not reveal any significant change therefore the hypothesis was not supported. However pre- and post-test results for the control and the yoga groups were comparable with normative levels (Marsh, 1990- author of SDQ I & II). Self-concept is known to suffer in children with behaviour, learning and social problems (Hoza et al, 1993;

Gresham et al 1998 as cited in Hoza, Pelham, Dobbs, Owens, Pillow, 2002). It was considered that yoga could influence young peoples' perception of themselves as it has been found to do so in some adult yoga studies (Dhume & Dhume, 1991; Ghoncheh & Smith, 2004; Schell et al., 1994) and in one child yoga study by Omizo (1980) who found significant improvements in the areas of anxiety, level of aspiration, identification versus alienation, leadership and initiative after non-yogic relaxation.

In contrast to students' reported normative levels of peer and parent relationships, were teachers' and parents' perceptions. At pre-test and post-test, in the yoga and control groups, teacher reports on the CTRS-R: L, Social Problems subscale T-scores were in the Mild to Moderate Significant Problem range (not greater than three T-score points difference). At pre-test and post-test parents reported social problems in the Markedly Atypical Significant Problem range for the yoga group and in the Mildly Atypical Significant Problem range on the CTRS-R: L, Social Problems subscale fore the control group. However, standard deviations were high (≥ 16) for T-scores.

The null results on the SDQ I and II compare with results of other yoga studies of young people (Denkowski et al., 1983, 1984; Harrison et al., 2004) who found that self-esteem levels at baseline were either within normal range or overinflated and did not change over the course of yogic or non-yogic relaxation interventions.

Self-esteem in children with ADHD is reported as low from a parental, teacher and clinician perception particularly in an academic, social and behavioural context (Hoza et al, 1993; Gresham et al 1998 as cited in Hoza, Pelham, Dobbs, Owens, Pillow, 2002). However other studies (Ialgongo et al 1994; Horn, Wagner, Ialango 1989) consider this not to be the case.

To investigate this further, Hoza, Pelham, Dobbs, Owens, Pillow (2002) found that ADHD boys overestimated their self-perceptions more than controls in the scholastic, social and behavioural domains relative to teacher-rating criterion. Comorbidity subgroup analyses suggested that ADHD boys tended to overestimate in the domains in which they were most impaired. For the ADHD boys with aggression, overestimations were detected in the social and behavioural domains, with low achievement, in scholastic domains. However those with depression reported lower levels of self-perception in most domains but not in the behavioural domain. The question arose with the authors as to why inflated self-perception arises in the ADHD population. Suggestions for this response include protecting themselves from admitted failure in many domains of impairment, (i.e. as a coping mechanism), inflating themselves as a conscious effort to project a positive image or inaccurate perception. These suggestions may be relevant relate to the participants in this study's sample. Although the SDQ I and II are demographically appropriate to the current study sample regarding location, that is, Sydney, Australia, learning, emotional and behavioural impairments may have influenced applicability of these questionnaires. This distinction needs to be considered when interpreting results due to some students having learning and language impairments, some being oppositional, some having attention problems, all factors that could impact on the students' ability to accurately report. Spiegel's (1996) work re patients who suffer from severe symptoms of emotional and cognitive disturbance being less likely to cooperate with medical treatment and participate in research is plausibly relevant to some students in this study sample.

Another factor which may have influenced outcomes was the variability in conditions in which forms were completed. Some students completed forms in groups with a supervising teacher or individually with a teacher or a researcher. Varying degrees of assistance were

warranted to help with entering responses, reading and comprehending questions. Additionally forms were completed by some students, weeks after their last yoga class.

5.4.6 Subgroup Analysis

It was considered that dose may improve efficacy of treatment. Subgroup analysis on students who attended over 20 yoga classes was conducted for the CTRS-R: L and the TEA-Ch. The children rated by their parents all attended more than 20 classes therefore supplementary analysis was necessary. Subgroup analysis did not significantly affect outcomes on the CTRS-R: L nor the TEA-Ch although the CTRS-R: L Oppositional subscale indicated increased significant improvement. However, examining attendance in over 20 classes, data did not necessarily alleviate the effect of students withdrawing before the end of the program**.** Subgroup analysis of the students who acted as their own controls (n=16) demonstrated significant effects (not seen in the analysis for the total yoga group) in one test of focused attention and in one test of switching attention favouring the yoga phase which demonstrates added power from the design originally intended for the total group.

5.5 Behaviour Observations

5.5.1 Behaviour observations using Behaviour Assessment System for Children-Portable Observation Program (BASC-POP)

The BASC-POP was employed to observe students in their normal classroom in the behaviour school and in the yoga classes to investigate the hypotheses that yoga would decrease off task behaviours of inattention, hyperactivity, impulsivity and oppositional behaviour. Classroom observations were conducted by independent blind raters and yoga classes were observed by independent blind raters and the main researcher. DSM-IV, ADHD and ODD diagnostic criteria were customised on the BASC-POP, enabling behaviours specific to the externalising behaviour to be observed. Videoed yoga classes enabled multiple observations by multiple observers which increased the reliability of observations.

Results indicated some significant improvements in classroom behaviour over time for the yoga group and in the group by time interaction favouring the yoga group. Results from videoed yoga classes indicated significantly less problematic behaviour at the beginning of the intervention and the end of the intervention compared with pre- and post-test classroom observations. On- and off-task behaviour observations of students (n=33), doing yoga indicated increasing levels of compliance from the beginning to the end of the intervention. Compliance in the yoga classes indicates that the students were following instructions and demonstrations which required focusing attention and controlling movement and at times either sitting or lying still. Performing these skills, gave students the experience of being less hyperactive and less impulsive and become more attentive. Students also experienced a

willingness to follow the directions of a teacher without the need for questioning their authority or feeling threatened by the task. These observations infer support for the hypotheses that motivation, competence, awareness and self-regulation would be increased and relaxation skills developed.

Observing students is a direct means of assessing behaviour and if conducted correctly can be a highly reliable source of data. Unfortunately, the behaviour observations conducted in the classroom in this sample underwent some problems. Valid observations were reduced due to the researchers' lack of vigilance in monitoring behaviour observers which resulted in one observer's observations being discarded due to falling below inter-rater reliability levels. Another fourteen sets of data were lost due to technical problems. This technical problem could not be rectified because the company that produced the BAS-POP was sold to another company and requests for support were not answered by the new company. These problems resulted in the loss of the majority of data leaving only nineteen valid sets of observational data from classroom observations. Unavoidable inconsistencies in classroom observations arose in relation to the timing and type of lesson from pre- to post-test. This could have contributed to changes in behaviour apart from the possible changes due to the intervention. It is well known that the time of the day and how engaging a lesson is can affect behaviour in healthy students and more so in students with behaviour problems (Harris, 2008; Nichols, 2008; Yogabhakti, 1985). None of these problems were encountered in the yoga class BASC-POP observations.

Regardless of these shortcomings, the reduction of off-task behaviours in the classroom, was comparable with other yoga interventions (Peck et al., 2005) and non-yogic relaxation interventions (Redfering and Bowman, 1981) that controlled for time and type of lesson. The

Peck et al., (2005) and the Redfering and Bowman (1981) trials simplified observational data collection by recording on- and off-task behaviours only. Students were regarded as attending or not attending to class tasks set by the teacher. Although descriptors of off-task or non - attending behaviour were not specified in these studies, such terminology includes hyperactive, impulsive, inattentive, aggressive, and oppositional behaviour. In review, it may have been more effective to measure on- and off-task behaviours only in the classroom instead of the complex set of behaviours reflecting the DSM-IV diagnosis criteria for ADHD and ODD behaviours.

The problem with the unreliable rater would also would have been addressed if inter-rater reliability have been conducted on classroom observations and not just on yoga class observations. This is acknowledged as a methodological fault that was hard to address at the time due to the researcher (also the yoga teacher) not being available to do ratings at the same time as the employed rater and the lack of other available raters and equipment (extra laptop—not an issue in 2009 but was in 2004-5) at the time to do number of ratings required to test for inter-rater reliability.

On- and off-task behaviours, in addition to ADHD and ODD behaviours were observed via video in the yoga classes. Analysis was conducted for students present at the beginning and at the end of the intervention. On- and off-task behaviours were observed for all students that took part in a least one of the videoed classes. These results indicated high mean percentages of on-task behaviour.

Subgroup Analysis for BASC-POP

Subgroup analysis was conducted for eight students who acted as their own controls comparing students' behaviour at all assessment times prior to and post yoga class

assessment. The outcomes reflect more pronounced significant results than for the total group, that is, low problematic behaviour in the yoga classes compared to any other assessment time.

5.5.2 Teacher and Teacher's Aide (Staff) Observation Notes in Yoga Classes

Staff notes indicated a positive response to the hypotheses that addressed (i) attention to, task, (ii) positive mood and self-state, (iii) increased awareness and self -regulation, (iv) a positive attitude towards and response to yoga, (v) competence in learning yoga techniques, (vi) motivation to learn and participate in yoga class, and (vii).develop the ability to relax.

Staff observations provided a qualitative component of the study although data was quantified in relation to identifying positive and negative descriptors. This measure provided valuable moment to moment information about each child's behaviour in the yoga class. The method was not restricted to a prescribed formula, giving freedom to observers to state in their own words what they were observing. Displaying the content of the class visually, gave a framework in which observational comments could be placed. Through this method, positive/on-task descriptor behaviours were found to outnumber negative/off-task behaviours for both randomly selected students and for the total group. These results provide evidence of the development of abilities and states set out in the hypotheses listed above and are suggestive of less hyperactivity, impulsivity, inattention and oppositional behaviour in the school setting, in a group situation under the supervision of a teacher. Self-Reports

The inclusion of self-report measures, utilized on a daily and weekly basis, helped to overcome spasmodic attendance and attrition which severely impacted on the collection of

pre- and post- measures and was valuable supplementary data on behaviour and well-being. The common essential element of the daily and weekly self report measures was the speed and ease of administration. Due to unavailability of standardised measures, researchers needed to design and source measures both applicable to the participants and sensitive to potential effects of yoga.

Self-reports on the FFS and the PEMS contrasted the overall results on the psychometric measures. The possible explanation for this could be that this data was collected in close proximity to practicing yoga and required students to express how they were feeling in the moment. This may be a very important factor as the other self-reports (SDQ I & II and STAI-Y & STAIC/T) were not administered in close proximity to practicing yoga and required students' perceptions over time. On reflection it may have been better to administer the State component instead of the Trait component of the STAI and the STAIC in close proximity to pre-and post-yoga sessions. The State component requires respondents to report on how they are feeling in the moment. The FFS and PEMS were also quick and simple and thus more suitable for a sample of students who can become 'bored' quickly, can have poor reading and writing skills, and as we have seen from the literature be poor reporters about the areas in which they are most impaired (Hoza et al., 2004). The FFS and the PEMS did not require students to generalize perceptions or seek self - value judgments nor did they require complex thinking skills. Although these trait self-perception assessments are valuable, if reliability is questionable, simpler more reliable measures are more valid.

5.5.3 Feelings Faces Scale (FFS)

The FFS investigated hypothesised improvements in motivation, attention, mood and competence after practicing yoga. The self-report *Feeling Faces Scale* indicated high levels of happiness, calmness, enjoyment and competency immediately after the last yoga class of each week during the intervention. These results reflect a high level of well-being in a sample of students who suffer from a complexity of problems which diminish well-being.

When examining the FFS components of happiness, calmness, enjoyment and competency, the following comments emphasise the significance of the findings which support the hypotheses (in italics). The students expressed:

- Happiness after a yoga lesson. For students to feel happiness after a lesson in which they had listened, followed directions, were still, quiet and *attentive* (all tasks which students with disruptive behaviour have problems with) is suggestive of a lesson that was suited to the students needs.

- Calmness and *relaxation* in a group who are prone to physical and verbal violence and abuse. This may indicate the students felt at ease, safe and with no threatening expectations.

- Enjoyment indicating *motivation* and satisfaction. This could imply that being able to progress at their own rate, in a non-competitive environment while learning about personal limits and strengths was satisfying to the students.

- Competence in learning new skills indicating self confidence, capability and persistence.

5.5.4 Physical, Emotional and Mental State (PEMS).

The PEMS investigated hypothesised improvements in self-states and the awareness of self states after practicing yoga. Significantly improved emotional wellbeing, mental clarity and balanced energy levels (self-states) is indicated in the results from a subgroup of students who reported daily, immediately before and after participation in a thirty (30) minute) (approx.) yoga class.

Negative moods decreased, positive moods increased and energy levels increased (less tired, more energetic). Moods immediately before the yoga session tended to be ranked towards the lower end of the scale but this tendency diminished over the course of the intervention. Post yoga sessions reports, indicated consistent improvement over the course of all yoga sessions. No significant improvement was seen towards the end of the program because pre- and post-scores were similarly high. This could be attributed to residual effects of yoga over time. However numbers were small in these sessions therefore caution should be exercised in this interpretation.

Although PEMS scores were collected aurally in the group, student to student scores varied which indicates students were not generally influencing each another.

Although the reliability and validity of this measure has not been tested, this measure proved to be acceptable to the students and a workable method of collecting important data from a sample of a population who tend to be difficult to engage in and commit to research studies. These outcomes warrant further investigation of the validity of this measure for children with disruptive behaviour being taught yoga.

The PEMS required a subgroup of students to express an awareness of how they felt, physically, emotionally and mentally before and after each yoga class. The FFS required students to express how they felt emotionally and physically immediately after a yoga class. This process resembles the initial skills taught in cognitive behaviour therapy (CBT). CBT requires participants to become aware of how they are feeling but not unlike yoga, is problem-solving oriented and cognitively challenging (Wicks-Nelson & Israel, 2003). The awareness developing in yoga can lead to developing self-regulatory abilities (Martin, 1997) through body oriented activities where emphasis is placed on consciously focusing the attention.

Shapiro et al., (2007) used a similar measure to the FFS and the PEMs, although with more items (twenty) and with a Likert design to test for mood immediately before and after a yoga session with adults diagnosed with depression. Similar to results of the current study, results indicated significant immediate changes from before to after each class.

5.6 Individual Assessment in Yoga Competence

Individual assessment of Yoga Competence investigated hypothesised improvements in motivation, competence, self-regulation, ability to relax, awareness and the symptoms of ADHD and ODD. Results from the *Individual Assessment of Yoga Competence* indicated the students' ability to perform postures and techniques by themselves with only a visual agenda of the class and minimal coaching from the yoga teacher. These results combined with program attendance and program attitude indicated a high level of involvement, motivation and competency in the subgroup of 11 students from two schools who agreed to participate in a detailed assessment of acquisition of yoga skills.

Skills demonstrated in the individual class assessment were evidence of attention, focus and concentration; minimal restlessness, hyperactivity, and impulsivity; disciplined action; self-direction and self-regulation. However, being assessed individually would have reduced distraction and inappropriate interaction. These results indicate the level of involvement, motivation and competency this subgroup of students displayed, as an outcome of the program. It suggests with regular practice, effects are substantial.

5.7 Yoga Survey

The Yoga Survey is a simply worded and quick to complete questionnaire specifically designed by the researchers. It measures yoga outcomes and is suitable for primary school students with behaviour and learning problems. The survey, administered at the end of the study, indicated perceived benefits of increased strength, flexibility, energy, calmness, and reduced anger and mood swings. To disrupt positive bias one of the six questions was negatively worded. Additionally, two questions were similar to check for response consistency. None of the completed surveys were invalid. However the positive bias of most questions may have influenced outcomes.

5.8 Physical Measure-Summit Respiratory Inductive Plethysmography (RIP)

It was hypothesised that the practice of *Yoga Nidra* would stabilise unstable breathing patterns and indicate the relaxation skills could be developed. This study examined breathing

patterns using the *Summit Respiratory Inductive Plethysmography* (RIP) during a *Yoga Nidra* session in a subgroup of seven students only, due to delays in gaining approval for use the measure from DET. The subgroup represented a range of externalising and internalising behaviour problems with comorbid emotional disturbances and learning disorders. Outcomes compared participants' pre-, during and post-results and were also compared with three students without disruptive behaviour results. Although data collected from the three students without disruptive behaviour cannot be regarded as control data (not matched for age or gender) it serves as an indication of breathing patterns in adolescents without disruptive behaviour with and without yoga experience.

Yoga Nidra, taught progressively over a 13 week period, proved to be a feasible means of exposing students with high levels of restlessness, oppositional and aggressive behaviour to a relaxation experience. A high degree of compliance indicated that the students had acquired the ability to remain still and quiet for up to 20 minutes; were able to follow a teacher's instructions; and developed enhanced sensory awareness through recognition of the somatic aspect of the breathing process and various parts of their bodies.

Baseline breathing data showed large within and between subject instability in breathing patterns within the disruptive behaviour group and compared with the students without disruptive behaviour.

In the pre-*Yoga Nidra* phase, students in the Disruptive Behaviour group displayed continuous fast, irregular and sometimes chaotic breathing particularly, which is possibly suggestive of hyperventilation (although it could also be regarded as a the extreme end of normal breathing), previously found to cause an increase in skin conductance (Kartsounis & Turpin, 1987) which is associated with anxiety and stress (Ley, 1999). The unstable breathing

patterns recorded in the DB group, especially in the pre-*Yoga Nidra* phase, are frequently associated with anxiety, in particular panic disorder and panic attack, yet only one boy had an anxiety disorder (PTSD) (participant 1) and one was assessed as having both internalising and externalising behaviour symptoms (participant 6). Although two others had emotional disturbances (participant 2 and 5) which may or may not have been associated with anxiety, neither reported anxiety, yet had breathing patterns consistent with anxiety. The three remaining boys had externalising disorders only, yet two displayed erratic breathing patterns at the pre-*Yoga Nidra* stage. It appears from these results that behaviour problems may affect breathing patterns but larger numbers are needed to confirm this observation.

During the *Yoga Nidra* practice, as evident from observations of one minute screen shots, mid phase and to lesser a degree full phase screen shots showed trends towards normalising breathing patterns, stabilising breath rate and regulating amplitude. This change could be seen as a relaxation response which could contribute to a reduction in hyperactivity according to the theory of Braud et al. (1974) cited in Dunn and Howell (1982). Braud et al (1974) theorised that muscle tension and inability to relax contribute to and exaggerate the symptoms of hyperactivity.

Although breathing rate remained relatively high in five of the seven DB students during the *Yoga Nidra* phase, breathing was more regular despite being somewhat shallow. Results for participants 6 and 7 during *Yoga Nidra* and participant 1 after *Yoga Nidra* are consistent with previous research showing that relaxation training reduced respiration rates (S. P. Sarang & Telles, 2007; Schleifer & Ley, 1994; Telles et al., 2000). The practice of *Yoga Nidra* gave all the students with DB varying degrees of relaxation associated with more normal patterns of amplitude or slower breathing rates (Ley, 1999; Stovik, 2000).

Telles et al (1997) also found a reduction in breathing rates in a similar sample undergoing a yoga program. Other studies have reported reduced breathing rates and volume after yoga relaxation and meditation (Aftanas & Golocheikine, 2005; Aftanas & Golocheikine, 2001, 2002; Arumbula, Peper, Kawakami, & Gibney, 2001; Goyeche, Abo, & Ikemi, 1982; H. Herzog et al., 1990; Kjaer et al., 2002; S. P. Sarang & Telles, 2007; Telles, Nagarathna, & Nagendra, 1995; Telles et al., 1998; R. P. Vempati, Telles, Vempati, & Telles, 2002).

In the 5 minutes after *Yoga Nidra* four of the seven students retained increased stability. The breathing of participant 2 became irregular after the *Yoga Nidra* practice compared with his breath patterns during practice, but he was keen to get up and did not want to remain still (as reported to the researcher). The post *Yoga Nidra* instability also seen in two other participants (5 & 6) may have also been a result of frustration at having to remain still after the practice was complete. This is suggestive of the difficulty the DB students have in remaining still when the mind is not focused. The effects found in this study could indicate a reduction in sympathetic arousal which is associated with a more relaxed state (Pal et al., 2004; R P Vempati & Telles, 2002). While all students in the post *Yoga Nidra* phase were no longer mentally engaged in the focus-oriented practice of *Yoga Nidra*, many were able to remain still for the purposes of further data collection.

The children with disruptive behaviour in this study developed an ability to remain still for the duration of the practice. Their behaviour during *Yoga Nidra* is consistent with other findings that suggest that *Yoga Nidra* is characterized by a reduced desire for physical action or activity (Kjaer et al., 2002). To achieve this state in young people with DB, *Yoga Nidra* is useful given the excessive activity and impulsivity of children with disruptive behaviour disorders as categorised in the DSM-IV-TR (APA, 2000).

Erratic breathing patterns, in this sample of children, suggests irregular autonomic nervous system (ANS) activity. Other indicators of ANS activity are the heart rate, galvanic skin resistance, blood pressure all of which have been found to be irregular in children with disruptive behaviour (Boyce et al., 2001; Garralda et al., 1991; van Lang et al., 2007). Irregular breathing patterns are associated with the internalising anxiety disorders (Ley, 1999; Pine et al., 1998; Stovik, 2000) but an association between irregular breathing patterns and disruptive behaviour has received little attention in the literature and the results of this study suggest more investigation is warranted.

5.9 Case Studies

Three observations with respect to the pre- and post- test assessments on the standardised measures resulted in the decision to present some individual case studies, as follows: (i) there were very few significant differences on the standardised measures between yoga and control groups; (ii) there were very large standard deviations on most of the standardised measures indicating wide variability in outcomes; and (iii) a consistently positive response from students in the yoga group on the rating scales used immediately after the yoga classes to asses their response to the yoga experience. These scales provide some evidence that these very disturbed young people were both receptive to and positive about their yoga experience. It is note worthy that young people with behaviour problems can respond positively to a program that requires high levels of controlled movement, appropriate focused attention on internal and external stimuli and that require periods of silence and stillness. There were, of course, students who lost interest and who at times were uncooperative and displayed the symptoms of ADHD and ODD in the yoga class. The behaviour of children with disruptive

behaviour is by its nature highly variable and responsive to environmental contingencies. An examination of individual responses over time may be instructive with respect to these variable patterns of behaviour.

A consistently positive response was evident on all outcome measures for Case 1. These outcomes were in contrast to the principal's observations of the student's progress. Case 2 initially responded with enthusiasm and confidence reflected in staff observation notes and non-standardised self-report measures taken on a regular basis. Withdrawal early from the program, most likely influenced psychometric outcomes at post-test. Case 3 had a consistently positive attitude and participated fully in yoga classes. This positive attitude was reflected in staff observation notes and non-standardised self-report measures taken on a regular basis. Psychometric yoga outcomes were unchanged for attention levels and were positive for some of the self-concept subscales and differed considerable from parent to teacher. The variability seen in outcome measures even though student's responses were positive, highlights the importance of conducting case studies. Case Study 4, known for his severe aggressiveness, fluctuated in his response to the program which appeared to be mood dependant. Variable responses were reflected in staff observation notes of yoga classes and self–reports on non-standardised measures. Off-task behaviour times, which may have been due to home life changes, were too difficult for short yoga sessions to influence. However, outcomes on the standardised measures were variable. Some improvements were demonstrated on the TEA-Ch and SDQ I, STAIC/T outcomes remained stable and not suggestive of anxiety. CTRS-R :L outcomes were average at pre-test and indicated some deterioration in two scales at post-test.

Case studies outcomes, particularly in the non-standardised measures, reflect how effective a yoga program can be for some students and less so for others. The wide variability of

responses on psychometric measures in case studies, seen also in the total means standard deviations is most likely attributed to many factors difficult to control for and cannot solely be attributed to yoga having a null effect.

5.10 Awareness and Yoga

Yoga aims to promote awareness (Satyananda, 1981) and it was hypothesised that awareness would be developed in the students experience of yoga. Awareness was demonstrated in the nature of the student's participation in the yoga program. Participation required directing the awareness predominantly towards the body, the body sensations and the breath and to a lesser degree the emotions and the mind.

Body awareness was promoted through moving the body into positions that required steadiness, balance, coordination and strength. Awareness of sensations was promoted through becoming slower in movements and directing the attention to how the body was responding to this movement for example, the sensations of heat, strain and stretching. Sensations were also observed during relaxation when the body was still, for example, listening to external sounds and the sound of the breath. The students were instructed to be aware of how the body was responding to movement and making mental adjustments to achieve the required movement, for example placing more weight on one leg and adjusting the position in order to attain a balance pose. Awareness of the sensations of feelings were promoted, for example, through the contact between the body and the floor, being aware of the body breathing and being able to subtly feel the presence of body parts and the body as a whole. Perseverance, endurance and will were required to achieve and sustain a posture without causing imbalance, pain or injury. Breath awareness was promoted by following

instructions, for example, to inhale when moving into a pose and exhale when moving out of a pose. Following these instructions enabled the students to experience the sensation of expansion with inhalation and relaxation with exhalation and the knowledge they could have some control over the breath. The breathing practices performed when sitting still, enabled the students to manipulate their breath by increasing the inhalation and exhalation rate and volume. Awareness of expanding and contracting the upper and lower chest and the abdomen and diaphragm taught students how to voluntarily deepen the breath. The deepening of the breath enabled the students to experience what could be perceived as a sense of calm, witnessed by their stillness and quietness The calming effects of breath awareness and deepening the breath are well documented in 'The Science of Breathing-the Yogic View' by Stovik (2000) and 'The Modification of Breathing Behaviour' by Ley (1999).

It can be seen from the fewer behavioural problems in the yoga class compared with the classroom that the engagement of the students' attention may have been instrumental in achieving this. In practicing yoga, the students' attention was readily engaged in their bodies. Initially their eyes were engaged in watching how to do a movement and their minds in following instructions and demonstrations. Progressively self-directing their attention to the task was required. Additionally, time was allowed for the students to feel any sensations arising from performing the techniques. Awareness of how the body and mind responded to postures in such areas as flexibility, endurance, strength, calmness and stillness were all factors that presumably contributed to reducing inattention, restlessness, hyperactivity, impulsivity, oppositional behaviour and aggression. Students were encouraged to progress at their own rate and competition was discouraged. However, students encouraged one another through attempting poses and on occasions worked as a group to form a group pose. Failure or inadequacy, which can be a contributing factor for children displaying disruptive behaviour

(Norris & Hoffman, 1996; Rowe, 1994) was not generally observed in the yoga class. However, it is possible that failure or inadequacy may have caused disinterest and non-attendance as some students were very inflexible and some very lethargic. Relaxing of the body and mind led students to feel comfortable and trusting, ascertained by their willingness to lay still and quiet often with their eyes closed with other students in close proximity (students with whom they may have had a disharmonious relationship). A willingness to cooperate while listening to instructions from the yoga teacher demonstrated the students' capacity to be focused and attentive. However were situations were students took some time to settle and some students were asked to leave the class by the school staff due to not settling but this type of behaviour was expected.

Apart from the content of the intervention, the delivery of the program was important. Catering to diverse learning requirements (visual, kinaesthetic and clear verbal instruction) is essential teaching strategies for children with behaviour problems (Barkley, 2001; Patterson & Wardanian, 1998; Richmond, 2007; Wicks-Nelson & Israel, 2003) and would have contributed to increasing engagement. The physical nature of many aspects of yoga, the visual representation of the class in the form of an agenda and the demonstration of poses could have helped reduce the aspects of inattention arising from cognitive deficits evident in children with ADHD (Plizska et al., 1996; Rowe, 1994; J. M. Swanson et al., 2007).

5.11 Awareness and Self Regulation

The preceding section has discussed the aspect of awareness as being a large component of the yoga program taught to the study sample. Martin (1997), in a paper on mindfulness discusses the development of self–regulation through increased self-awareness and ultimate

implications for health. For children with hyperactivity and impulse control problems, the lack of self–regulation, according to Barkley (1996) is due to cognitive impairments and is outlined in his theory of behavioural disinhibition. In relation to learning, Bandura (1997) found after two decades of research that self-efficacy was the most powerful predictor of persistence in learning and effective academic outcomes.

There is a lack of self-regulation in the children with externalising behaviour. The central and autonomic nervous system of children with externalising behaviours has been found to be under-aroused particularly to neutral stimulation and require greater stimulation to achieve optimal arousal (Searlight et al., 2001). The need to arouse have been associated with higher risk taking or sensation seeking behaviour (Searlight et al., 2001). Psycho-stimulants in conjunction with behaviour management are commonly used strategies to increase regulation (R W Greene & Ablon, 2001). For the children with self-regulation deficits, the development of self-regulation can be empowering and contribute to reducing of the level of 'external' control from teachers and parents. External control is frequently challenged by young people with externalising behaviour problems and frequently results in arguments, violence, management plans, detentions and suspensions.

Exercise was found by Oaten and Chen (2006) to promote self-regulation by improving regulatory stamina, resistance to distraction and daily behaviour habits. Tantillo, Keswick, Hynd, and Dishman (2002) reported the effects of exercise on children with ADHD. Significant increases in spontaneous blink rate, after maximal exercise, in particular for boys was found, which suggested that exercise could be acting as a dopaminergic adjuvant (similar to psycho-stimulants). Although the Oaten and Chen (2006) study sample were students without disruptive behaviour, results are relevant to the problems experienced by young

people with disruptive behaviour. The Tantillo et al., (2002) studies findings are highly relevant to yoga studies due to the large exercise component of yoga. The student self-reports collected in close proximity to practicing yoga and behaviour reports by independent blind observers and non-independent observers indicate an improvement in self-regulation observed through a reduction in hyperactivity/ impulsivity and inattentive behaviours in the classroom, low levels of off-task behaviours in the yoga classes and a predominance of on-task behaviours in the yoga classes as reported in the behaviour observations of school staff.

Self-regulation also occurs on an unconscious level or involuntary level due to the effects of postures, breathing and relaxation on the central nervous system (CNS) and the autonomic nervous system (ANS) as mentioned in Section 2.4 and 2.5. Yoga practices influence, for example, brain wave frequencies, glucose metabolism and cortisol levels. The ANS is subject to the regulatory influence of yoga on heart rate, skin conductance and blood pressure and breath rate. The resultant regulatory influence on physical, emotional and mental states contributes to self -regulation. Although only one physiological measure was employed in this study, results indicated a stabilizing of breathing patterns as a result of yoga relaxation. This is an indicator of the regulation of the ANS.

5.12 The 'Dose' Effect of Yoga

Given that the psycho-physiological functioning of the brain undergoes change when yoga is being practiced (Aftanas & Golocheikine, 2002; Arumbula et al., 2001; J. Backon, 1988; R. P. Brown & Gerbarg, 2005b; Hoffman, 1998; Kennedy, Shannahoff-Khalsa, & Ziegler, 1994; Kennedy et al., 1986; Kjaer et al., 2002; Robert., 1997; Stancak & Kuna, 1994; Werntz, Bickford, Bloom, & Shannahoff-Khalsa, 1983; Werntz, Bickford, & Shannahoff-Khalsa,

1987), it could be said, that like the psycho-stimulant treatment medication for ADHD (L. Greenhill et al., 1999; Hood et al., 2005; Ialongo, Lopez, Horn, Pascoe, & Greenberg, 1994; Peter S Jensen, 2000), the effects of yoga are also dose dependent. Yoga, however unlike medication, when practiced over longer periods of time, has been shown to have a positive accumulative effect (Aftanas & Golocheikine, 2001).

Presuming the effects of yoga are dose dependent, then it is reasonable to assume that the greatest effects will be observed in close proximity to the practice of yoga. This was the case in this study sample. Most of the psycho-physiological data on the effects of yoga were collected in close proximity to its practice. Effects in this study were indicated in more stable breathing patterns and rates, in more positive mood, mental and physical states and in high percentages of on-task behaviour in the observed yoga classes and to a lesser extent in the classroom. Like psycho-stimulant treatments, effects diminish with time and problematic behaviours return (Spencer et al., 1996). This could explain why effects were not transferring to the classroom and the home according to teachers and parents' perceptions. However, as mentioned previously the regular practice of yoga can produce more long term effects and this was beginning to be seen in less problematic behaviours being observed in the classroom on the BASC-POP. It must also be considered, that a relatively short program of short yoga session (30-40 minutes) could not have a have a major effect in environments where behaviour dysfunction has been evident, often from infancy and where the yoga program had no control over the environments to which the child returned after yoga sessions.

The question of optimum dose for optimum outcomes is an important consideration. Other effective yoga interventions, involving children with behaviour problems, have ranged from six weeks to one year of regular practice. From this wide variance, it is difficult to say what

length of time is optimum to see changes. The 13 week duration of this study, when compared with other studies could be regarded as an acceptable duration but when fluctuating attendance and attrition, the volatile environment in which the research was conducted and the severity of the disruptive behaviour are taken into account reduced exposure feasibly compromised treatment effects.

But are longer interventions feasible in the behaviour school environment? The literature indicates (Kazdin, 1995; 2003) and teachers report (Laws, C. Personal Communication, 16.7.04; Yates, J. Personal Communication, 8.6.05) that children with disruptive behaviour have difficulties remaining committed to programs designed to improve their wellbeing. Growing up in dysfunctional families also impacts on children's willingness and ability to expose themselves to positive initiatives offered to them.

5.13 Limitations

The attainment of research objectives was limited in the following ways:

1. Being an exploratory study, the use of a diverse set of measures to accommodate the multidimensional nature of disruptive behaviour and yoga as a treatment for this sample was required. These factors contributed greatly to the complexity and difficulty of administering all the procedures with sound methodology.

2. Researchers attempted to measure EEG of the students before, during and after yoga relaxation but were prevented from doing so by DET. Physiological outcomes form the majority of evidence of efficacy in most yoga studies. Additionally, due to delays in

gaining permission to measure breathing rates, the number of participants was reduced to seven.

3. It was intended that all recruits act as their own controls. Six out of nine schools chose not be involved in the control phase. This considerably reduced control numbers and the power of the study.

4. Randomisation of students into a control group or yoga group was not possible because most of the schools declined to participate in a control phase.

5. Full attendance and completion of the program was needed to fully achieve aims. However, attendance was spasmodic for many of the participants for a variety of reasons. Attrition occurred in both yoga and control groups. This resulted in some scales, questionnaires and tests being completed up to month after the child's last yoga class. This compromised outcomes

6. Spasmodic attendance and attrition resulted in a reduction in data collected at the beginning and end of the intervention. Collection of post yoga data proved difficult to collect in close proximity to the completion of the program. Observers and psychologists were not always available at the desired time. Students could be absent or uncooperative on designated assessment days; therefore, alternative days had to be arranged but this did not necessarily guarantee collection of data.

7. Conner's Teacher Rating Scales (CTRS) were not always returned promptly and sometimes were returned incomplete. Different teachers completed the pre- and post-test assessments for some students.

8. A low percentage of parents responded. Numbers may have been bolstered if researchers could have had contact with them. It is plausible that the low response rate was due to family circumstances. Anecdotal accounts provided by the principals of the behaviour schools indicated that substance abuse, violence, neglect and poor economic circumstances were present in many of the children's families.

9. Research methodology was compromised at times due to the volatile situations that arise in behaviour schools between students and teachers. This caused many disruptions and delays to many aspects of the research and sometimes plans had to be abandoned.

10. Greater reliability and consistency would have been added to school staff observations of students in yoga class if the BASC-POP was used daily in yoga classes but teaching and providing this computerised observation system to a changing number of observers was not feasible.

11. The small numbers of potential and actual recruits (from five to twelve students recruited) from each school combined with the long distances between schools and the availability of only one yoga teacher limited the numbers of yoga classes delivered and the length of the intervention in each school.

12. The unfamiliarity of most teachers and teacher's aides with the practice of yoga as an intervention for disruptive behaviour restricted the capability of staff being agents for increased exposure.

13. Yoga is generally practiced on an empty stomach to prevent interrupting digestion and in a quiet atmosphere to allow increased self-awareness. However, in this sample, children may have just eaten, be talkative and noisy, reactive, annoying, aggressive,

lethargic, restless, hyperactive, stiff, un-cooperative, failing and/or ostracized, any of which had the potential to create a volatile atmosphere. Insisting on ideal conditions was neither feasible nor realistic, given the nature of the participants. Some students whose behaviour did not de-escalate were asked to leave by school staff or given the option to leave. However, this was a last resort for researchers due to the need to optimise exposure.

14. The intervention delivery was a modified and shortened version of a general yoga program. Most yoga sessions attended by the general population are from 90-120 minutes duration. This length of time was not realistic for students with disruptive behaviour who were new to yoga as a concept and as a practice.

15. Follow-up procedures, to ascertain continued individual practice, school continuation of a yoga program or return of students to home schools was not conducted. Follow-up procedures are problematic due to dispersal of students and complex ethical approval protocols required by the Department of Education and Training, NSW.

16. Mean outcomes from teacher and parent rating scales did not indicate significant benefits of yoga. This indicates that benefits perceived by students and behaviour observers were not transferring into the school and home environments. The shortness of the program compared with the severity of the behaviour problems most likely contributed. The behaviours presented by these children and adolescents were a result of years of dysfunctional behaviour.

17. The intervention was limited to the yoga class being held from two to three times each week, therefore, researchers had no control over the teaching and learning environment in the school nor over the home environment. The yoga class climate was influenced by

pre-existing relationships between students and students and staff. Students tended to take conflicts and familiarity (sometimes contemptuous) into the yoga class which does not tend to happen in a neutral location evidenced in other studies (e.g. Jensen and Kenny 2004). However, these challenges gave the study a naturalistic component.

18. The difficulties faced by researchers in delivering frequent yoga sessions over a long period of time are not faced by researchers conducting medication trials. Medication trials generally require the taking of a medication once a day. The conducting of social skills trials can be delivered by teachers as part of their curriculum and teachers have ready access to training and programs endorsed by education departments. Conducting questionnaires and surveys also do not require the time and energy commitments of a yoga intervention. Therefore, conducting labour intensive interventions, like yoga, is limited by the amount of time, energy and resources that researchers have available.

19. The length of the intervention was more than likely too short to achieve outcomes on the psychometric measures although it is conceded that attrition rates were concerning during the designated duration of the intervention. Longer-term interventions are needed but for this to be feasible, (due the labour intensity of this type of intervention), the number of participants would need to be limited and this would reduce the power of the study. This is a conundrum facing yoga researchers. However, it is surmised that as yoga becomes more integrated into the school culture levels of commitment would increase.

Limitations of the use of the *Summit Respiratory Inductive Plethysmography*

20. Despite the noticeable changes in breathing patterns from baseline through treatment and post treatment in the majority of DB participants, study numbers were small, hence

replication with larger numbers and simultaneous assessment of other concomitant psycho physiological measures such as heart rate, EEG and oro/nasal airflows is needed.

21. The lack of pre-yoga program data on breathing patterns is a limitation of the study. However, this data may have been too difficult to gather due to the boys' inability to lie still for the required length of time prior to the commencement of the yoga program.

22. More information would be useful when recording patterns of breathing associated with various temporal aspects of the content of the Yoga Nidra practice, for example, when students were listening to sounds or when they were observing their natural breath.

23. Analysis of breathing patterns was limited to visual analysis of graphs. Calculation of breath rates and amplitude proved to be difficult with some recordings. Detecting "a breath or effort" was particularly difficult where erratic, unstable breathing effort was present. Recording maximum and minimum amplitude was not always a good indicator of type of breathing because in some samples within the minute the maximum and minimum amplitude varied considerably.

It is inevitable that researchers working with students with disruptive behaviour and in difficult environments will be challenging. Methodology will be threatened and results compromised especially with interventions that require long term commitment (in this case 13 weeks) from students, teachers and parents. However, these challenges should not be reason to discontinue research with students with disruptive behaviour nor in the field of investigating yoga.

5.14 Future Directions

The question remaining unanswered is-'if the children in the sample were exposed to yoga for longer and methodological issues were addressed would greater effect be seen on the psychometric measures?'

Administering measures more regularly and in close proximity to yoga practice is likely to furnish more reliable results and reduce problems arising from beginning and end of intervention assessment. Therefore, there is a need for psychometric measures that are designed for multiple use, are simple and quick to complete and easy to administer and most importantly sensitive to the effects of yoga.

This study endeavoured to get approval to employ EEG equipment but was refused by the education authority (DET) responsible for the safety of the children, on the grounds that it was too intrusive. For future access to this equipment, if DET remain unchanged in this directive, alternative venues need to sourced for testing. To overcome ethical issues and to have access to more psycho-physiological instruments, conducting such interventions as *Yoga Nidra* could take place at a sleep laboratory where oro/nasal airflow patterns, ECG and EEG could be measured.

Further improvements may occur if yoga were practiced more regularly within the classroom environment and on an on-going basis. For this to occur, educational institutions would have to be willing to commit resources to further investigation, by training classroom teachers to incorporate yoga into the school curriculum. Larger numbers of participants and longer term interventions would provide a suitable climate for ongoing research.

It is suggested that classroom teachers be taught some basic yoga practices to use on a daily basis with the support of audio and audio/visual resources. This could be done under the guidance of a trained yoga teacher who could visit the school at least once a week. Ideally a whole-school approach would ensure daily delivery of yoga, both in scheduled sessions and in the use of practices to address negative moods and critical incidents. Negative moods and critical incidents occur frequently and can escalate into increasing tension and conflict impacting adversely on the atmosphere in the classroom and the school. Having a tool box of yogic strategies to immediately reduce escalation would be valuable management strategy. Research into Yoga (RYE) -- a European based organization founded by Michelene Flak (Yogabhakti), has successfully taught yoga techniques suitable for the classroom to classroom teachers since the 1970s.

Additionally, many mainstream Australian schools offer yoga as alternative to sport or to help students with examination stress and some also offer classes to teachers. These classes are generally taught by yoga teachers and not classroom teachers. Researchers could tap into this trend and conduct trials with mainstream students, many of whom are on the disruptive behaviour continuum.

Although a trained yoga teacher is preferable, it is not essential that one be present to deliver yoga relaxation interventions. An audio recording is an effective means of delivering the intervention to individuals, small groups and whole classes (Peck et al., 2005) although this would need to be closely monitored with students who have disruptive behaviour. Audio recordings of varying lengths would be required in order to cater for students new to the practice who may find it hard to lie still and listen to instructions for extended time periods. An audio recording of the practice of *Yoga Nidra* could be used in a Time Out/ Work-It-Out

room as an alternative to other strategies but students would need to be familiar with the practice.

In conclusion yoga as an adjuvant therapy for students enrolled in schools for disruptive behaviour is a non-invasive feasible, inexpensive, acceptable treatment that encourages participants to be actively involved in their own treatment and self management and is suitable for inclusion into the school environment.

6 Conclusion

This thesis investigated the feasibility, acceptability and outcomes of a 13 week yoga program (≤39 sessions) as a treatment for students with disruptive behaviour. Participants were aged between 8 and 16 years, were predominantly male and enrolled in nine special schools for disruptive behaviour, across the Sydney Metropolitan Region. Presenting disruptive behaviours included inattention, hyperactivity, impulsivity, and oppositional, aggressive, anxious, and emotional labile behaviours.

From the outset and throughout this field study, researchers were challenged in the following ways: (i) gaining permission to work with children in a government educational institution; (ii) the complex logistics in attempting to set up a cluster randomised cross-over controlled trial in a field setting with many constraints; (iii) enlisting the support and cooperation of each school, its principals, teachers and parents individually; (iv) the behavioural and academic impairments in the children in the sample; (v) the administration of a large number of measures, (vi) the stressful environment, and (vii) the need to adjust the method and design of the study in response to the constraints of the situation in order to continue with the study.

6.1 Attendance and Participation

Of the 71 students recruited for the yoga intervention, 81.3% willingly attended between 10 to 35 yoga sessions out of 23-39 sessions given. Absences due to lack of interest amounted to 45% with the remainder due to sickness, truancy, school commitments and suspension from

school for serious misconduct. Although attendance was compromised, the program appealed to students when they did attend, ascertained from the students willingness to participate (84.6%) in yoga classes all or most of the time, for 30-40 minutes. However, absentces meant that treatment intensity was reduced, thus reducing the emergence of potentially beneficial outcomes. The study needs to be replicated in a more controlled environment with greater and more consistent exposure to treatment. Training of selected teachers within each educational unit would assist in the transfer of training into the classroom environment.

6.2 Results from Psychometric Measures

Some factors need to be considered when assessing the lack of significant outcomes on most of the psychometric measures. Psychometric measures applied at pre- and post-test require adherence to an uncompromised methodology. Contributing factors to destabilising the methodology were limited exposure to treatment, delays in conducting assessments and absences on assessment days. Additionally, poor response from parents, teacher changes from pre- to post-test and hastiness in completing forms also would have contributed to reducing the amount and integrity of data collected on standardised tests. A lack of transference of effects of behaviour seen in the yoga classes to the classroom also contributed to the null outcomes. Further, the high standard deviations across all psychometric results indicated a large variance in severity of behaviours both at pre- and post-test, thus obscuring possible positive effects for some students, which necessitated the presentation of case studies.

Outcomes on the measures that were employed immediately after the yoga classes and collected regularly, demonstrated significant and positive effects. The process used for this set

of data collections overcame most of the limitations that arose concerning attendance, completion of data collection and lack of transference of skills between settings.

The teachers' overall perceptions of students' behaviour did not indicate significant change after yoga over time or in group by time interactions (except for the Oppositional subscale). It is difficult to explain why the subscale measuring oppositional behaviour was the only subscale found to significantly decrease in the whole group and in the subgroups who attended ≥20 classes and for the students who acted as their own controls. This outcome could possibly be explained by the emphasis placed in the yoga program on self-regulation and learning to become more relaxed.

The number of parent respondents on the Conners Parent Rating Scales-R: L at pre- and post intervention was low (10 for the control phase followed by 16 for the yoga phase) thus reducing the power of results. Unexpectedly significant improvements for the control group were found; however, transfer from mainstream class in a normal school to the behaviour school may have been responsible for this initial effect on behaviour. Overall outcomes suggest that parents could not detect any positive effect on their children's behaviour after yoga.

Sustained and focused attention, as measured on the TEA-Ch, significantly improved for the total yoga group**,** in the subgroups attending ≥20 classes and for the students who acted as their own controls. However, significant improvement was also indicated for the control group. This could be attributed to attention skills rapidly developing in childhood but significant improvement was not seen across all subtests. Yoga students' attention skills were developed through attending to learning many postures and techniques, holding difficult poses, in balances, in the attention given to their breath and to the attention required in

relaxation techniques involving listening to environmental sounds and feeling sensations within their bodies.

The students' self–reports on the Trait component of State-Trait Anxiety Inventory (STAI) and State-Trait Anxiety Inventory for Children (STAIC) indicated anxiety levels in the normative range at both pre- and post-yoga intervention. These results are in contrast to teachers' (CTRS-R:L) and parents' (CPRS-R:L) ratings that suggested significantly high anxiety levels. Poor reporting due to denial of problems or lack of accurate perception may have been a factor in students' self-reports of low anxiety. Using the *State* component of the STAI-Y and STAIC/T directly after the yoga class may have influenced outcomes although this would not have measured longer term effects.

Self-concept reported by the students indicated no significant change from pre- to post-test for the control or the yoga groups with reported results remaining in the normative range for most subscales. This outcome is not unexpected as most other yoga and non-yogic relaxation studies involving children with behaviour problems also found that measures of self-concept did not change post intervention. In addition, students with behavioural problems have been found to inflate their self-concept especially in the areas in which they are most impaired, which may have been the case for this sample. Additionally, the manual of the SDQ I and II indicated that self- concept remains stable over time, as few interventions are sufficiently powerful enough to substantially alter self-concept. The yoga intervention was more than likely not powerful enough to effect any significant improvement and the problems surrounding potential outcomes suggest excluding self–concept measures in future research of this type.

6.3 Behaviour Observations and Individual Assessment of Yoga Competence

Unlike the teacher and parent rating scales outcomes, some significant transference effects of yoga class behaviours was detected via the BASC-POP observations of both ODD behaviours compared with control and of ADHD behaviours over time in the classroom. High percentages of on-task behaviours were observed in the yoga classes. This outcome could be due to the specificity of the measure used. Behaviours being directly observed are arguably less subjective than teacher and parent impressions but adherence to strict behavioural codes are necessary to achieve this. Considerably fewer ODD and ADHD behaviours and a high percentage of on-task behaviours were observed on the BASC-POP in the yoga classes. This could possibly be explained by the highly structured nature and physicality of the program.

The daily observations of all yoga classes that were recorded by school staff proved to be a valuable record of the children's attitude to yoga. Staff observation notes, the results of BASC-POP observations, the use of *Individual Assessment in Yoga Competence* and the footage shown on the DVD demonstrated that the children developed:-

a. The ability to be silent and still from between 5 to 20 minutes during a guided relaxation. This took place in an environment (i.e. school) where many confrontation experiences have occurred.

b. Strength, endurance and balance as result of increased focus in performing postures.

c. Self–regulation skills demonstrated in performing postures on their own and in front of their peers. Self-regulation was also demonstrated in the individual assessment where

students performed yoga postures and techniques on their own with only the aide of a visually displayed class agenda and minimal coaching from the teacher.

d. Compliance in following instructions and directions to do repetitive, sometimes difficult movements, and to hold postures and be still and silent.

6.4 Self Reports

Students consistently reported high levels of happiness, calmness, enjoyment and competence on the *Feelings Faces Scale*, immediately after yoga classes. Students also displayed incremental improvements in the quick verbal assessment of their physical, mental and emotional states after yoga classes compared with before classes. These outcomes confirm the reported effects of yoga on mood and general well being reviewed in Section 2.4.2.3. Feeling calm, happy, joyful and competent is contrary to the everyday emotional states experienced by these students. Further robust testing of these scales as a response to yoga is needed, but the initial findings are promising and warrant further attention.

The Yoga Survey, although very short and simple, indicated that some of the children considered they benefited on a physical and emotional level. This could be explained by the emphasis in the program of developing the skills mentioned above in points a. to d. above.

6.5 Physical Measure – The Summit ™ Respiratory Inductive Plethysmography (RIP)

The RIP measurement of abdominal and thoracic breathing required lying still for 20 minutes before, during and after the yogic relaxation technique - *Yoga Nidra*. For the subgroup of students who underwent this assessment, improvements in stability of breathing patterns were observed, which is an indicator of a more relaxed state. Statistical analysis of the breathing patterns were not possible but is recommended in future research.

6.5.1 Case Studies

Case studies were conducted because of the very wide variability in responses to yoga as evidenced on the standardised tests (via wide standard deviations). Three case study students had a positive response to the yoga intervention, as determined by their consistent levels of interest and participation in all aspects of the yoga program while one case study had an inconsistent response to the intervention. There was a wide variability in response to psychometric outcome measures for these four boys even though for three, their attitude was consistently positive. This is an indicator of the need to match interventions with client characteristics, which is a challenge for all forms of therapy.

6.6 Summary

Although students reported direct benefits of yoga, these benefits were not perceived to transfer into other environments. These benefits are obviously not automatically and easily transferred, especially into the challenging environments of school and home. However, the results of this thesis provide sufficient evidence to suggest that a longer term, more intense program with more support would build on the skills the students developed within the yoga class in this study.

Children with habitual and severe disruptive behaviour, if not effectively treated, can be expected to have poor educational, social and personal outcomes into adolescence and adult life. Many adults with this history develop physical and mental health problems that negatively influence the remainder of their lives. The introduction of self-regulatory systems like yoga as an adjuvant therapy for students with disruptive behaviour has the potential of further reducing the effects of stress, anger, restlessness and hyperactivity. Increased awareness and relaxation of mind, body and emotional states can lead to increased self-regulation, which has positive implications for improved educational outcomes and general well being.

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Appendices

Appendix A

LETTERS TO PRINCIPALS

The University of Sydney

School of Behavioural & Community Health Sciences

Faculty of Health Sciences
College of Health Sciences

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THE IMPACT OF YOGA ON CHILDREN AND ADOLESCENTS WITH DISRUPTIVE BEHAVIOUR DISORDERS

Dear Principal,

Researchers A/Professor Dianna Kenny and Pauline Jensen, PhD Student invite your school to participate in this unique study. Participants will be students aged between 7-14 years old diagnosed with a disruptive behaviour disorder (ADHD, (Opposition Defiant Disorder, Conduct Disorder or other Behavioural Disorder or symptoms of such).

Aim of the Study

This study will assess the effects of yoga in students aged 7-14 years as an adjuvant and additional treatment to pharmacological and classroom management techniques in improving classroom and home behaviour, attention, hyperactivity and self-concept.

Methods

Study design:

A cross-over control study in DET SSP schools initially randomised into experimental or control groups. Pre-test and post-test measures of teacher and parental perception of behaviour and attention, a self report on self-concept, hyperactivity levels, attention levels, and observed classroom behaviour.

	Yoga	Control
Term 1 2005	School 1	School 2
Term 2 2005	School 2	School 3
Term 3 200	School 3	School 4
Term 4 2005	School 4	School 1

Procedure

Ethics approval has been obtained from Human Research Ethics Committee (HREC), The University of Sydney and from DET, Directorate of Strategic Research. All selected schools will be invited through a letter and follow-up phone contact to participate in the study. Schools receptive to participation will be selected in random order. The first school will be the 'yoga' school and the second the 'control school.' This control school will receive the yoga program in the following term. This procedure will continue until all participating schools have been included. One month prior to involvement in the study participating schools will be asked to distribute Participant Information Statements, Information pamphlets and Consent Forms to students and their parents/caregivers to consider participation. Baseline assessment will be conducted by approved independent assessors who comply with all requirements of HREC. in the last two weeks prior to the commencement of the study. Follow up assessment will occur in the last week of the 15 week period in both the control and yoga groups. During the control phase, the yoga teacher will visit the students fortnightly to establish a familiarity and to alleviate effect changes being attributable to relationships build during the yoga intervention phase. Teachers will be asked to complete a Conners' Teacher Rating Scale and conduct a Self Description Questionnaire with their students. Parents will be asked to complete a Conners' Parent Rating Scale both at pretest and posttest phases.

Participants:

Inclusionary Criteria: Participants will be students, aged 7-14 years, displaying the symptoms of ADHD, ODD & CD or symptoms of such, enrolled at a School for Special Purposes (SSP) for behaviour problems.
Exclusionary Criteria: Psychotic Disorder or displaying prodromal stages of psychosis; Epilepsy.

Participant Numbers:

Up to 6 students can participate in each yoga class. This class will be offered three (3) times a week for up to 90 minutes per day. but the length of classes can be determined by the Prinicpal of the school. If your school has 18 students meeting inclusionary criteria, we could offer three classes a day. The duration of the program will be 15 weeks for the yoga intervention and 15 weeks for the control phase.

Information for Participants and Parents/Caregivers

On approval from Principals and for those participants who meet inclusionary criteria, Participant Information Statements, Consent Forms and a pamphlet will be sent home, via their school to all prospective participants and parent/caregivers.

Measures:

- Conners' Parent Rating Scale-Revised (L) (CPRS-R) (Conners, 1997)
- Conners' Teacher Rating Scale-Revised (L) (CTRS-R) (Conners, 1997
- Test of Everyday Attention- Children (TEA-CH) (Manly, Nimmo-Smith & Anderson 1999)

- Actigaph- Motion Logger (Computer Science and Applications Inc)
- Behaviour Assessment System for Children Student Observation System (BASC-SOS) (Reynolds & Kamphaus, 1992)
- Self Description Questionnaire (SDQ) 1 or 2 (age relevant) (Marsh 1990)

Yoga Program.

Respiratory Training:

Selective use of oral and nasal passages for respiratory flow intended to increase the students breath awareness as well as train him/her to breathe naturally between both nostrils. All exercises are to be repeated several times and in a regulated rhythmical manner.

Postural training:

Involves stretching load bearing, backward and forward, lateral flexion and extensions performed in sitting, standing, supine and prone positions. These are performed in combination with respiratory exercises.

Relaxation Training:

Involves instruction on becoming progressively aware of and relaxing body parts and tensing and relaxing muscles.

Any questions or enquiries please contact Pauline Jensen Ph: 98106181; MOB 0414598238; Email: pjen1953@mail.usyd.edu.au or A/Professor Dianna Kenny (contact details above).

Yours sincerely,

Pauline Jensen and A/Professor Dianna Kenny

The University of Sydney

School of Behavioural & Community Health Sciences

Faculty of Health Sciences
College of Health Sciences

Associate Professor Dianna Kenny
PhD, MA(Sch Couns),BA(Hons), Dip Ed, ATCL, MAPsS, MAPA

Associate Professor of Psychology
Director, Australian Centre for Applied Research in Music Performance

Cumberland Campus C42
East Street (PO Box 170)
Lidcombe NSW 1825
Telephone:+61 2 9351 9644 9228
Facsimile:+61 2 9351 9540 9112
Email:D.Kenny@fhs.usyd.edu.au

THE IMPACT OF YOGA ON CHILDREN AND ADOLESCENTS WITH DISRUPTIVE BEHAVIOUR DISORDERS

Dear Principal,

Your school is currently participating in the above study. The researchers from this study have recently been given the opportunity to introduce another measure. This new instrument will measure breathing muscle movements and heart-rate. It will take about 10 minutes preparation time to attach the medical recording equipment to your son's or daughter's abdomen and chest and then approximately 1/2 hour to complete the tests which will be conducted before, during and after the class.

The data are recorded on a laptop computer. Data collection involves standard, non-invasive medical-recording equipment to test normal breathing, deep breathing and different breathing techniques, which are all part of the yoga program. This equipment takes the form of respiratory bands which would be placed over the student's clothes. All electrical equipment is full shielded from the electricity grid as it runs on batteries and all equipment is already medically approved for clinical and human research use in various Universities, Hospitals and Clinics around Australia and overseas.

Philip Stevens, PhD candidate from the Department of Biomedical Engineering in the School of Electrical and Computer Engineering and the Department of Complementary Medicine in the School of Health Sciences of RMIT University will be operating the equipment.

We have compiled an additional Participant Information Statement and Consent Form for parents /guardians. This consent form will need to be completed before we proceed.

Any questions may be directed to Pauline Jensen Ph: 98106181; MOB 0414598238; Email: pjen1953@mail.usyd.edu.au or A/Professor Dianna Kenny (9351 9644)

Yours sincerely,

Dianna Kenny

A/Professor Dianna Kenny and Pauline Jensen

Appendix B

PARTICIPANT INFORMATION STATEMENTS, PAMPHLETS, CONSENT FORMS AND DETAILS OF PARTICIPANTS

The University of Sydney

School of Behavioural & Community Health Sciences

Faculty of Health Sciences
College of Health Sciences

Associate Professor Dianna Kenny
PhD, MA(Sch Couns),BA(Hons), Dip Ed, ATCL, MAPsS, MAPA

Associate Dean, Graduate Studies
Associate Professor of Psychology
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D.Kenny@fhs.usyd.edu.au

THE IMPACT OF YOGA ON DISRUPTIVE BEHAVIOUR DISORDERS

PARTICIPANT INFORMATION STATEMENT

We would like to invite you and your son or daughter to take part in a research study into the effects of Yoga on the behaviour of students with Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder, Conduct Disorder and other Disruptive Behaviour Disorders. The object of the study is to discover whether Yoga improves their behaviour over and above the improvements achieved by the use of medications prescribed by a paediatrician or if behaviour improves for your son or daughter if not on prescribed medication and over and above behaviour management strategies used in the classroom. The study will be conducted by Pauline Jensen, who is a trained Yoga Teacher and a school teacher with many years experience teaching students with behaviour problems and a PhD student, and A/Professor Dianna Kenny of the Department of Behavioural and Community Health Sciences, Faculty of Health Sciences, The University of Sydney. Permission for this study has been received from Department of Education and Training (DET). Before we commence the yoga classes, we will assess your son's/daughter's attention and activity levels, if they are hyperactive. The attention test is simple to administer and will take approximately 45 minutes. We will assess activity levels by asking your son/daughter to wear a computerised motion logger on his/her wrist during class time. This device has the appearance of a watch and most students are happy to wear it. In addition, you and your son/daughters's teacher will be asked to complete questionnaires asking about your son/daughters's behaviour and your son/daughter will be asked to complete a questionnaire on self–concept and a questionnaire on anxiety. At regular intervals, during the program, your son or daughter will be asked to complete a short questionnaire to gauge how they are feeling about themselves. The program will extend over one and a half terms. Classes will be held three (3) times a week for approximately 40 minutes in his/her school and conducted by

Pauline Jensen. At the end of the treatment period, we will reassess your son/daughter's behaviour and attention with the same battery of tests and questionnaires. This will enable the researchers to compare the behaviour from the beginning to the end of the program to see if yoga has helped your son/daughter with his/her attention and behaviour levels. Throughout the treatment period, you will be able to contact researchers if required (P. Jensen 98106181, 0414598238; D. Kenny 93519644).

All aspects of the study, including results, will be strictly confidential and only the investigators will have access to the information on your son. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

For further information, a meeting for all interested students and parents/caregivers will be arranged at your son/daughter's school in the term before the study is due to begin.

For all students who met the requirements of the study, there are no foreseen risks to the health or safety of your son/daughter from participation in this study. Your participation is voluntary and you and your son can withdraw at any time without it affecting your academic standing or relationship with the school. When you have read this information, please contact Pauline Jensen to discuss it with you further and answer any questions you may have. This information sheet is for you to keep.

Essential Information: Any person with concerns or complaints about the conduct of a research study can contact The Manager of Ethics Administration, HREC, University of Sydney. Tel: 02 9351 4811

1 of 1

The University of Sydney

School of Behavioural & Community Health Sciences

Faculty of Health Sciences
College of Health Sciences

Associate Professor Dianna Kenny
PhD, MA(Sch Couns),BA(Hons), Dip Ed, ATCL, MAPsS, MAPA

Associate Dean, Graduate Studies
Associate Professor of Psychology
Graduate Adviser, Australian Centre for Applied Research in Music

Cumberland Campus C42
East Street (PO Box 170)
Lidcombe NSW 1825
Telephone:+6129351 9644
Facsimile:+61 2 9351 9540
Email:

THE IMPACT OF YOGA ON DISRUPTIVE BEHAVIOUR DISORDERS

CONSENT FORM.

I_____ have read the Participant Information Statement and gained assent from my son/daughter to participate in this study. I give my consent for my son/daughter_____to participate in the research study into The Impact of Yoga on Disruptive Behaviour Disorders.
I understand that my son/daughter and I can withdraw at any time from the study without it affecting my son's academic standing or relationship with the school.

Signature:_____

Witness:_____

Date:_____

Researchers: Pauline Jensen PhD Student University of Sydney & Itinerant Support Teacher for Behaviour and Learning. Ph: 98106181; MOB 0414598238; Email:pjen1953@mail.usyd.edu.au
A/Prof. Dianna Kenny

x

The University of Sydney

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Associate Dean, Graduate Studies
Associate Professor of Psychology
Research Director, Australian Centre for Applied Research in Music Performance

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Email:D.Kenny@fhs.usyd.edu.au

THE IMPACT OF YOGA ON DISRUPTIVE BEHAVIOUR DISORDERS

RELEASE OF INFORMATION FORM

I,_____give permission for the release of data (results of psychological testing by counsellor) and medical information on my son/daughter _____to A/Professor Dianna Kenny and Pauline Jensen, PhD Research Student) in the Department of Behavioural and Community Health Sciences, Faculty of Health Sciences, The University of Sydney.

I understand that the data will only be viewed by the researchers and no identifying material will be used in the study or in any publications arising from the study.

Signature:_____

Date:_____

Researchers: Pauline Jensen PhD Student, The University of Sydney. Ph: 98106181; MOB 0414598238; Email:pjen1953@mail.usyd.edu.au

A/Professor Dianna Kenny PhD

The University of Sydney

School of Behavioural & Community Health Sciences

Faculty of Health Sciences
College of Health Sciences

Associate Professor Dianna Kenny
PhD, MA(Sch Couns),BA(Hons), Dip Ed, ATCL, MAPsS, MAPA

Associate Dean, Graduate Studies
Associate Professor of Psychology
Research Direcctor, Australian Centre for Applied Research in Music Performance

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Email:D.Kenny@fhs.usyd.edu.au

THE IMPACT OF YOGA ON DISRUPTIVE BEHAVIOUR DISORDERS

PERMISSION TO MAKE BEHAVIOURAL OBSERVATIONS

I, (Parent)_____

I, (Principal)_____

I, (Teacher)_____

give permission to_____(Honours Graduate Department of Psychology, University of Sydney) to observe_____in the classroom on at least three occasions. The results of these observations will provide data to enable a comparison between the behaviour of students after practising yoga for 10 weeks with those in a control group. The research study is being conducted by A/ Professor Dianna Kenny and Pauline Jensen of the Faculty of Health Sciences, The University of Sydney.

Signatures:

Parent_____

Principal_____

Teacher_____

Researchers: Pauline Jensen PhD. Student, University of Sydney. Ph: 98106181; MOB 0414598238; Email:pjen1953@mail.usyd.edu.au and A/Prof. Dianna Kenny

The University of Sydney

School of Behavioural & Community Health Sciences

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Email:
D.Kenny@fhs.usyd.edu.au

THE IMPACT OF YOGA ON DISRUPTIVE BEHAVIOUR DISORDERS

PERMISSION TO INCLUDE PHOTOGRAPHS AND VIDEO RECORDINGS

I_____ hereby give permission for photographs and video recordings of my son/daughter, _____with *face clear* or *obscured* (please cross out which is not applicable) to be included in Pauline Jensen's PhD thesis. The photographs and video recordings included display your son/daughter competently practising yoga. The thesis will be available to students and academic community.

Signature:_____

Witness:_____

*Date:*_____

Researchers: Pauline Jensen PhD. Student, University of Sydney. Ph: 98106181; MOB 0414598238; Email:pjen1953@mail.usyd.edu.au
A/Prof. Dianna Kenny

About this study-

This study will take place at schools similar to your school.

The yoga program will run for 15 weeks and you will be asked to practice yoga 3 days a week for up to an hour a day.

The study will run for three terms in your school. For one and a half terms you will not be doing yoga and the other one and one half terms you will be doing yoga. At the beginning of the study and at the end of each part of the study you'll be asked to complete a questionnaire, an attention exercise, wear a smaller motion logger on your wrist (if you find it difficult to keep still) and do an attention exercise. You will also be observed in the classroom. Your Parents/Caregiver and teacher will also be asked to fill out a questionnaire.

This will help us find out if yoga is helpful for you.

About your Yoga Teacher.

Pauline Jensen is both a school teacher and a PhD student at The University of Sydney. She is also a trained Yoga teacher.

She practises yoga every day and says it helps her with her studies by improving her concentration and keeps helps her to stay calm.

This study is being conducted with the approval of the University' of Sydney, Human Ethics Committee and we have received permission for the study from the Department of Education and Training.

If you have any questions- Pauline Jensen can be contacted on 9810 6181 or her University Supervisor, A/ Professor, Dianna Kenny on 93519644.

Y

O

G

A

Participant Information Statement

About Yoga and Behaviour

Yoga is a Sanskrit word meaning union (eg. body and mind union).

The type of Yoga you'll be practicing in this study involves body movements (see photographs), breathing exercises and relaxation.

This study is trying to find out if yoga can help students who attend your school.

Yoga can give you energy and it can also calm restless energy.

People who practice say that YOGA

- Gives them more control over their body and mind.
- Helps them be more coordinated.
- Helps concentration.
- Calms them down.
- Improves their balance
- Gives them better health

BEST OF ALL YOGA IS FUN

Students doing YOGA

Your Consent.

You and your Parents/ Caregiver need to agree to participate in the study.

This pamphlet gives you information about the study so you can decide whether you want to be involved.

There are also consent forms that ask permission for-

- Participation in the study
- For information from the school
- For photographs and videos
- For observations in the classroom.

It is important that you and your Parents/Caregiver talk about and agree to being part of this study.

Participating in this study-

- is voluntary
- will not hurt you.

If you stop doing the program it will not make any difference to your teacher's relationship with you or to your school reports

The University of Sydney

School of Behavioural & Community Health Sciences

Faculty of Health Sciences
College of Health Sciences

Associate Professor Dianna Kenny
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THE IMPACT OF YOGA ON CHILDREN AND ADOLESCENTS WITH DISRUPTIVE BEHAVIOUR DISORDERS

PARTICIPANT INFORMATION STATEMENT

Your son or daughter is currently participating in the above study. The researchers from this study have recently been given the opportunity to introduce another measure. This new instrument will measure breathing muscle movements and heart-rate. It will take about 10 minutes preparation time to attach the medical recording equipment to your son's or daughter's abdomen and chest and then approximately 1/2 hour to complete the tests which will be conducted before, during and after the class.

The data are recorded on a laptop computer. Data collection involves standard, non-invasive medical-recording equipment to test normal breathing, deep breathing and different breathing techniques, which are all part of the yoga program. This equipment takes the form of respiratory bands which would be placed over your son's or daughter's clothes. All electrical equipment is full shielded from the electricity grid as it runs on batteries and all equipment is already medically approved for clinical and human research use in various Universities, Hospitals and Clinics around Australia and overseas.

Philip Stevens, PhD candidate from the Department of Biomedical Engineering in the School of Electrical and Computer Engineering and the Department of Complementary Medicine in the School of Health Sciences of RMIT University will be operating the equipment.

All aspects of the study, including results, will be strictly confidential and only the investigators will have access to the information on your son/daughter. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

For all students who met the requirements of the study, there are no foreseen risks to the health or safety of your son/daughter from participation in this study. Your participation is voluntary and you and your son/daughter can withdraw at any time without it affecting your academic standing or relationship with the school. When you have read this information, please contact Pauline Jensen on 0414598238 to discuss it with you further and answer any questions you may have. This information sheet is for you to keep.

Essential Information: Any person with concerns or complaints about the conduct of a research study can contact The Manager of Ethics Administration, HREC, University of Sydney. Tel: 02 9351 4811

The University of Sydney

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usyd.edu.au

THE IMPACT OF YOGA ON CHILDREN AND ADOLESCENTS WITH DISRUPTIVE BEHAVIOUR DISORDERS

CONSENT FORM FOR ADDITIONAL MEASURE

I_____ have read the information concerning the additional measure and gained assent from my son/daughter to allow this measure to be used during one session in the yoga program.
I understand that my son/daughter and I can withdraw at any time from the use of this additional measure without it affecting my son's/daughter' academic standing or relationship with the school.

Signature:_____

Witness:_____

Date:_____

Researchers: Pauline Jensen PhD Student University of Sydney & Itinerant Support Teacher for Behaviour and Learning. Ph: 98106181; MOB 0414598238; Email:pjen1953@mail.usyd.edu.au and A/Prof. Dianna Kenny.

Table 1: Proforma for details of participants

YOGA AND DISRUPTIVE BEHAVIOUR STUDY- PAULINE JENSEN. UNIVERSITY OF SYDNEY										
SCHOOL:				DATE:				GROUP: YOGA OR CONTROL		
NAME of PARTICIPANT	GENDER M/F	ID (FOR RESRACHER)	D.O.B.	SCHOOL YEAR in 2004	AGE	DATE OF ENROLLMENT AT THIS SCHOOL	IQ Below Av (BA)/ Av (A)/ or Above Av.(AA)	DIAGNOSIS/ PROBLEMS	MEDICATION DETAILS/DOSAGE	COMMENTS

Appendix C

ETHICS APPROVAL DOCUMENTS

The University of Sydney

NSW 2006 Australia

Human Research Ethics Committee
http://www.usyd.edu.au/ethics/human
Manager:
Mrs Gail Briody
Telephone: (02) 9351 4811
(02) 9351 4474
Facsimile: (02) 9351 6706
Email: gbriody@mail.usyd.edu.au
Rooms L4.14 & L4.13 Main Quadrangle A14

Human Secretariat
Telephone: (02) 9036 9309
(02) 9036 8308
Facsimile: (02) 9036 9310
Email: r.todd@reschols.usyd.edu.au
m.williams@reschols.usyd.edu.au

12 August 2003

Associate Professor Dianna Kenny
School of Behaviour and Community Health Sciences
Faculty of Health Science
Building C42
The University of Sydney NSW 2006

Dear Associate Professor

I am pleased to inform you that the Human Research Ethics Committee at its meeting on 28 July 2003 approved your protocol on the following study. Please note that subject to annual monitoring returns, the approved protocol is valid for five years.

Title:	***The effects of Yoga on Boys with Attention Deficit Hyperactivity Disorder (ADHD)***
Ref No.:	***6945***
Approval Period:	***July 2003 – July 2004***
Authorised Personnel:	***Dianna Kenny***
	Pauline Jensen
	Shirley Telles
	David Shannahoff-Khalsa

In order to comply with the *National Statement on Ethical Conduct in Research Involving Humans*, and in line with the Human Research Ethics Committee requirements the Chief Investigator's responsibility is to ensure that:

...2/

(1) Modifications to the protocol cannot proceed until such approval is obtained in writing. (Refer to the website www.usyd.edu.au/ethics/human under 'Forms and Guides' for a Modification Form).

(2) The confidentiality and anonymity of all research subjects is maintained at all times, except as required by law.

(3) All research subjects are provided with a Participant Information Sheet and Consent Form, unless otherwise agreed by the Committee.

(4) The Participant Information Sheet and Consent Form are to be on University of Sydney letterhead and include the full title of the research project and telephone contacts for the researchers, unless otherwise agreed by the Committee.

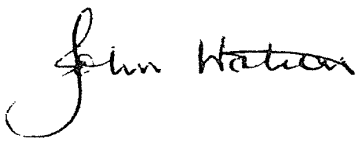
(5) The following statement must appear on the bottom of the Participant Information Sheet. ***Any person with concerns or complaints about the conduct of a research study can contact the Manager, Ethics Administration, University of Sydney, on (02) 9351 4811.***

(6) The standard University policy concerning storage of data and tapes should be followed. While temporary storage of data or tapes at the researcher's home or an off-campus site is acceptable during the active transcription phase of the project, permanent storage should be at a secure, University controlled site for a minimum of seven years.

(7) A progress report should be provided by the end of each year. Failure to do so will lead to withdrawal of the approval of the research protocol and re-application to the Committee must occur before recommencing.

(8) A report and a copy of any published material should be provided at the completion of the Project.

Yours sincerely



Associate Professor J D Watson
Chairman
Human Research Ethics Committee

Encl. Dear Principal Letter
Participant Information Statement
Consent Form

COPY

The University of Sydney

NSW 2006 Australia

Human Research Ethics Committee
www.usyd.edu.au/ethics/human/
Manager:
Mrs Gail Briody
Telephone: (02) 9351 4811
(02) 9351 4474
Facsimile: (02) 9351 6706
Email: gbriody@mail.usyd.edu.au
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Telephone: (02) 9036 9309
(02) 9036 9308
Facsimile: (02) 9036 9310
Email: r.todd@reschols.usyd.edu.au
m.williams@reschols.usyd.edu.au

12 September 2003

Associate Professor Dianna Kenny
School of Behaviour and Community Health Sciences
Faculty of Health Science
Cumberland Campus
Bldg C42

Dear Professor Kenny

Title: ***The Impact of Yoga on Disruptive Behaviour Disorders***
Ref No. ***6945***

The Executive sub-committee at its meeting on 12 September 2003 considered your correspondence of 20 August 2003 concerning your modification. After considering your request to modify your application, it was the Executive Sub-Committee's opinion that there were no ethical objections to this work being carried out and therefore recommends approval to proceed.

The following variation was approved:

- Change of title to "The Impact of Yoga on Disruptive Behaviour Disorders".
- Extension of recruitment to allow all students at the study locations named in the proposal to participate in the study if they and their parents so desire.

In order to comply with the *National Statement on Ethical Conduct in Research Involving Humans,* and in line with the Human Research Ethics Committee requirements the Chief Investigator's responsibility is to ensure that:

1. The individual researcher's protocol complies with the final and Committee approved protocol.
2. Modifications to the protocol cannot proceed until such approval is obtained in writing.
3. The confidentiality and anonymity of all research subjects is maintained at all times, except as required by law.
4. All research subjects are provided with a Participant Information Sheet and Consent Form, unless otherwise agreed by the Committee.
5. The Participant Information Sheet and Consent Form are to be on University of Sydney letterhead and include the full title of the research project and telephone contacts for the researchers, unless otherwise agreed by the Committee.

6. The following statement must appear on the bottom of the Participant Information Sheet. ***Any person with concerns or complaints about the conduct of a research study can contact the Manager of Ethics Administration, University of Sydney, on (02) 9351 4811.***
7. The standard University policy concerning storage of data and tapes should be followed. While temporary storage of data or tapes at the researcher's home or an off-campus site is acceptable during the active transcription phase of the project, permanent storage should be at a secure, University controlled site for a minimum of five years.
8. A progress report should be provided by the end of each year. Failure to do so will lead to withdrawal of the approval of the research protocol and re-application to the Committee must occur before recommencing.
9. A report and a copy of any published material should be provided at the completion of the Project.

Yours sincerely

Associate Professor Stewart Kellie
Chairman, Human Research Ethics Committee

Encl. *Letters to Principals*
Participant Information Statement
Consent form
Release of Information Form
Permission to make behavioural observsations form
Permission to include photographs and video recordings
Participant information leaflet

cc: *Ms Pauline Jensen, School of Behaviour & Community Health Sciences, C42*

PLANNING AND INNOVATION

NEW SOUTH WALES
DEPARTMENT
OF EDUCATION
AND TRAINING

Early Childhood and Primary Education
Secondary Education
Technical and Further Education
Vocational Education and Training
Higher Education
Adult and Community Education

Pauline Jensen / Dianna Kenny
51 Cecily Street
Lilyfield NSW 2040

Dear Ms Jensen

SERAP Number **03.197**

I refer to your application for extension of your research project in NSW government schools entitled *The Impact of Yoga on Disruptive Behaviour Disorders.* I am pleased to inform you that your application has been approved.

This approval will remain valid until 1/9/2005.

When your study is completed please forward your report marked to the General Manager, Planning and Innovation, Department of Education and Training, GPO Box 33, Sydney, NSW 2001.

Yours sincerely

for Martin Graham
A/Director of Strategic Information and Planning
30 August 04

• Level 6, 35 Bridge Street • Sydney NSW 2000 • GPO Box 33 • Sydney NSW 2001 •
• *telephone* 02 9561 8744 • *facsimile* 02 9561 8941 • www.det.nsw.edu.au •

The University of Sydney

NSW 2006 Australia

Human Research Ethics Committee
www.usyd.edu.au/ethics/human
Manager:
Gail Briody
Telephone: (02) 9351 4811
(02) 9351 4474
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Rooms L4.14 & L4.13 Main Quadrangle A14

Human Secretariat
Telephone: (02) 9036 9309
(02) 9036 9308
Facsimile: (02) 9036 9310
Email: r.todd@reschols.usyd.edu.au

21 September 2005

Associate Professor D Kenny
School of Behavioural and Community Health Sciences
Faculty of Health Sciences
Cumberland Campus - C42
The University of Sydney

Dear Professor Kenny

Title: ***The impact of yoga on children and adolescents with disruptive behaviour disorders***
Ref No.: ***6945***

The Executive Committee considered Ms Pauline Jensen's request to modify the above protocol. The Executive Committee found that there were no ethical objections to the modifications and therefore recommends approval to proceed.

The following modifications were approved:

- Renewal of the project to 31 July 2006.
- Inclusion of Mr Philip Stevens to the list of authorised personnel.
- Inclusion of an objective measure to collect physiological data.
- Inclusion of three school recruitment sites (Lomandra SSP, Verona SSP and Green Square SSP).
- Amendments to the following documents:
  - Dear Principal letter
  - Participant Information Sheet
  - Consent Form

Conditions of Approval Applicable to all Projects
In order to comply with the *National Statement on Ethical Conduct in Research Involving Humans,* and in line with the Human Research Ethics Committee requirements the Chief Investigator's responsibility is to ensure that:

(1) The individual researcher's protocol complies with the final and Committee approved protocol.

(2) Modifications to the protocol cannot proceed until such approval is obtained in writing.

(3) The confidentiality and anonymity of all research subjects is maintained at all times, except as required by law.

(4) All research subjects are provided with a Participant Information Sheet and Consent Form, unless otherwise agreed by the Committee.

(5) The Participant Information Sheet and Consent Form are to be on University of Sydney letterhead and include the full title of the research project and telephone contacts for the researchers, unless otherwise agreed by the Committee.

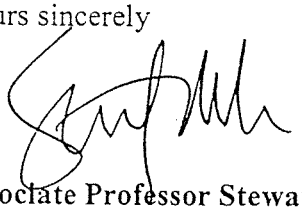
(6) The following statement must appear on the bottom of the Participant Information Sheet. ***Any person with concerns or complaints about the conduct of a research study can contact the Manager of Ethics Administration, University of Sydney, on (02) 9351 4811.***

(7) The standard University policy concerning storage of data and tapes should be followed. While temporary storage of data or tapes at the researcher's home or an off-campus site is acceptable during the active transcription phase of the project, permanent storage should be at a secure, University controlled site for a minimum of five years.

(8) A progress report should be provided by the end of each year. Failure to do so will lead to withdrawal of the approval of the research protocol and re-application to the Committee must occur before recommencing.

(9) A report and a copy of any published material should be provided at the completion of the Project.

Yours sincerely



Associate Professor Stewart Kellie
Chairman, Human Research Ethics Committee

Encl. Participant Information Statement
Consent form
Release of Information form
Permission to make Behavioural Observations form

PLANNING AND INNOVATION

NEW SOUTH WALES
DEPARTMENT
OF EDUCATION
AND TRAINING

Early Childhood and Primary Education
Secondary Education
Technical and Further Education
Vocational Education and Training
Higher Education
Adult and Community Education

Ms Pauline Jensen/ Associate Professor Diana Kenny
51 Cecily Street
LILYFIELD NSW 2040

Dear Ms Jensen and Associate Professor Kenny SERAP Number **03.197**

I refer to your application for an extension and modification of your research project in NSW government schools entitled *The Impact of Yoga on Disruptive Behaviour Disorders.* I am pleased to inform you that your application for an extension to this project has been approved.

This approval will remain valid until 31 July 2006.

The modification requested for your project, the use of brainwave recording equipment, has not been approved and this equipment may not be used.

The modification requested has been assessed as not meeting all the Criteria for approval as set out in the *Guidelines for the Conduct of Research in Government Schools.*

In particular I am not confident that the modification requested will result in sufficient educational benefit to outweigh the implications for the welfare of students in Departmental schools. Furthermore, it is intended that the proposed brainwave measurement results be used for another researcher's project as well. The second project has not been given departmental approval and parents and principals have not been provided with necessary information to give *informed* consent for their participation in the second project.

The following researchers and research assistants have approval to enter schools for the purposes of this research.

Names	**Approval expires**
Pauline Jensen	04/07/2006
Emily Higgins	15/08/2006
Veronique Pasquier	09/08/2006
Felicity Rea	01/07/2006
Melissa Stephens	10/06/2006
Patricia Burns	01/06/2006
Kylie Sharrock	21/02/2006
Rebecca Dunn	14/02/2006

Please note that no researcher is to enter schools beyond these dates, and that consideration and approval of further extensions would depend on

submission for each person of forms E and F, plus acceptable proof of identity, as indicated in the guidelines.

When your study is completed please forward your report marked to the General Manager, Planning and Innovation, Department of Education and Training, GPO Box 33, Sydney, NSW 2001.

If you would like to discuss any issue regarding this letter please contact Dr Rob Stevens, Manager, Schooling Research on (02) 9561 8402.

Yours sincerely

Dr Christine Ewan
General Manager, Planning and Innovation
20 October 05

OFFICE OF THE DEPUTY DIRECTOR-GENERAL
STRATEGIC PLANNING AND REGULATION

NEW SOUTH WALES
DEPARTMENT
OF EDUCATION
AND TRAINING

Early Childhood and Primary Education
Secondary Education
Technical and Further Education
Vocational Education and Training
Higher Education
Adult and Community Education

Ms Pauline Jensen
51 Cecily Street
Lilyfield NSW 2040

Dear Ms Jensen

SERAP Number: 03.197

I refer to your application for modification of your research project in NSW government schools entitled *The Impact of Yoga on Disruptive Behaviour Disorders.*

I am pleased to inform you that your application for a modification of this project has been approved. The use of instruments to measure breathing muscle movements and heart rate has been approved. The use of an instrument applied to the scalp to measure brainwave activity has not been approved.

The approval will remain valid until 31 July 2006.

You should include a copy of this letter with the documents you send to schools. I draw your attention to the following requirements for all researchers in NSW government schools:

- School Principals have the right to withdraw the school from the study at any time. The approval of the Principal for the specific method of gathering information for the school must also be sought.
- The privacy of the school and the students is to be protected.
- The participation of teachers and students must be voluntary and must be at the school's convenience.
- Any proposal to publish the outcomes of the study should be discussed with the Research Approvals Officer before publication proceeds.

When your study is completed please forward your report marked to General Manager, Planning and Innovation, Department of Education and Training, GPO Box 33, Sydney, NSW 2001.

Yours sincerely

Dr Christine Ewan
General Manager, Planning and Innovation
16 November 2005

Appendix D

MENTAL HEALTH CRITERIA (DET)

DISABILITY CRITERIA

An Information Package for School Counsellors

NSW Department of Education and Training
(School Sector)

NEW SOUTH WALES
DEPARTMENT
OF EDUCATION
AND TRAINING

July 2000

DISABILITY CRITERIA - NSW Department of Education and Training (school sector) - CODE SHEET – JULY 2000

DISABILITY CRITERIA	DESCRIPTION	CODE
Hearing impairment	Students must have a current audiogram and report from *Australian Hearing* which indicates a sensori-neural or permanent conductive hearing loss of 30 decibels or more in both ears. A report is required from the AP/ET Hearing which outlines an assessment of the student's communication and auditory skills, and describes the educational impact of the student's hearing impairment.	H1
Vision impairment	Students must have a current diagnosed vision impairment, which details a permanent vision loss that is 6/24 or less in the better eye corrected, or less than 20 degrees field of vision. A report is required from the AP/ET Vision which indicates that the student requires additional support to access the curriculum in alternative formats or with significant modification of materials. There must also be information on the student's ability to access the physical environment and daily living, orientation, mobility and social skills.	V1
Deaf/Blind	Students must have a current diagnosed vision impairment which details a permanent vision loss of 6/60 or less in the better eye corrected, or less than 20 degrees field of vision. They must also have a current audiogram and report from *Australian Hearing* which indicates a sensori-neural or permanent conductive hearing loss of greater than 90 decibels in both ears. The degree of vision and hearing loss are not the sole determinants of educational need. There must be evidence that the student has a dual sensory impairment which uniquely impacts on their ability to learn and communicate: a severe functional difficulty in responding to auditory and visual stimuli; a requirement for an alternative means of communication and/or the use of other senses (e.g., tactile) or aids; and the need for an intervention which cannot be provided by a program for students with hearing or vision impairment. Approval is required from a Co-ordinator Student Counselling and Welfare together with a Co-ordinator Special Education before a student can be confirmed as meeting criteria for deaf/blind.	DB1
Mental health problems	Students must exhibit behaviour(s) that is characteristic of mental health problems at a level of frequency, duration and intensity that seriously affects their educational functioning and emotional well-being. The behaviour(s) must be evident in the home, school and community environments. Students must have a current report from a specialist medical practitioner or registered psychologist with appropriate clinical experience, which details the nature of the behaviour(s). There must also be documented evidence of ongoing individual intervention by a mental health practitioner or school counsellor. The school must also provide documentation and evaluation of strategies used to address the student's needs within the school setting.	MH1 = predominantly internalising features MH2 = predominantly externalising features MH3 = other (please specify on summary sheet)

Element	Notes/comment
Students must have a current report	What is the date of the report? Its currency will depend on the student's age and the nature of the behaviour. Some disabilities are longer lasting (e.g. conduct disorder) others are transient (e.g. reactive depression). Is presently observed behaviour consistent with the report? Professional judgment is required.
from a specialist medical practitioner or registered psychologist with appropriate clinical experience	Reports from psychiatrists, paediatricians, registered psychologists with significant experience in the field of mental health, and multi disciplinary teams from large centres such as the New Children's Hospital would meet this requirement. DGOs should consult the co-ordinator, student counselling and welfare if in doubt.
which details the nature of the behaviour(s).	The report should support other statements and observations as to the nature of the behaviours of concern.
There must also be documented evidence of ongoing individual intervention by a mental health practitioner or school counsellor.	Records of school counsellor interventions and copies of reports provided by mental health practitioners (if available) will be on the student counselling file. Where reports are not available the school counsellor will have recorded information provided by parents/carers about support received.
The school must also provide documentation and evaluation of strategies used to address the student's needs within the school setting.	Intervention strategies should have been specifically planned with the needs of the individual student in mind (e.g. by a support teacher, behaviour) and while they may include elements more broadly applicable to a number of students, should be clearly tailored to the individual needs of this student. There will usually have been significant involvement of parents/carers. Documentation may be held by the school in a variety of formats – IEPs, minutes of review meetings, school reports etc. DGOs do not need to sight it all.

Considerations in assessing whether a student meets disability criteria for MENTAL HEALTH PROBLEMS

Before confirming that a student meets disability criteria, DGOs will, from the file and from discussion with the school counsellor, satisfy themselves that the student meets all elements of the criteria. The following comments are a guide to assist with this process.

Element	Notes/comment
Students must exhibit behaviour(s) that is characteristic of mental health problems	Are behaviours specified in detail? Is it clear that the behaviour constitutes a mental health problem rather than a behaviour problem with another cause (e.g. under-socialised child, adolescent consciously seeking suspension/expulsion)? Comparison with DSM-IV criteria may assist.
at a level of frequency	What is the frequency (hourly/ daily/ weekly/ in the classroom only/ playground only/ home)? A high level of frequency across a range of contexts would be expected.
duration and	How long does any one example of relevant behaviour last (1 minute/ 5 minutes/ all day)?
intensity	What is the intensity of the behaviour (i.e. what level of control has the student over it/ is the student disengaged from reality)? Levels will be well above those appropriate for age/developmental level. (Standardised assessments may help here - e.g. Achenbach, Devereux.)
that seriously affect their educational functioning	What is the student's achievement level relative to age, grade and ability? Is it clear that educational difficulties are the result of the disability? Is the achievement level cause for serious concern?
and emotional well-being.	How is the student's well-being affected? Is there evidence that social competency is diminished? Is the behaviour maladaptive and/or inconsistent with developmental level? (Standardised assessments may help here - e.g. Achenbach, Devereux). Is the student ostracised?
The behaviour(s) must be evident in the home, school and community environments.	Note, most DSM-IV criteria specify a variety of settings.

Appendix E

INSTRUMENTS

Parent and Teacher Rating Scale Forms

Conners' Parent Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

Child's Name:_____ **Gender:** M F (Circle One)

Birthdate:____/____/____ (Month / Day / Year) **Age:**_____ **School Grade:**_____

Parent's Name:_____ **Today's Date:**____/____/____ (Month / Day / Year)

Instructions: Below are a number of common problems that children have. Please rate each item according to your child's behavior in the last month. For each item, ask yourself "How much of a problem has this been in the last month?", and circle the best answer for each one. If none, not at all, seldom, or very infrequently, you would circle 0. If very much true, or it occurs very often or frequently, you would circle 3. You would circle 1 or 2 for ratings in between. Please respond to all the items.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
1. Angry and resentful	0	1	2	3
2. Difficulty doing or completing homework	0	1	2	3
3. Is always "on the go" or acts as if driven by a motor	0	1	2	3
4. Timid, easily frightened	0	1	2	3
5. Everything must be just so	0	1	2	3
6. Has no friends	0	1	2	3
7. Stomach aches	0	1	2	3
8. Fights	0	1	2	3
9. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)	0	1	2	3
10. Has difficulty sustaining attention in tasks or play activities	0	1	2	3
11. Argues with adults	0	1	2	3
12. Fails to complete assignments	0	1	2	3
13. Hard to control in malls or while grocery shopping	0	1	2	3
14. Afraid of people	0	1	2	3
15. Keeps checking things over again and again	0	1	2	3
16. Loses friends quickly	0	1	2	3
17. Aches and pains	0	1	2	3
18. Restless or overactive	0	1	2	3
19. Has trouble concentrating in class	0	1	2	3
20. Does not seem to listen to what is being said to him/her	0	1	2	3
21. Loses temper	0	1	2	3
22. Needs close supervision to get through assignments	0	1	2	3
23. Runs about or climbs excessively in situations where it is inappropriate	0	1	2	3
24. Afraid of new situations	0	1	2	3
25. Fussy about cleanliness	0	1	2	3
26. Does not know how to make friends	0	1	2	3
27. Gets aches and pains or stomachaches before school	0	1	2	3
28. Excitable, impulsive	0	1	2	3
29. Does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behavior or failure to understand instructions)	0	1	2	3
30. Has difficulty organizing tasks and activities	0	1	2	3
31. Irritable	0	1	2	3
32. Restless in the "squirmy sense"	0	1	2	3
33. Afraid of being alone	0	1	2	3
34. Things must be done the same way every time	0	1	2	3
35. Does not get invited over to friends' houses	0	1	2	3
36. Headaches	0	1	2	3
37. Fails to finish things he/she starts	0	1	2	3

Items continued on back page...

Conners' Parent Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
38. Inattentive, easily distracted	0	1	2	3
39. Talks excessively	0	1	2	3
40. Actively defies or refuses to comply with adults' requests	0	1	2	3
41. Fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities	0	1	2	3
42. Has difficulty waiting in lines or awaiting turn in games or group situations	0	1	2	3
43. Has a lot of fears	0	1	2	3
44. Has rituals that he/she must go through	0	1	2	3
45. Distractibility or attention span a problem	0	1	2	3
46. Complains about being sick even when nothing is wrong	0	1	2	3
47. Temper outbursts	0	1	2	3
48. Gets distracted when given instructions to do something	0	1	2	3
49. Interrupts or intrudes on others (e.g., butts into others' conversations or games)	0	1	2	3
50. Forgetful in daily activities	0	1	2	3
51. Cannot grasp arithmetic	0	1	2	3
52. Will run around between mouthfuls at meals	0	1	2	3
53. Afraid of the dark, animals, or bugs	0	1	2	3
54. Sets very high goals for self	0	1	2	3
55. Fidgets with hands or feet or squirms in seat	0	1	2	3
56. Short attention span	0	1	2	3
57. Touchy or easily annoyed by others	0	1	2	3
58. Has sloppy handwriting	0	1	2	3
59. Has difficulty playing or engaging in leisure activities quietly	0	1	2	3
60. Shy, withdrawn	0	1	2	3
61. Blames others for his/her mistakes or misbehavior	0	1	2	3
62. Fidgeting	0	1	2	3
63. Messy or disorganized at home or school	0	1	2	3
64. Gets upset if someone rearranges his/her things	0	1	2	3
65. Clings to parents or other adults	0	1	2	3
66. Disturbs other children	0	1	2	3
67. Deliberately does things that annoy other people	0	1	2	3
68. Demands must be met immediately — easily frustrated	0	1	2	3
69. Only attends if it is something he/she is very interested in	0	1	2	3
70. Spiteful or vindictive	0	1	2	3
71. Loses things necessary for tasks or activities (e.g., school assignments, pencils, books, tools or toys)	0	1	2	3
72. Feels inferior to others	0	1	2	3
73. Seems tired or slowed down all the time	0	1	2	3
74. Spelling is poor	0	1	2	3
75. Cries often and easily	0	1	2	3
76. Leaves seat in classroom or in other situations in which remaining seated is expected	0	1	2	3
77. Mood changes quickly and drastically	0	1	2	3
78. Easily frustrated in efforts	0	1	2	3
79. Easily distracted by extraneous stimuli	0	1	2	3
80. Blurts out answers to questions before the questions have been completed	0	1	2	3

Conners' Teacher Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

Student's Name:_____ **Gender:** M F (Circle One)

Birthdate:____/____/____ (Month / Day / Year) **Age:**_____ **School Grade:**_____

Teacher's Name:_____ **Today's Date:**____/____/____ (Month / Day / Year)

Instructions: Below are a number of common problems that children have in school. Please rate each item according to how much of a problem it has been in the last month. For each item, ask yourself "How much of a problem has this been in the last month?", and circle the best answer for each one. If none, not at all, seldom, or very infrequently, you would circle 0. If very much true, or it occurs very often or frequently, you would circle 3. You would circle 1 or 2 for ratings in between. Please respond to all the items.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
1. Defiant	0	1	2	3
2. Restless in the "squirmy" sense	0	1	2	3
3. Forgets things he/she has already learned	0	1	2	3
4. Appears to be unaccepted by group	0	1	2	3
5. Feelings easily hurt	0	1	2	3
6. Is a perfectionist	0	1	2	3
7. Temper outbursts; explosive, unpredictable behavior	0	1	2	3
8. Excitable, impulsive	0	1	2	3
9. Fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities	0	1	2	3
10. Sassy	0	1	2	3
11. Is always "on the go" or acts as if driven by a motor	0	1	2	3
12. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)	0	1	2	3
13. Is one of the last to be picked for teams or games	0	1	2	3
14. Is an emotional child	0	1	2	3
15. Everything must be just so	0	1	2	3
16. Restless or overactive	0	1	2	3
17. Fails to finish things he/she starts	0	1	2	3
18. Does not seem to listen to what is being said to him/her	0	1	2	3
19. Actively defies or refuses to comply with adults' requests	0	1	2	3
20. Leaves seat in classroom or in other situations in which remaining seated is expected	0	1	2	3
21. Poor in spelling	0	1	2	3
22. Has no friends	0	1	2	3
23. Timid, easily frightened	0	1	2	3
24. Keeps checking things over and over	0	1	2	3
25. Cries often and easily	0	1	2	3
26. Inattentive, easily distracted	0	1	2	3
27. Has difficulty organizing tasks or activities	0	1	2	3
28. Has difficulty sustaining attention in tasks or play activities	0	1	2	3
29. Has difficulty waiting his/her turn	0	1	2	3
30. Not reading up to par	0	1	2	3

Items continued on back page...

Conners' Teacher Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

	NOT TRUE AT ALL (Never, Seldom)	JUST A LITTLE TRUE (Occasionally)	PRETTY MUCH TRUE (Often, Quite a Bit)	VERY MUCH TRUE (Very Often, Very Frequent)
31. Does not know how to make friends	0	1	2	3
32. Sensitive to criticism	0	1	2	3
33. Seems over-focused on details	0	1	2	3
34. Fidgeting	0	1	2	3
35. Disturbs other children	0	1	2	3
36. Talks excessively	0	1	2	3
37. Argues with adults	0	1	2	3
38. Cannot remain still	0	1	2	3
39. Runs about or climbs excessively in situations where it is inappropriate	0	1	2	3
40. Lacks interest in schoolwork	0	1	2	3
41. Has poor social skills	0	1	2	3
42. Has difficulty playing or engaging in leisure activities quietly	0	1	2	3
43. Likes everything neat and clean	0	1	2	3
44. Fidgets with hands or feet or squirms in seat	0	1	2	3
45. Demands must be met immediately—easily frustrated	0	1	2	3
46. Blurts out answers to questions before the questions have been completed	0	1	2	3
47. Spiteful or vindictive	0	1	2	3
48. Short attention span	0	1	2	3
49. Loses things necessary for tasks or activities (e.g., school assignments, pencils, books, tools, or toys)	0	1	2	3
50. Only pays attention to things he/she is really interested in	0	1	2	3
51. Shy, withdrawn	0	1	2	3
52. Distractibility or attention span a problem	0	1	2	3
53. Things must be done the same way every time	0	1	2	3
54. Mood changes quickly and drastically	0	1	2	3
55. Interrupts or intrudes on others (e.g., butts into others' conversations or games)	0	1	2	3
56. Poor in arithmetic	0	1	2	3
57. Does not follow through on instructions and fails to finish schoolwork (not due to oppositional behavior or failure to understand instructions)	0	1	2	3
58. Easily distracted by extraneous stimuli	0	1	2	3
59. Restless, always up and on the go	0	1	2	3

SELF DESCRIPTION QUESTIONNAIRE – I

SDQ I

Your Name_____ Circle one: Boy Girl

School_____ Grade_____ Age_____

Teacher_____ Date:_____

This is a chance to look at yourself. **It is not a test.** There are no right answers and everyone will have different answers. Be sure that your answers show how you feel about yourself. **PLEASE DO NOT TALK ABOUT YOUR ANSWERS WITH ANYONE ELSE.** We will keep your answers private and not show them to anyone.

When you are ready to begin, please read each sentence and decide your answer (You may read quietly to yourself as I read aloud). There are five possible answers for each question - "True", "False", and three answers in between. There are five boxes next to each sentence, one for each of the answers. The answers are written at the top of the boxes. Choose your answer to a sentence and put a tick in the box under the answer you choose. **DO NOT** say your answer out loud or talk about it with anyone else. Before you start there are three examples below. A student named Bob has already answered the first two examples to show you how to do it. In the third example you must choose your own answer by ticking a box.

		FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE
EXAMPLES						
1.	I like to read comic books..... 1	☐	☐	☐	☐	☑
2.	In general, I am neat and tidy..... 2	☐	☐	☑	☐	☐
3.	I like to watch T.V..... 3	☐	☐	☐	☐	☐

(Bob put a tick in the box under the answer "TRUE". This means that he really likes to read comic books. If Bob did not like to read comic books very much, he would have answered "FALSE" or "MOSTLY FALSE").

(Bob answered "SOMETIMES FALSE, SOMETIMES TRUE" because he is not very neat, but he is not very messy either)

(For this sentence you have to choose the answer that is best for you. First you must decide if the sentence is "TRUE" or "FALSE" or somewhere in between. If you really like to watch T.V. a lot you would answer "TRUE" by putting a tick in the last box. If you hate watching T.V. you would answer "FALSE" by putting a tick in the first box. If your answer is somewhere in between then you would choose one of the other three boxes).

If you want to change an answer you have marked you should cross out the tick and put a new tick in another box on the same line.

For all the sentences be sure that your tick is on the same line as the right sentence. You should have one answer and only one answer for each sentence. **Do not leave out any of the sentences.** Once you have started, **PLEASE DO NOT TALK.** Turn over the page and begin.

ID	Surname	Christian Name	Sex 1 - Male 2 - Female	Year	School	Class	Age	DOB	Date	Time

Self-concept Enhancement and Learning Facilitation (SELF) Research Centre, University of Western Sydney.

			FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
1.	I am good looking	1	❑	❑	❑	❑	❑	1
2.	I am good at all **SCHOOL SUBJECTS**	2	❑	❑	❑	❑	❑	2
3.	I can run fast	3	❑	❑	❑	❑	❑	3
4.	I get good marks in **READING**	4	❑	❑	❑	❑	❑	4
5.	My parents understand me	5	❑	❑	❑	❑	❑	5
6.	I hate **MATHEMATICS**	6	❑	❑	❑	❑	❑	6
7.	I have lots of friends	7	❑	❑	❑	❑	❑	7
8.	I like the way I look	8	❑	❑	❑	❑	❑	8
9.	I enjoy doing work in all **SCHOOL SUBJECTS**	9	❑	❑	❑	❑	❑	9
10.	I like to run and play hard	10	❑	❑	❑	❑	❑	10

			FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
11.	I like **READING**	11	❑	❑	❑	❑	❑	11
12.	My parents are usually unhappy or disappointed with what I do	12	❑	❑	❑	❑	❑	12
13.	Work in **MATHEMATICS** is easy for me	13	❑	❑	❑	❑	❑	13
14	I make friends easily	14	❑	❑	❑	❑	❑	14
15.	I have a pleasant looking face	15	❑	❑	❑	❑	❑	15
16.	I get good marks in all **SCHOOL SUBJECTS**	16	❑	❑	❑	❑	❑	16
17.	I hate sports and games	17	❑	❑	❑	❑	❑	17
18.	I am good at **READING**	18	❑	❑	❑	❑	❑	18
19.	I like my parents	19	❑	❑	❑	❑	❑	19
20.	I look forward to **MATHEMATICS**	20	❑	❑	❑	❑	❑	20

	FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
21. Most kids have more friends than I do..... 21	☐	☐	☐	☐	☐	21
22. I am a nice looking person..... 22	☐	☐	☐	☐	☐	22
23. I hate all **SCHOOL SUBJECTS**..... 23	☐	☐	☐	☐	☐	23
24. I enjoy sports and games..... 24	☐	☐	☐	☐	☐	24
25. I am interested in **READING**..... 25	☐	☐	☐	☐	☐	25
26. My parents like me..... 26	☐	☐	☐	☐	☐	26
27. I get good marks in **MATHEMATICS**..... 27	☐	☐	☐	☐	☐	27
28. I get along with kids easily..... 28	☐	☐	☐	☐	☐	28
29. I do lots of important things..... 29	☐	☐	☐	☐	☐	29
30. I am ugly..... 30	☐	☐	☐	☐	☐	30

	FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
31. I learn things quickly in all **SCHOOL SUBJECTS**..... 31	☐	☐	☐	☐	☐	31
32. I have good muscles..... 32	☐	☐	☐	☐	☐	32
33. I am dumb at **READING**..... 33	☐	☐	☐	☐	☐	33
34. If I have children of my own, I want to bring them up like my parents raised me..... 34	☐	☐	☐	☐	☐	34
35. I am interested in **MATHEMATICS**..... 35	☐	☐	☐	☐	☐	35
36. I am easy to like..... 36	☐	☐	☐	☐	☐	36
37. Overall, I am no good..... 37	☐	☐	☐	☐	☐	37
38. Other kids think I am good looking..... 38	☐	☐	☐	☐	☐	38
39. I am interested in all SCHOOL SUBJECTS..... 39	☐	☐	☐	☐	☐	39
40. I am good at sports..... 40	☐	☐	☐	☐	☐	40

		FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
41.	I enjoy doing work in **READING**..... 41	❑	❑	❑	❑	❑	41
42.	My parents and I spend a lot of time together..... 42	❑	❑	❑	❑	❑	42
43.	I learn things quickly in **MATHEMATICS**..... 43	❑	❑	❑	❑	❑	43
44.	Other kids want me to be their friend..... 44	❑	❑	❑	❑	❑	44
45.	In general, I like being the way I am..... 45	❑	❑	❑	❑	❑	45
46.	I have a good looking body..... 46	❑	❑	❑	❑	❑	46
47.	I am dumb in all **SCHOOL SUBJECTS**..... 47	❑	❑	❑	❑	❑	47
48.	I can run a long way without stopping..... 48	❑	❑	❑	❑	❑	48
49.	Work in **READING** is easy for me..... 49	❑	❑	❑	❑	❑	49
50.	My parents are easy to talk to..... 50	❑	❑	❑	❑	❑	50

		FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
51.	I like **MATHEMATICS**..... 51	❑	❑	❑	❑	❑	51
52.	I have more friends than most other kids..... 52	❑	❑	❑	❑	❑	52
53.	Overall, I have a lot to be proud of..... 53	❑	❑	❑	❑	❑	53
54.	I am better looking than most of my friends..... 54	❑	❑	❑	❑	❑	54
55.	I look forward to all **SCHOOL SUBJECTS**..... 55	❑	❑	❑	❑	❑	55
56.	I am a good athlete..... 56	❑	❑	❑	❑	❑	56
57.	I look forward to **READING**..... 57	❑	❑	❑	❑	❑	57
58.	I get along well with my parents..... 58	❑	❑	❑	❑	❑	58
59.	I am good at **MATHEMATICS**..... 59	❑	❑	❑	❑	❑	59
60.	I am popular with kids of my own age..... 60	❑	❑	❑	❑	❑	60

	FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
61. I can't do anything right..... 61	☐	☐	☐	☐	☐	61
62. I have nice features like nose, and eyes, and hair..... 62	☐	☐	☐	☐	☐	62
63. Work in all **SCHOOL SUBJECTS** is easy for me..... 63	☐	☐	☐	☐	☐	63
64. I am good at throwing a ball..... 64	☐	☐	☐	☐	☐	64
65. I hate **READING**..... 65	☐	☐	☐	☐	☐	65
66. My parents and I have a lot of fun together..... 66	☐	☐	☐	☐	☐	66
67. I can do things as well as most other people..... 67	☐	☐	☐	☐	☐	67
68. I enjoy doing work in **MATHEMATICS**..... 68	☐	☐	☐	☐	☐	68
69. Most other kids like me..... 69	☐	☐	☐	☐	☐	69
70. Other people think I am a good person..... 70	☐	☐	☐	☐	☐	70

	FALSE	MOSTLY FALSE	SOMETIMES FALSE, SOMETIMES TRUE	MOSTLY TRUE	TRUE	
71. I like all **SCHOOL SUBJECTS**..... 71	☐	☐	☐	☐	☐	71
72. A lot of things about me are good..... 72	☐	☐	☐	☐	☐	72
73. I learn things quickly in **READING**..... 73	☐	☐	☐	☐	☐	73
74. I am as good as most other people..... 74	☐	☐	☐	☐	☐	74
75. I am dumb at **MATHEMATICS**..... 75	☐	☐	☐	☐	☐	75
76. When I do something, I do it well..... 76	☐	☐	☐	☐	☐	76

SELF DESCRIPTION QUESTIONNAIRE – II

SDQ II

Your Name_____ **Circle one:** **Male** **Female**

School_____ **Grade**_____ **Age**_____ **Date:**_____

This is a chance to look at yourself. **It is not a test.** There are no right answers and everyone will have different answers. Be sure that your answers show how you feel about yourself. **PLEASE DO NOT TALK ABOUT YOUR ANSWERS WITH ANYONE ELSE.** We will keep your answers private and not show them to anyone.

When you are ready to begin, please read each sentence and choose an answer. There are six possible answers for each question - "True", "False", and four answers in between. There are six boxes next to each sentence, one for each of the answers. The answers are written at the top of the boxes. Choose your answer to a sentence and put a tick in the box under the answer you choose. **DO NOT** say your answer out loud or talk about it with anyone else.

Before you start there are three examples below. A student named Bob has already answered the first two examples to show you how to do it. In the third example you must choose your own answer by ticking a box.

EXAMPLES

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE
1.	I like to read comic books..... 1	☐	☐	☐	☐	☐	☑

(Bob put a tick in the box under the answer "TRUE". This means that he really likes to read comic books. If Bob did not like to read comic books very much, he would have answered "FALSE" or "MOSTLY FALSE".)

2.	In general, I am neat and tidy..... 2	☐	☐	☑	☐	☐	☐

(Bob answered "MORE FALSE THAN TRUE" because he is definitely not very neat, but he is not really messy either).

3.	I like to watch T.V..... 3	☐	☐	☐	☐	☐	☐

(For this sentence you have to choose the answer that is best for you. First you must decide if the sentence is "TRUE" or "FALSE" for you, or somewhere in between. If you really like to watch T.V. a lot you would answer "TRUE" by putting a tick in the last box. If you hate watching T.V. you would answer "FALSE" by putting a tick in the first box. If you do not like T.V. very much, but you watch it sometimes, you might decide to put a tick in the box that says "MOSTLY FALSE" or the box for "MORE FALSE THAN TRUE".)

If you want to change an answer you have marked you should cross out the tick and put a new tick in another box on the same line.

For all the sentences be sure that your tick is on the same line as the sentence you are answering. You should have one answer and only one answer for each sentence. **Do not leave out any of the sentences**. Once you have started, **PLEASE DO NOT TALK.** Turn over the page and begin.

ID	Surname	Christian Name	Sex 1 - Male 2 - Female	Year	School	Class	Age	DOB	Date	Time

Self-concept Enhancement and Learning Facilitation (SELF) Research Centre, University of Western Sydney.

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
1.	**MATHEMATICS** is one of my best subjects..... 1	❑	❑	❑	❑	❑	❑	1
2.	Nobody thinks that I am good looking..... 2	❑	❑	❑	❑	❑	❑	2
3.	Overall, I have a lot to be proud of..... 3	❑	❑	❑	❑	❑	❑	3
4.	I sometimes take things that belong to other people.... 4	❑	❑	❑	❑	❑	❑	4
5.	I enjoy things like sports, gym, and dance..... 5	❑	❑	❑	❑	❑	❑	5
6.	I am hopeless in **ENGLISH** classes..... 6	❑	❑	❑	❑	❑	❑	6
7.	I am usually relaxed..... 7	❑	❑	❑	❑	❑	❑	7
8.	My parents are usually unhappy or disappointed with what I do..... 8	❑	❑	❑	❑	❑	❑	8
9.	People come to me for help in most **SCHOOL SUBJECTS**..... 9	❑	❑	❑	❑	❑	❑	9
10.	It is difficult to make friends with members of my own sex..... 10	❑	❑	❑	❑	❑	❑	10

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
11.	People of the opposite sex whom I like, don`t like me.... 11	❑	❑	❑	❑	❑	❑	11
12.	I often need help in **MATHEMATICS**..... 12	❑	❑	❑	❑	❑	❑	12
13.	I have a nice looking face..... 13	❑	❑	❑	❑	❑	❑	13
14.	Overall, I am no good..... 14	❑	❑	❑	❑	❑	❑	14
15.	I am honest..... 15	❑	❑	❑	❑	❑	❑	15
16.	I am lazy when it comes to things like sports and hard physical exercise..... 16	❑	❑	❑	❑	❑	❑	16
17.	I look forward to **ENGLISH** classes..... 17	❑	❑	❑	❑	❑	❑	17
18.	I worry more than I need to..... 18	❑	❑	❑	❑	❑	❑	18
19.	I get along well with my parents..... 19	❑	❑	❑	❑	❑	❑	19
20.	I am too stupid at school to get into a good university... 20	❑	❑	❑	❑	❑	❑	20

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
21.	I make friends easily with boys..... 21	☐	☐	☐	☐	☐	☐	21
22.	I make friends easily with girls..... 22	☐	☐	☐	☐	☐	☐	22
23.	I look forward to **MATHEMATICS** classes..... 23	☐	☐	☐	☐	☐	☐	23
24.	Most of my friends are better looking than I am..... 24	☐	☐	☐	☐	☐	☐	24
25.	Most things I do, I do well..... 25	☐	☐	☐	☐	☐	☐	25
26.	I sometimes tell lies to stay out of trouble..... 26	☐	☐	☐	☐	☐	☐	26
27.	I am good at things like sports, gym, and dance..... 27	☐	☐	☐	☐	☐	☐	27
28.	I do badly on tests that need a lot of **READING** ability... 28	☐	☐	☐	☐	☐	☐	28
29.	I don`t get upset very easily..... 29	☐	☐	☐	☐	☐	☐	29
30.	It is difficult for me to talk to my parents..... 30	☐	☐	☐	☐	☐	☐	30

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
31.	If I work really hard I could be one of the best students in my school year..... 31	☐	☐	☐	☐	☐	☐	31
32.	Not many people of my own sex like me..... 32	☐	☐	☐	☐	☐	☐	32
33.	I am not very popular with members of the opposite sex..... 33	☐	☐	☐	☐	☐	☐	33
34.	I have trouble understanding anything with **MATHEMATICS** in it..... 34	☐	☐	☐	☐	☐	☐	34
35.	I am good looking..... 35	☐	☐	☐	☐	☐	☐	35
36.	Nothing I do ever seems to turn out right..... 36	☐	☐	☐	☐	☐	☐	36
37.	I always tell the truth..... 37	☐	☐	☐	☐	☐	☐	37
38.	I am awkward at things like sports, gym, and dance..... 38	☐	☐	☐	☐	☐	☐	38
39.	Work in **ENGLISH** classes is easy for me..... 39	☐	☐	☐	☐	☐	☐	39
40.	I am often depressed and down in the dumps..... 40	☐	☐	☐	☐	☐	☐	40

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
41.	My parents treat me fairly..... 41	❑	❑	❑	❑	❑	❑	41
42.	I get bad marks in most **SCHOOL SUBJECTS**..... 42	❑	❑	❑	❑	❑	❑	42
43.	I am popular with boys..... 43	❑	❑	❑	❑	❑	❑	43
44.	I am popular with girls..... 44	❑	❑	❑	❑	❑	❑	44
45.	I enjoy studying for **MATHEMATICS**..... 45	❑	❑	❑	❑	❑	❑	45
46.	I hate the way I look..... 46	❑	❑	❑	❑	❑	❑	46
47.	Overall, most things I do turn out well..... 47	❑	❑	❑	❑	❑	❑	47
48.	Cheating on a test is OK if I do not get caught..... 48	❑	❑	❑	❑	❑	❑	48
49.	I am better than most of my friends at things like sports, gym, and dance..... 49	❑	❑	❑	❑	❑	❑	49
50.	I am not very good at **READING**..... 50	❑	❑	❑	❑	❑	❑	50

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
51.	Other people get more upset about things than I do..... 51	❑	❑	❑	❑	❑	❑	51
52.	I have lots of arguments with my parents..... 52	❑	❑	❑	❑	❑	❑	52
53.	I learn things quickly in most **SCHOOL SUBJECTS**..... 53	❑	❑	❑	❑	❑	❑	53
54.	I do not get along very well with boys..... 54	❑	❑	❑	❑	❑	❑	54
55.	I do not get along very well with girls..... 55	❑	❑	❑	❑	❑	❑	55
56.	I do badly in tests of **MATHEMATICS**..... 56	❑	❑	❑	❑	❑	❑	56
57.	Other people think I am good looking..... 57	❑	❑	❑	❑	❑	❑	57
58.	I don`t have much to be proud of..... 58	❑	❑	❑	❑	❑	❑	58
59.	Honesty is very important to me..... 59	❑	❑	❑	❑	❑	❑	59
60.	I try to get out of sports and physical education classes whenever I can..... 60	❑	❑	❑	❑	❑	❑	60

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
61.	**ENGLISH** is one of my best subjects..... 61	❑	❑	❑	❑	❑	❑	61
62.	I am a nervous person..... 62	❑	❑	❑	❑	❑	❑	62
63.	My parents understand me..... 63	❑	❑	❑	❑	❑	❑	63
64.	I am stupid at most **SCHOOL SUBJECTS**..... 64	❑	❑	❑	❑	❑	❑	64
65.	I have good friends who are members of my own sex... 65	❑	❑	❑	❑	❑	❑	65
66.	I have lots of friends of the opposite sex..... 66	❑	❑	❑	❑	❑	❑	66
67.	I get good marks in **MATHEMATICS**..... 67	❑	❑	❑	❑	❑	❑	67
68.	I am ugly..... 68	❑	❑	❑	❑	❑	❑	68
69.	I can do things as well as most people..... 69	❑	❑	❑	❑	❑	❑	69
70.	I sometimes cheat..... 70	❑	❑	❑	❑	❑	❑	70

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
71.	I can run a long way without stopping..... 71	❑	❑	❑	❑	❑	❑	71
72.	I hate **READING**..... 72	❑	❑	❑	❑	❑	❑	72
73.	I often feel confused and mixed up..... 73	❑	❑	❑	❑	❑	❑	73
74.	I do not like my parents very much..... 74	❑	❑	❑	❑	❑	❑	74
75.	I do well in tests in most **SCHOOL SUBJECTS**..... 75	❑	❑	❑	❑	❑	❑	75
76.	Most boys try to avoid me..... 76	❑	❑	❑	❑	❑	❑	76
77.	Most girls try to avoid me..... 77	❑	❑	❑	❑	❑	❑	77
78.	I never want to take another **MATHEMATICS** course.... 78	❑	❑	❑	❑	❑	❑	78
79.	I have a good looking body..... 79	❑	❑	❑	❑	❑	❑	79
80.	I feel that my life is not very useful..... 80	❑	❑	❑	❑	❑	❑	80

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
81. When I make a promise I keep it.....	81	❑	❑	❑	❑	❑	❑	81
82. I hate things like sports, gym, and dance.....	82	❑	❑	❑	❑	❑	❑	82
83. I get good marks in ENGLISH.....	83	❑	❑	❑	❑	❑	❑	83
84. I get upset easily.....	84	❑	❑	❑	❑	❑	❑	84
85. My parents really love me a lot.....	85	❑	❑	❑	❑	❑	❑	85
86. I have trouble with most SCHOOL SUBJECTS.....	86	❑	❑	❑	❑	❑	❑	86
87. I make friends easily with members of my own sex.....	87	❑	❑	❑	❑	❑	❑	87
88. I get a lot of attention from members of the opposite sex.....	88	❑	❑	❑	❑	❑	❑	88
89. I have always done well in MATHEMATICS.....	89	❑	❑	❑	❑	❑	❑	89
90. If I really try I can do all most anything I want to do.....	90	❑	❑	❑	❑	❑	❑	90

		FALSE	MOSTLY FALSE	MORE FALSE THAN TRUE	MORE TRUE THAN FALSE	MOSTLY TRUE	TRUE	
91. I often tell lies.....	91	❑	❑	❑	❑	❑	❑	91
92. I have trouble expressing myself when I try to write something.....	92	❑	❑	❑	❑	❑	❑	92
93. I am a calm person.....	93	❑	❑	❑	❑	❑	❑	93
94. I am good at most SCHOOL SUBJECTS.....	94	❑	❑	❑	❑	❑	❑	94
95. I have few friends of the same sex as myself.....	95	❑	❑	❑	❑	❑	❑	95
96. I hate MATHEMATICS.....	96	❑	❑	❑	❑	❑	❑	96
97. Overall, I am a failure.....	97	❑	❑	❑	❑	❑	❑	97
98. People can really count on me to do the right thing.....	98	❑	❑	❑	❑	❑	❑	98
99. I learn things quickly in ENGLISH classes.....	99	❑	❑	❑	❑	❑	❑	99
100. I worry about a lot of things.....	100	❑	❑	❑	❑	❑	❑	100
101. Most school subjects are just too hard for me.....	101	❑	❑	❑	❑	❑	❑	101
102. I enjoy spending time with my friends of the same sex	102	❑	❑	❑	❑	❑	❑	102

YOGA SURVEY

NAME:_____

SCHOOL:_____

DATE:_____

Since doing YOGA:-

	Circle the correct answer.	
1. Do you have more energy?	**YES**	**NO**
2. Are you are calmer person?	**YES**	**NO**
3. Are you more flexible?	**YES**	**NO**
4. Do you feel stronger?	**YES**	**NO**
5. Are you able to relax easier?	**YES**	**NO**
6. Do you have less mood swings?	**YES**	**NO**
7. Do you experience as much anger?	**YES**	**NO**

Any comments about you and YOGA.

_____

_____

_____

_____

_____

_____

Figure 1: Yoga Survey

Individual Assessment in Yoga Competence Class

Table 1: Individual Assessment of Yoga Competence class

Individually Assessed Class
JOINT EXERCISES (ankles, knees, hips fingers, wrists, elbows, shoulders, neck).
SPINAL EXERCISES (Rocking and rolling ,side twist, bridge..
POSTURES FOR UNBLOCKING ENERGY
HA BREATHING
POSTURES FOR LIFTING THE MOOD, DEEPENING THE BREATH AND CALMING /RELAXING
POSTURES TO HELP REDUCE ANGER AND AGGRESSION
.CAT
TIGER
.COBRA
GRASSHOPPER
.LOCUST
SKY DIVER
.CHILD'S POSE
DOG
.UPWARDS FACING DOG
MOON
RELAXATION POSES
BALANCING AND INCREASING CONCENTRATION AND FOCUS
TADASANA
TREE POSE
THE LEANING TREEE POSE
THE CRANE POSE
.THE POSE OF THE PATIENT CRANE
.EAGLE
LOTUS FLOWER
SPARROW POSE
YOGIC BREATHING
FULL YOGIC BREATHING
RELAXATION
3- 10 mins SOUNDS/ MUSCLES/ BODY ROTATION/ BREATHING
PRANAYAMA
KAPALBHATI.-STAIR CASE/FAST BRE.
BRAHMARI
Chanting SOUNDS

Assessment Tasks for Individual Assessment in Yoga Competence

Table 1: Assessment Tasks for Individual Assessment in Yoga Competence

YOGA AND DISRUPTIVE BEHAVIOUR DISORDERS PAULINE JENSEN UNIVERSITY OF SYDNEY									
SCHOOL:				**DATE:**					
ASSESSMENT TASKS									
Name of Participant	Attendance **10**	Attitude **20**	Ability to concentrate and focus in posture correctly and hold for 5 breaths where required. **28 (4 per sequence)**	Perform the warm ups slowly and with awareness. **6**	Ability to hold relaxation pose after posture where required. **6**	Ability to relax for 3-5 minutes **10**	Ability To remain calm/quiet throughout program. **10**	Abilty to do breathing practices. **5**	Abilty to calmly ch **5**

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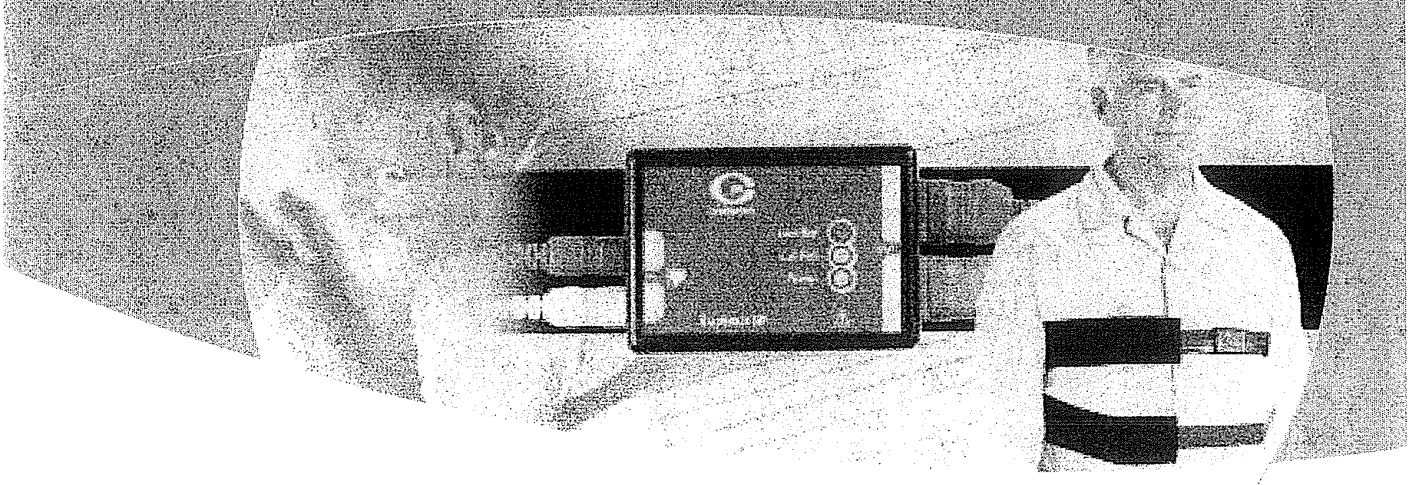

Technical Information Bulletin

NeuroMedical Supplies

Appendix F

YOGA INTERVENTION MANUAL AND RESOURCES

RESEARCHING THE EFFECTS OF YOGA ON BEHAVIOUR DISORDERS.

PAULINE JENSEN. School of Behavioural and Community Health Sciences. THE UNIVERSITY OF SYDNEY, LIDCOMBE NSW.

SCHOOL:_____ GROUP_____

WEEK	11						12						13						14						15					
DATE																														
JOINT EXERCISES (ankles, knees, hips, fingers, wrists, elbows,shoulders, neck).																														
SPINAL EXERCISES (Lower back massage, back stretch, leg stretch, cycling, spinal twist and stretch. bridge, boat.																														
POSTURES FOR UNBLOCKING ENERGY																														
1.ROWING THE BOAT																														
2.CHURNING THE MILL																														
3.WOODCHOPPER																														
4.SALUTE TO NATURE																														
5.PUMP																														
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POSTURES FOR LIFTING THE MOOD, DEEPENING THE BREATH AND CALMING /RELAXING																														
8..UP / FOR / BACK / SIDEWAYS																														
9.WARRIORS POSE																														
10.HERO'S POSE																														
11. KONASANA																														
12.TRIANGLE POSE SIMPLE																														
TRIANGLE POSE- DIFFICULT																														
13.TORTOISE																														
14. SLEEPING THUNDERBOLT																														
15. LUNGE																														
POSTURES FOR STEADYING AND REGULATING THE BREATHING, GROUNDING THE ENERGY AND REMOVING EXCESS ENERGY																														
16.DOG BREATHING																														
17..HANDS IN and OUT BREATHING																														
POSTURES TO HELP REDUCE ANGER AND AGGRESSION																														
18.CAT																														
19.THREADING THE NEEDLE																														
20. TIGER																														
21.POUNCING TIGER																														
22. CAMEL																														
23.SPHINX/ SNAKE POSE																														
24.SWING STRETCH																														
25.BOW																														
26..LOCUST																														
27.SKY DIVER																														
28.WAIST ROTATION POSE																														

29.SITTING SPINAL TWIST 1																													
RESEARCHING THE EFFECTS OF YOGA ON BEHAVIOUR DISORDERS. PAULINE JENSEN. School of Behavioural and Community Health Sciences. THE UNIVERSITY OF SYDNEY, LIDCOMBE NSW.																													
SCHOOL:_____ GROUP_____																													
WEEK	11						12						13						14						15				
DATE																													
30..SITTING SPINAL TWIST 2																													
31..HEAD TO KNEE POSE																													
32..CHILD'S POSE																													
33. THE ARCHER																													
34. DOG																													
35.UPWARDS FACING DOG																													
36. SALUTE																													
RELAXATION POSES																													
37.ANIMAL POSE																													
38. CROCODILE																													
39. BEST POSE																													
40. CORPSE POSE																													
BALANCING AND INCREASING CONCENTRATION AND FOCUS																													
41.TADASANA																													
42.TREE POSE																													
43.THE LEANING TREEE POSE																													
44.ARROW POSE																													
45.THE CRANE POSE																													
46.SPINAL COLUMN POSE																													
47.THE BALANCING POSE																													
48..THE POSE OF THE PATIENT CRANE																													
49.EAGLE																													
50.ONE LEFGGED SQUAT																													
51. ONE LEGGED BALANCE																													
YOGIC BREATHING																													
DIAPHRAMATIC BREATHING																													
THORACIC (chest) BREATHING																													
UPPER LOBAR BREATHING																													
FULL YOGIC BREATHING																													
RELAXATION																													
3- 10 mins SOUNDS/ MUSCLES/ BODY ROTATION/ BREATHING																													

RESEARCHING THE EFFECTS OF YOGA ON BEHAVIOUR DISORDERS.

PAULINE JENSEN. School of Behavioural and Community Health Sciences. THE UNIVERSITY OF SYDNEY, LIDCOMBE NSW.

SCHOOL:_____ GROUP_____

WEEK	11						12						13						14						15					
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PRANAYAMA																														
KAPALBHATI.-STAIR CASE/FAST BRE.																														
ALTERNATE NOSTRIL BREATHING																														
HISSING BREATH																														
BRAHMARI																														
MANTRA SOUNDS																														

RESEARCHING THE EFFECTS OF YOGA ON DISRUPTIVE BEHAVIOUR
Pauline Jensen:pjen1953@mail.usyd.edu.au

YOGA
Manual of Practices.

Complied and illustrated by Pauline Jensen.
School Of Behavioural And Community Health Sciences.
The University Of Sydney, Lidcombe NSW.

RESEARCHING THE EFFECTS OF YOGA ON DISRUPTIVE BEHAVIOUR

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The following practices have been included in this manual because of the anticipated beneficial effects on children and adolescents with disruptive behaviour. These behaviours include, restlessness, impulsivity, inattentiveness, lack of concentration, high levels of arousal, stress and tension, anger and aggression.

INSTRUCTIONS AND SUGGESTIONS

FOR MAKING YOGA SESSIONS MORE EFFECTIVE AND ENJOYABLE

1) Attempt to do yoga on an empty stomach (best time is before meals).

2) Don't hurry. Focus on what you are doing.

3) Wear comfortable clothing.

4) Stay aware of your breath in all the practices.

5) Don't push your body. With practice, the use of the breath and a calm attitude your body will gradually respond.

6) Some postures can be repeated rapidly. These are called dynamic. Doing yoga in this manner is energising and helps to remove tiredness and laziness. When postures are performed slowly and held for longer periods, they can have a relaxing effect.

Introduction to BREATHING PRACTICES

Deepening, slowing and regulating the rhythm of the breath, helps to reduce tension, stress and high levels of arousal.

The objectives of the breathing practices described here most useful to children are:

1. Bringing into action all the lobes of the lungs for full utilisation

2. To normalise the breathing rate/and

3. To make the breathing uniform continuous and rhythmic.

The practices include (i) yogic cleansing practices (ii) sectional breathing (iii) yogic breathing with postures (iv) breath exercises (v) relaxation.

The principles involved in regularising the breathing are:

1) increase and decrease in the breathing rate.

2) developing awareness of breathing through the movement of different parts of the body

Special tips for beginners

1) Emphasize on the movement of hands, legs, abdominal or thoracic muscles as needed in each exercise.

2) Use full breathing unless otherwise instructed. Synchronise breathing with the corresponding movements.

3) Attempt to slow down movements while feeling the movement of air filling and emptying the lungs. Develop an awareness of breathing.

4) Close the eyes and repeat a few rounds retaining the awareness.

PRACTICES

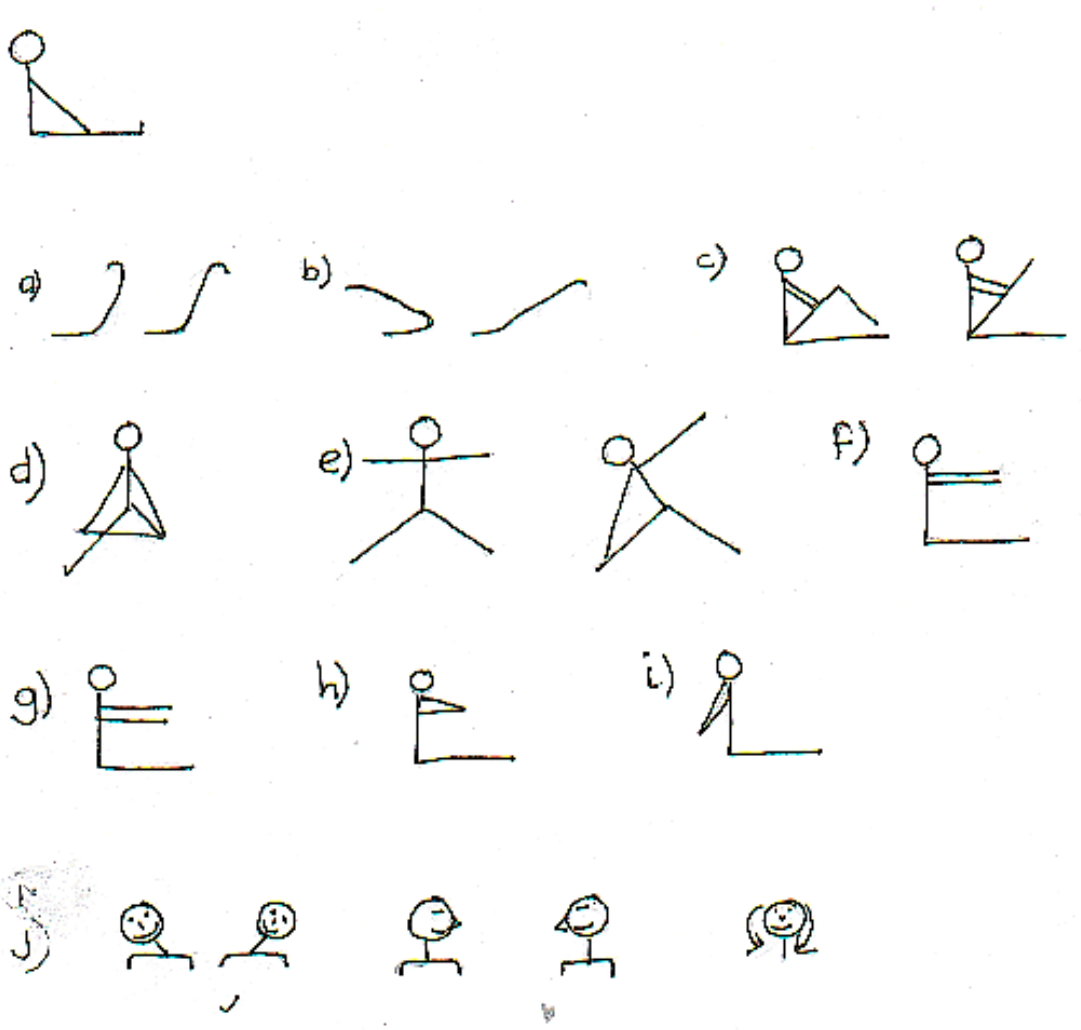
LIMBERING THE JOINTS

Important as a physical preparation for all other aspects of the program.

You can do these movements with your eyes closed. Repeat each movement from 5 to 10 times.

In a sitting position legs straight out in front of you.

a) Roll the toes back and forward, then spread them out.
b) Ankles. Stretch both feet towards the ground. Now pull them back towards your shins. Repeat. Now rotate both feet in one direction several times. Then the other direction. Now separate both feet and rotate in opposite directions, now reverse the direction
c) Knees. Lift the right leg, holding onto the thigh with both hands, bend leg up and down. Repeat on the left side.



d) Hips. Bend the right leg and place the right foot on the left thigh. Place the right hand on the right knee and the left hand on the left foot. Gently push the right knee up and down. Then rotate the right hip in one direction then the other direction. Repeat with the left leg.
e) Hips and waist. With the legs spread a comfortable distance apart, stretch arms out to either side, while breathing in. Now breathing out, rotate the body at the waist, bringing the right hand as far down the leg as is comfortable, while the left arm reaches behind you.
f) Fingers. Stretch the arms out in front of you. Spread the fingers and stretch the muscles of the fingers. Relax them. Fist both hands and squeeze. Repeat.
g) Wrists. Stretch the hands forwards and backwards from the wrists. Rotate wrists in one direction then the other direction then in opposite directions. Repeat.
h) Elbows. With the arms still stretched out in front of you, turn the palms upwards, the bend the elbows up and down. Repeat.
i) Shoulders. With the fingers placed on the shoulders, rotate the shoulders forwards and upwards while breathing in and backwards and downwards, while breathing out. Repeat. Now reverse the direction. Repeat.
j) Neck. Gently drop the head towards the right shoulder. Breath in and out for a few times Bring head back the to the central position. Repeat the same on the left side. In the central position rotate the chin in a small circle, moving in one direction then the other.

ENERGY UNBLOCKING POSTURES

RESEARCHING THE EFFECTS OF YOGA ON DISRUPTIVE BEHAVIOUR

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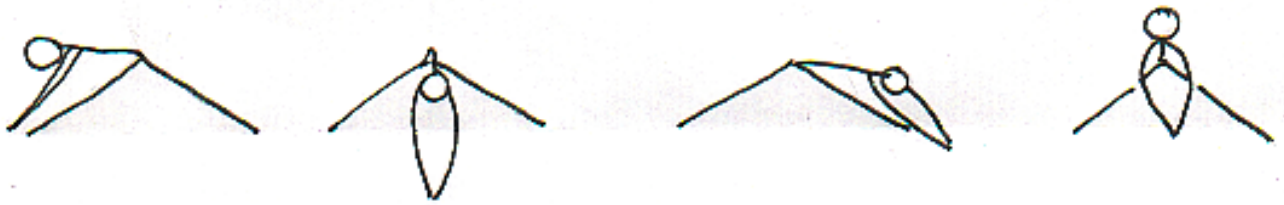
1. 1.ROWING THE BOAT. (Nauka Sanchalana)

- Sitting with the legs stretched in front of the body.
- Make movements as if you are rowing a boat, keeping the legs together.
- Make circular motions, bending the body forwards and backwards, several times in each direction.

2. CHURNING THE MILL (Chakki Chalana)

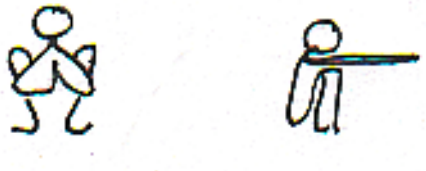


- Sitting with the legs stretched out in front of the body.
- Making horizontal circular movements, keeping the arms straight with fingers interlocked, imaging you are grinding wheat between two stones.
- Move clockwise and anti- clockwise.

3. . WOODCHOPPER

- Begin pose in squatting position.
- Place palms together and arms straight out in front of body
- Breathing out raise arms above the head.
- Breathing out sweep the arms downwards, like a woodchopper chopping wood.

4. . SALUTE TO NATURE (Namaskara)



- Sit in a squat, attempting to have feet flat on the floor.
- Place the palms together in front of the chest, the elbows between the knees.
- Breathing in, now breathing out, move the hands and arms in a straight fast moving line, directly in front of you.
- Repeat.

5. THE PUMP

- Squat with the feet flat on the floor. If the heels will not sit on the floor put a towel underneath them so the body weight is distributed over both feet.
- Place the fingers under the arches of the feet from the inside, so as the back of the hands are on the floor.
- Inhale while raising the head. Exhale while standing up, leaving the hands where they are and lowering the chin.
- Hold the pose.
- Now inhale, raising the head and lowering the body into a squat.

POSTURES FOR LIFTING THE MOOD, DEEPENING THE BREATH AND CALMING /RELAXING/RELEASING TENSION

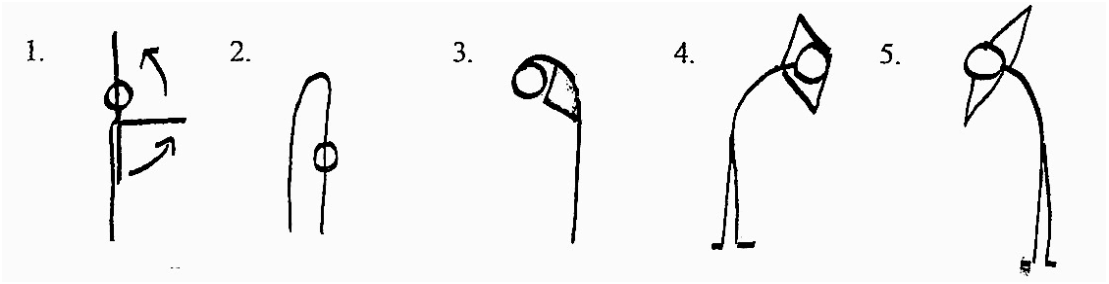
6. . BOAT (Navasana)

Also strengthens stomach and back muscles. Tones intestines, liver and kidneys. For nervousness and tension.

- Lying on your back, palms facing downwards, beside your body.

- While taking in a deep breath, lift the arms, head, shoulders about 10 cms off the gro remaining in this position for a comfortable length of time. Release the position and feel the muscles relaxing.
- Repeat the pose, tightening all the muscles in the body, including the hands into fists and the facial muscles.

7. . UPWARDS/FORWARDS/ BACKWARDS/ SIDEWAYS STRETCH BREATHING



- Stand with legs shoulder distance apart.
- Inhaling raise arms forward and upwards and stretch upwards. Exhale and bend forwards.
- Inhaling come up, place hands on waist and stretch backwards.
- Inhaling come up, place hands on head and bend and stretch to your right while exhaling.
- Inhaling come up, bend and stretch to your left while exhaling.
- Inhaling come up.
- Repeat 2 more times.

8. . WARRIOR'S POSE .(Virabhadra)

- Stand feet wide apart.
- Breathing in, raise arms sideways in each direction.
- Turn to one side, bending the forward leg and lunge. Take 2 deep long breaths. Look intently in the forward direction as if focusing on a target.
- Breathing in, return to starting position
- Repeat to the other side.

9. . HERO'S POSE (Virabhadra)

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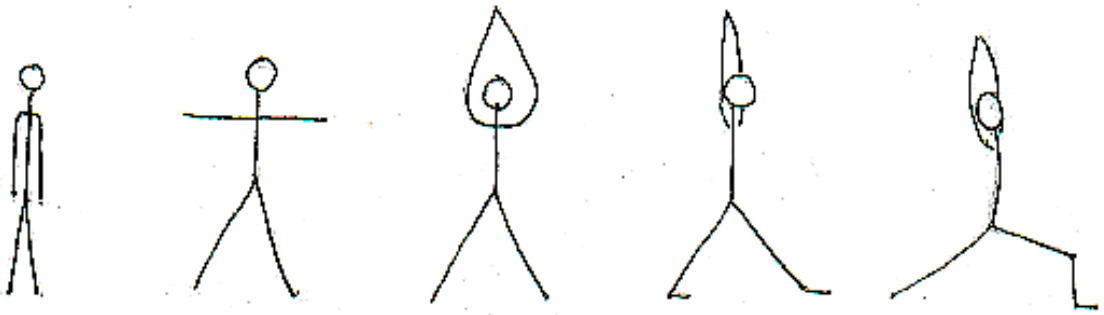


Increases stamina. Develops lungs and chest. Strengthens shoulder and back muscles. Stand feet wide apart.

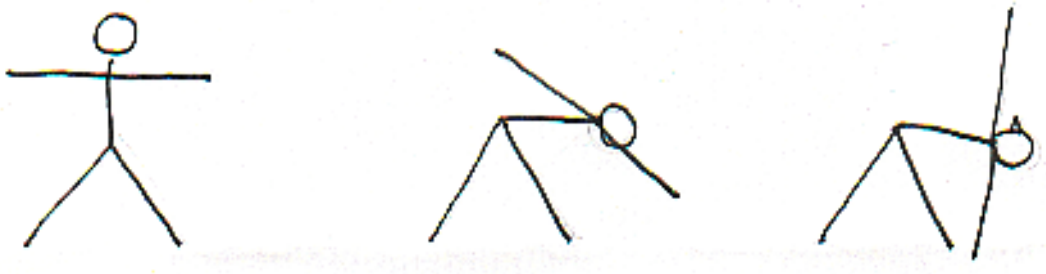
- Breathing in, raise arms sideways and upwards, placing palms together above your head.
- Turn to the right, bending the forwards leg, lunge downwards and curving the back backwards. Take two deep long breaths, Breathing in return to starting position.
- Repeat to the left side

10. THE ANGLE POSE (Konasana)

- Begin from the Warrior Pose.
- Lean forward resting the arm on the knee. The other arm is bent backwards against the back. Hold for a comfortable time.
- Drop the resting arm and place the hand on the floor, next to the foot, while the other arm, is stretched at an angle upwards. Hold.
- Repeat all above on the other side.

11. THE TRIANGLE POSE (Trikonasana).

Simple Version



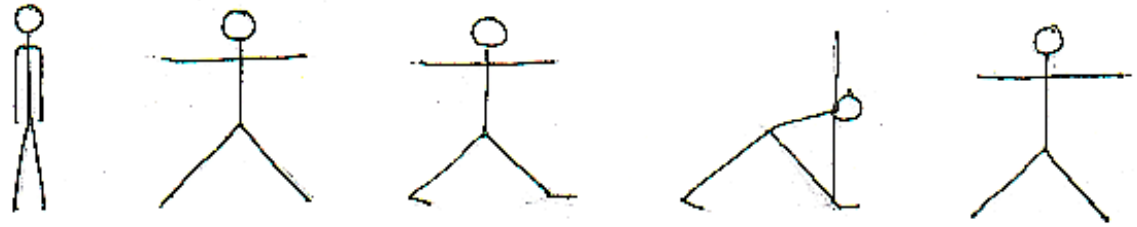
- Stand with legs apart spreading arms out to either side.
- Bend forward from the hips.

- Turn to the right side, taking the left hand to the right foot, and look up at the right hand.
- Reverse the movements and resume the first position.
- Repeat on the other side.

More difficult version.

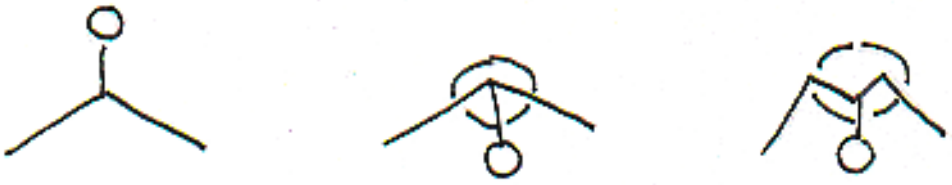
Helps keep the spine supple, the spinal nerves toned and improves digestion.

- Stand in the Mountain Pose- Tadasana.
- Spread your legs wide and a comfortable distance apart, arms stretched side ways and your feet facing forwards.
- Turn your right foot 90 degrees in outwards and your other foot at sixty degrees. Stretch forward and back a few times .



- Stretch forwards, turn sideways, then place the forward stretched arm towards the lower part of the forward leg. Check your body is on one plane. Then str etch the other arm upwards. Look up to the hand. Hold position for comfortable length of time.
- Come out of the position as you went into it.
- Now repeat on the other side.

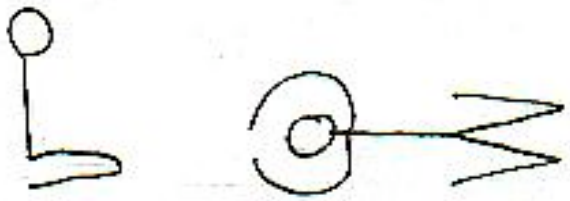
12. TORTOISE POSE (Koormasana)



- Sit with legs apart.
- As you bend forward take the arms underneath the legs and move the hands towards oneanother, bending the legs to allow the hands to come together.

13. The Sleeping Thunderbolt Pose (Supra- Vajrasana).

Removes stomach problems, rests the heart, removes fatigue, calms and quietens the mir
Not with back problems.



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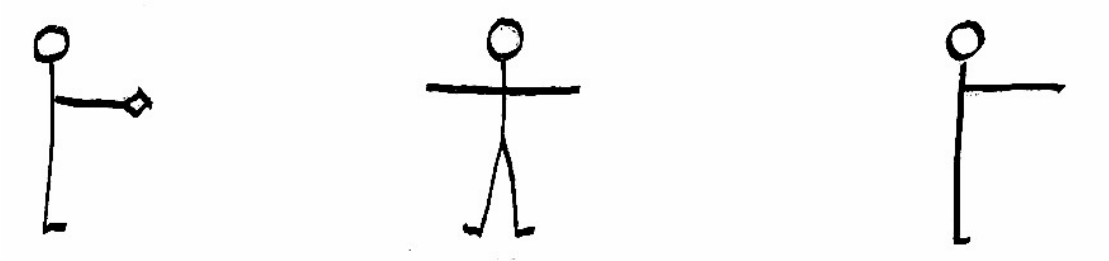
- From Vajrasana, gently lie backwards, taking the arms above the head and place on the floor.

POSTURES FOR STEADYING AND REGULATING THE BREATHING, GROUNDING THE ENERGY AND REMOVING EXCESS ENERGY

14..DOG BREATHING (SVÁNA BREATHING).

- With the mouth open, the tongue stretched out, sittin on the calves and bending forward a little, inhale and exhale through the mouth, like a panting dog. Repeat several times.

15. HANDS IN AND OUT BREATHING



- Stand erect with legs shoulder distance apart. Bring the arms to horizontal position, palms pressing each other, fingers pointing forward.
- Move the arms backwards as much as possible while inhaling. The arms swing back with shoulder as hinges in the same horizontal plane. Chest is expanded.
- Bring the arms back to front position while exhaling fully and making the sound ah.
- Repeat 3 times making the sounds uh the second time and um the third time.

16..ROCKING AND ROLLING

Tones the spine and stimulates the vestibular system that involves both physical balance and behavioural stability.

- Lie with your kne es drawn up to your chest, wrapping your arms around your legs

- Rocking the body forward come up onto both feet.
- Now roll back again to the original position.

- Continue to rock and roll, gaining momentum but not losing control.

POSTURES TO HELP REDUCE ANGER AND AGGRESSION

These postures work on the stomach, liver, kidneys and pancreas.

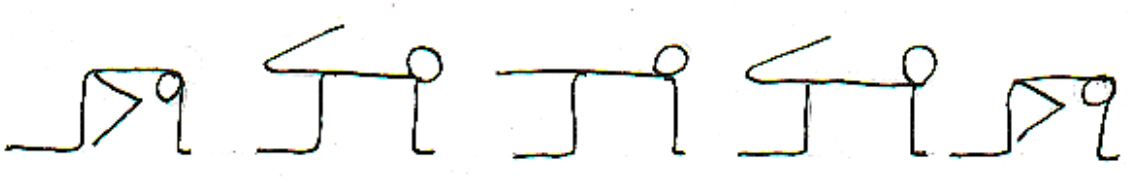
17. THE CAT (Marjariasana)

- Rest on the palms and the knees. No bending at the elbow joint. Keep the heels apart.
- Bend the head inwards flexing the spine up (spine convex), while exhaling slowly through the nose.
- Slowly arch the spine down (spine concave) while inhaling fully and raise the head up as you inhale slowly.

18.. THREADING THE NEEDLE

- From the cat pose, breath in, stretching the right arm upwards and backwards, loc upwards.
- While breathing out thread right arm through to left side, resting it on the floor, left arm stretching upwards and looking up towards it.
- Unthread and return to cat.
- Do the same on the other side.

19.. TIGER POSE



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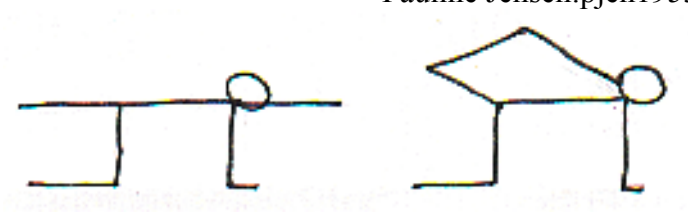
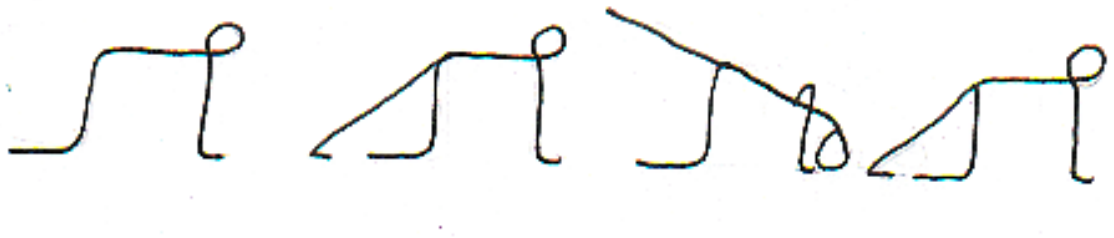


Exercises the spine.

- Begin in the cat pose. Breath e in.
- Breathing out bend right leg, bringing the knee towards the forehead Left foot toes against the floor
- Breathing in lift the right leg upwards, bending it over the body, then extending it straight out towards the back.
- Breathing in, bend it back over the back.
- Breathing out bring it towards forehead
- Extend the right leg backwards and the left hand forwards. Balance.
- Bend the right leg taking hold of the right foot with the left hand. Balance.
- Release the pose and come back into the tiger
- Then back into the cat
- Repeat all movements in sequence on the other side.

20.. POUNCING TIGER



For flexible neck, shoulders and spine

- Begin in the cat pose.
- Breathing in, extend the right leg back.
- Lift right leg upwards.
- Breathing out, bend elbows, bringing your head towards the ground.
- Return to second position, then to cat. Repeat on the other side.

21. THE CAMEL (Ushtraasana).

For sufferers of asthma and bronchial problems. Develops firmness in the chest. Remove backache.

- Assume a kneeling position.
- Tightening the buttock muscles, lift and stretch the right arm backwards, arching the back, moving the neck backwards as well, if the neck is not sore or stiff*. Then gen resume starting position
- Do the same with the left arm.
- Now take both arms above the head, arch the back and the neck*.
- Now lift the feet and tuck the toes under, take the left arm and place the hand on the left heel and stretch the right arm upwards and backwards arching the back and neck*.

  Gently resume original position.
- Repeat on the other side.
- Now take the right hand to the right heel and the left hand to the left heel and arch the back and neck*.
- Repeat the previous movement with the feet flat on the floor.

22. THE SPHINX POSE (version of Bhujangasana) and THE SNAKE POSE (Sarpasana)

Beneficial for abdominal organs, especially the liver and the kidneys. Removes backache.

- Lie flat on the front of your body.
- Place your hands underneath your shoulders.
- Lift the shoulders and head off the ground, leaving the hands on the ground, breathing in. Hold.
- Breathing out lower the body onto the floor.
- Swing arms around onto the back. Hold hands. Breathing in lift the arms and the head and shoulders upwards. Hold
- Breathing out, lower the body to the floor.

23.. SWING STRETCH

- Lying on the front of your body.
- Straighten your hands raising your body in a straight line.
- Turn your head to look at your toes.
- Repeat on the other side.

24. THE BOW. (Dhanurasana).

Makes the spine elastic. Expands the chest and lungs.

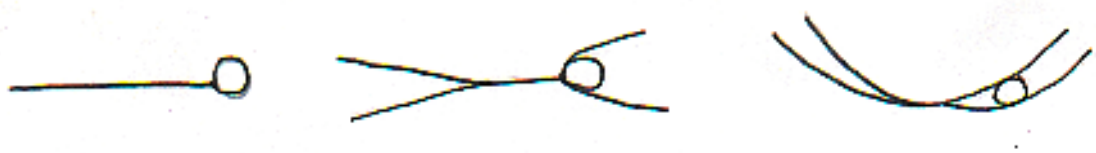
- Lying on your front, take hold of the ankles with both hands.
- Stretch back with the legs.
- Now rock back and forwards.
- Resume lying down position.

25..LOCUST POSE (Shalabhasana)

Strengthens the muscles of the back, hips and back of the thighs. Stimulates the appetite
Tones abdominal organs, liver, pancreas and kidneys.

- Lying downwards, place fists under thighs.
- Lift right leg with the help of the fist, keeping it straight Hold. Then place back on the floor.
- Repeat with the left leg.
- Now raise both legs a comfortable height off the ground.

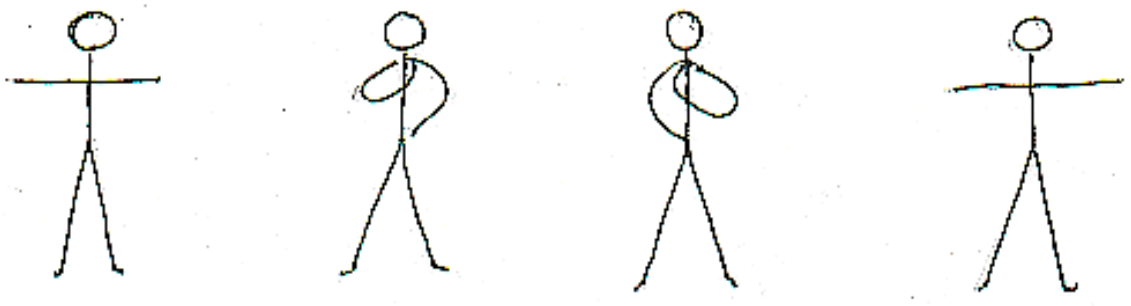
26.. SEA CREATURE (Makaraasana)



- Lie face down on the floor., arms fully extended in front with the palms on the floor. The legs are also fully extended on the floor.
- Raise simultaneously, the head, chest, arms and legs as high as possible without bending them. Try to have only the stomach muscles on the floor. Try to hold the contraction for at least 6 seconds. Breathe freely.
- As you become stronger bring the feet/legs and hands/arms closer together.

27.. SPINAL TWISTS

1. WAIST ROTATING POSE (Kati Chakrasana)



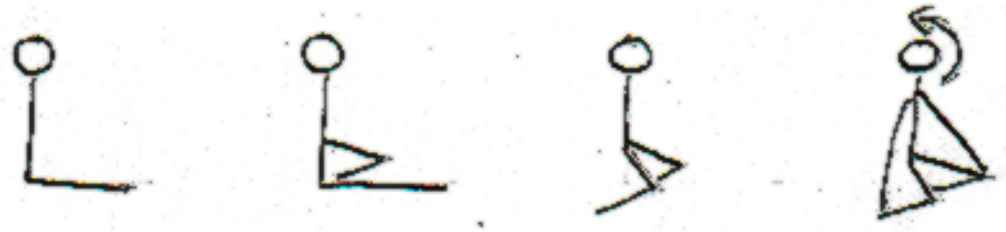
- From a standing position, breathing in take the right hand to the left shoulder and the left arm behind the back.
- Rotate at the waist, from side to side. Slowly increase the pace.

28.. SITTING SPINAL TWIST –1

Relieves sore backs and stiff shoulders.

- Sit with your legs straight out in front of you.
- Bend your legs back, placing both legs behind your right hip. Keep your right ankle over the arch of your right foot.
- Hold your left knee with your right hand.
- Swing your left hand behind your back, catch hold of your right harm. Turn your head and look over your right shoulder.
- Repeat on the other side.

29. SITTING SPINAL TWIST –2



- Sit with your legs straight out in front of you.
- Bend your left leg inwards and your right leg outwards.
- Swing your left arm behind your back and take hold of your right foot.
- Hold your left knee with your right hand. Turn your head, looking over your left shoulder.

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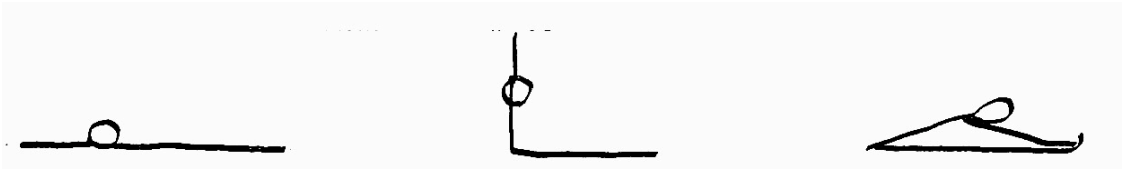
30.. HEAD TO KNEE POSE

- Sit with the right leg bent inwards. Turn the body towards the right knee.
- Raise both hands above the head, breathing in. Now lower the body from the hips towards the floor over the right bent leg, breathing out. Raise the body up again, breathing in.
- Lower the arms, turn the body to the right, place palms on floor beside right leg and twist body backwards.
- Raise the arms above the head, breathing in, turn to face the left outstretched leg. Breathing out lower the body over the left leg.
- Raise the right arm and sweep it in an arch over the head and place the right palm on the floor in line with the left leg. Now push off from the right hand and stretch the whole lifting the left leg up. Hold pose.
- Repeat on the other side ..

31.. BACK STRETCH (Paschimottanasana)



- Lying on the back with the arms stretched above the head.
- Breathing in, sit up, arms still stretched above the head.
- Breathingout , bend forward clasping the lower legs or feet, bringing a stretch to the back.
- Breath in, sit up, stretching arms above head.
- Breath out, lower body to floor.
- Repeat 3 times.
- Hold the final position, for at least a minute, breathing normally.

32. LION POSE (Simhaasana)

- Sit on the calves with a straight back.
- Separate the knees and spread the lower legs outwards.
- Lean forwards and straighten the arms, turning the hands around so fingers are facing towards the body, palms flat on the ground.
- While breathing in, raise the head, direct your sight to the space between the eye brows, poke the tongue out and roar like a lion.

- Repeat.

33.. POSE OF THE MOON (Shashankasana)

- Sit with a straight back on your calves.
- While breathing in, raise both hands above the head.
- Exhale slowly, while bringing the chest to rest on the thighs and the forehead to the floor in front of the knees.
- Breathe normally while holding the pose.
- Inhaling slowly raise the body and arms.
- Lower the arms and rest the hands on the knees
- Repeat.y7
- Variations involve taking the fists in the lower part of the abdomen, instead of arms stretched out or arms behind the back with hands holding oneanother.

34.. CHILD'S POSE

- Sit on your calves.
- Breath in straightening your spine.
- While breathing out slowly bend from the hips, bringing the forehead forward in front of the knees.
- Relax the hands beside the feet, palms facing upwards.
- Breath normally while in the pose.
- To release the pose, breath in while raising the head and torso.

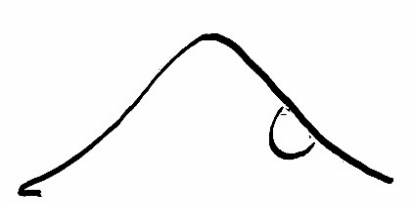
35. THE ARCHERS POSE (Dhanur Akarshanasana)

- Sit with the legs straight out in front.
- Using the right hand to place the left foot on the right thigh. Grasp the left toe.
- Hold the right toe with the left hand, keeping the leg straight.
- Raise the right big toe to the left ear. Do not bend your neck or back.

- Imagine drawing a bow and aiming the arrow, that has a special message to someone you want to say something special too.

POSTURES FOR ENERGISING

36..THE DOG POSE (Adho Mukha Svanasana)



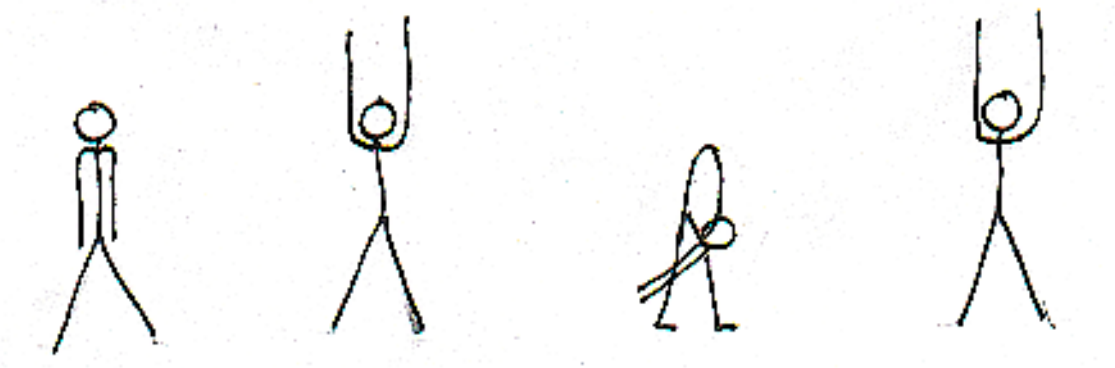
Removes fatigue. Refreshes the brain. Tones the leg muscles. Good for runners.

- From the cat pose, straighten the legs, attempting to place the heels on the floor.
- Your back and arms form a straight line with your head in between your elbows.
- Your body should form a triangle.

37.. UPWARD FACING DOG

- From the dog, lower the body to the floor, bending the arms and stretching the head, neck and back backwards.
- Hold the position for 3 breaths.

38.. HA BREATHING



- Stand with feet apart.
- Breathing in, raise both arms above your head.
- Sweep both hands down between the legs making a loud Ha sound.
- Repeat several times.

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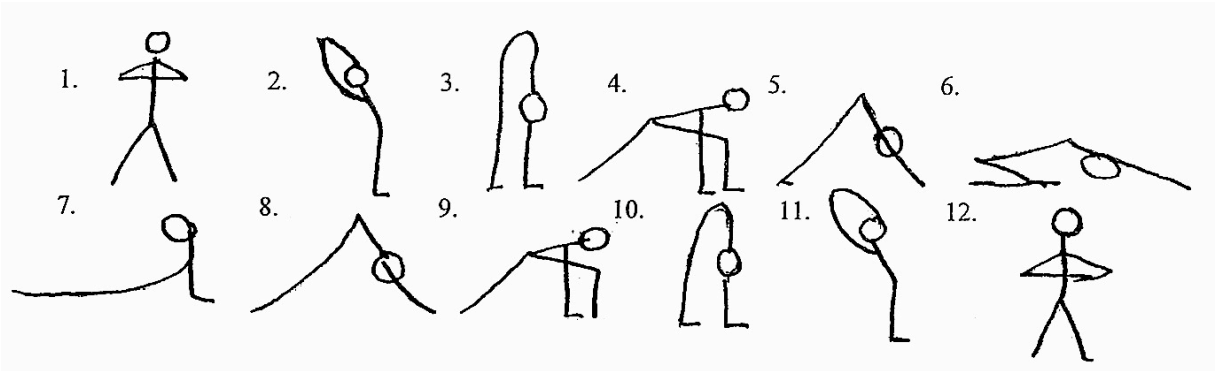
39.. JUMPING BACK STRETCH

- Sit in a squat with the hands on the floor beside the feet.
- Jump back, so the legs are stretched out behind you.
- Now jump back into the squat.
- Now jump forward with legs facing forwards.

. SALUTE (Suryanamskar)



Each stage of Suryanamskar is accompanied by regulation of breath. The 12 steps of Suryanamskar are as follows:

1. Stand erect with the legs together. Take the hands above the head and bend the trunk backwards. Inhale fully.

2. Bend the body to the front and take the forehead towards the knees. Put the palms on the floor on either side of the legs while fully exhaling.

3. Take the right leg back and the left knee forward, look up and inhale.

4. Take the left leg also back, resting only on palms and toes; keep the body straight from head to toes inclined to the ground at about 30o. Exhale completely.

5. Bend at the knee and rest the knees on the floor without altering the positions of the palms and toes. Rest the forehead on the ground. In this position inhale while moving backwards and then exhale completely.

6. Without moving the hands and toes, come forward on the chest and rest the forehead. In this position, forehead, chest, hands, knees and legs all the eight points will be touching the ground.

7. Inhale, raise the head and trunk making the spine concave upwards without changing the position of the hands and feet.

8. Exhale. Raise the buttocks, push the head down and have a complete arch with the heels touching the ground and palms on the floor.

9. Same as 5th step. Inhale and exhale.

10. Inhale and bring the right leg in between the two hands and in line with them. Arch the back concave upwards as in Step 3.

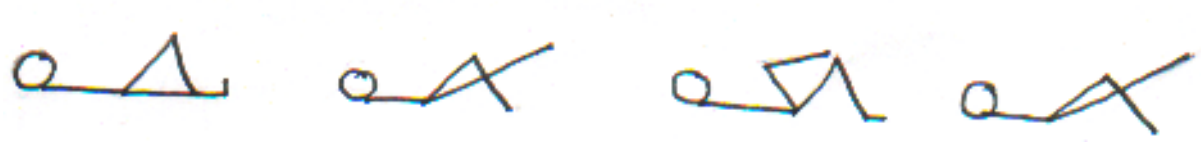
11. Exhale and bring the left foot forward next to the right foot and touch the knees with forehead as in 2.

12. Inhale. Come up, stand erect with hands along the body and relax.

40. ANIMAL RELAXATION POSE

- Sit with the left leg bent backwards with the left heel outside the left buttock and the right leg bent inwards, placing the sole of the right foot against the right thigh with the hands resting on the right knee.
- Inhale and raise both hands slowly above the head.
- While exhaling slowly bend over the right knee, bringing the forehead to the floor.
- Retain the position for a minute, while breathing normally and rhythmically.
- Inhale while raising the arms and the body then exhale repeating the procedure above.
- Reverse the position of the legs and repeat the above procedure.

41.. CYCLING



- Lie on the floor on your back.
- Bend the left leg, placing the left foot next to the right knee.
- Lift the right leg straight up, bend, moving it towards the head, then straighten moving forwards. Repeat.
- Now reverse the direction by bending the right leg, raise and straighten it and bring it downwards. Repeat.
- Now do the same with the left leg.

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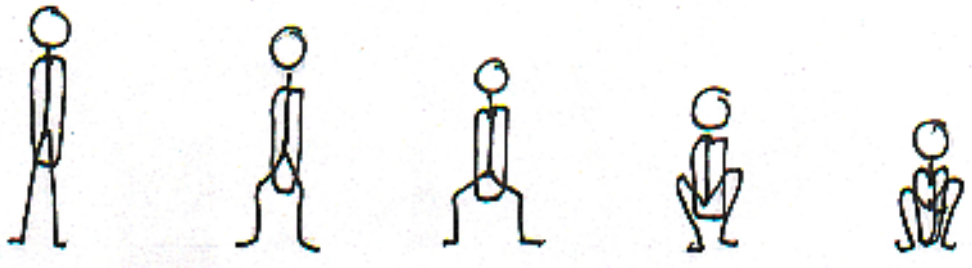
42.. HALF BUTTERFLY

- Sit with the left leg bent inwards.
- Holding the left knee with the right hand and the left foot with the left hand, lift and drop the leg, followed by rotating the bent leg. Repeat.
- Resume the 1 st position.
- Now lift the left leg with both hands, but do not fully straighten it. Repeat.
- Resume the 1 st position.
- Now holding onto the left leg, move the toes close `to the face. Repeat.
- Resume the 1 st position.
- Now lift the left leg and move the toes towards the shoulder. Repeat.
- Repeat the whole procedure on the right side.

43.. SQUAT AND RISE POSE (Utthanasana)



- Stand with the feet about a metre apart, with the fingers interlocked in front of the body.
- Slowly bend the knees and lower the trunk about 20 cms while exhaling. Return to 1 st pose while inhaling.
- Exhale and descend again. This time about 30 cms. Return to 1 st pose while inhaling.
- Exhale and descend about 40 cms. Return to 1 st pose while inhaling.
- Exhale and descend as low as the body will go. Return to 1 st Pose while inhaling.
- Repeat.

POSTURES FOR BALANCING AND INCREASING CONCENTRATION AND FOCUS

BALANCES

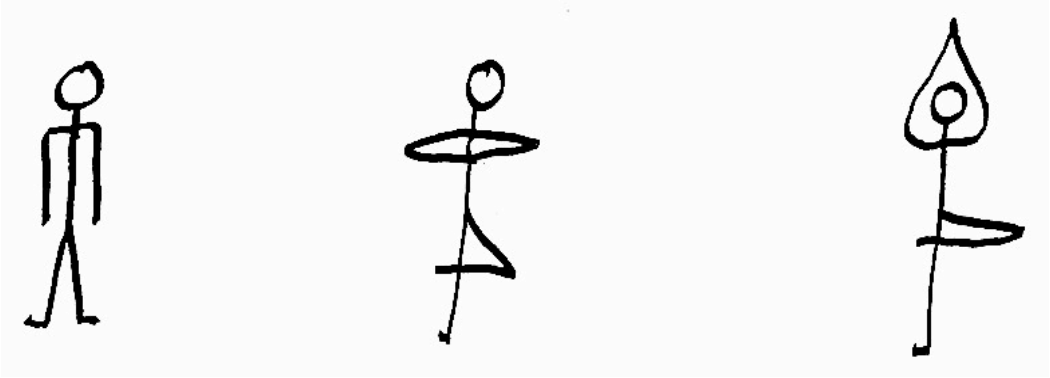
When doing balances, fix your gaze on a point in front of you. This will help keep the balance steady. Attempt to go into the balance slowly and come out of it as you went into it.

44. MOUNTAIN POSE (Tadasana)

Balances the cerebral hemispheres, engenders confidence, body awareness.

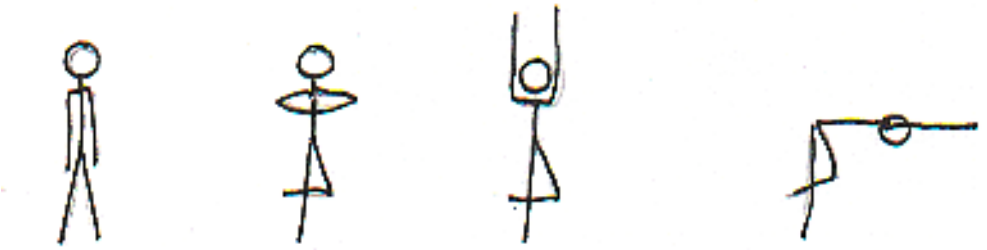
- Stand erect with feet together. Feel the weight of your body evenly distributed over both feet.
- Spread the toes, turn in the shin bones soften the knees and lift the knee-caps.
- Turn out the thighs.
- Extend the spine in both directions.
- Tilt the pelvis by tucking in the buttocks.
- Open up the chest by rolling back the shoulders and dropping them.
- Tuck the chin in and down, thus lengthening the neck.
- Imagine a thread connected to the top of your and suspended from the ceiling.

45.. TREE POSE (Vrkasana)



- Stand erect with feet together and arms at your sides.
- Bend left leg and place left foot on the front of your right thigh.
- Place palms together in front of the chest and raise them above your head. Balance in this position.
- Repeat on the left side.

46. THE LEANING TREE POSE



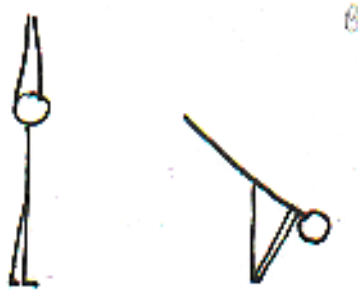
- Standing with feet apart.
- Place right foot on left knee and hands in prayer pose.
- Raise arms above head and stretch upwards. Look at something that is still and become steady.
- Slowly lower the body from the hips and hold pose when body is at a right angle to the floor.

47.. THE ARROW

Stretches the whole body.

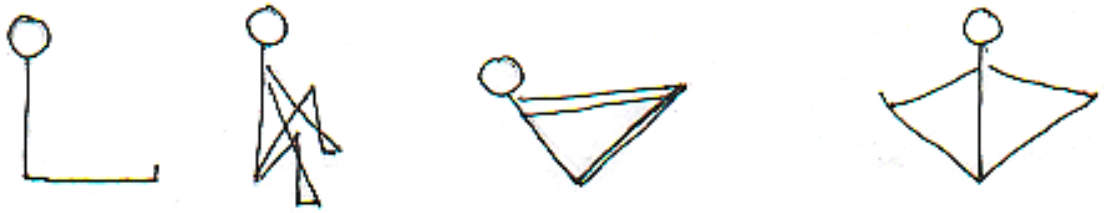
- Stand in a relaxed position.
- Fix your gaze on a point in front of you.
- Clasp your right foot with your right hand
- Raise your left hand above your head.
- Slowly lower your body forwards, stretching your left arm forward and your right leg backwards. Hold the position and breath steadily.

48. THE CRANE POSE (Bakasana)



- Stand with feet apart
- Raise the arms above the head, stretch upwards.
- Slowly bend forwards, taking the hands towards the feet while raising the right leg upwards.
- Hold the pose.

49.. SPINAL COLUMN POSE (Merudanasana)



- Sit with legs extended forwards.
- Bend the legs and place the soles together and hold both feet in the hands.
- Still holding the feet, lift the soles of the feet off the ground and balance on the buttocks.
- Slowly lift the feet upwards, maintaining the balance, moving towards straightening the legs. When the legs are straight, separate them as far as comfortable.

50. THE BALANCING POSE (Santolanasana)

- Move into the Cat pose.
- Straighten out the torso and the legs into one line.
- Take the weight onto the left hand, lift the right hand up and place on top of the body, looking to the right side.
- Repeat on the other side.
- Move into the Cat pose.
- Straighten out the torso and the legs into one line.
- Take the weight onto the left hand, lift the right hand up and bend arm and place on the back.
- Lift the right leg up keeping it straight.

51. THE FLOWER

- Sit on the floor with your knees bent.
- Slip your arms under your knees and raise your feet off the floor.
- Open your hands and point your feet upward.
- Hold for 5 breaths.

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52. THE SPARROW

- Squat down with feet apart, shoulders and arms between the knees.
- Bring your arms behind your calves and place your hands on the floor behind your feet.
- Look up.
- Now lift your heels off the floor, balancing on your toes.

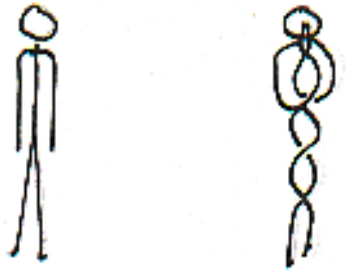
53. POSE OF THE PATIENT CRANE (Baka Dhyanasana)

- Move into a squat.
- Place the hands on the floor beside the feet.
- Bend the elbows and lean forward, placing the knees on the upper arms.
- Slowly lift the feet off the floor and balance on the feet. Hold the pose.

54. SINGLE FOOT BALANCING SQUAT.

- From a squat, take the right leg straight out in front. Help to balance with your hands on the floor either side of you.
- When steady bring your palms together at your chest. Hold for 3 breaths.
- Do the same with the opposite leg.

55. THE EAGLE (Garudasana)



Strengthen the muscles, tones the nerves and loosens the bone joints in the legs. Deve balance.

- Stand in Tadasana
- Lift the right arm over the left arm at the elbow joints.
- Curl the right hand around the left hand and place the palms together.
- Curl the right leg around the left leg, tucking the right foot around the left ankle.
- When steady begin to lower the body. Looking forward at the level of the hands.
- Repeat on the other side.

SECTIONAL BREATHING AND FULL AND FULL YOGA BREATHING

This is a preparatory breathing practice for doing Pranayama. It corrects the breathing pattern and increases the vital capacity of the lungs. It has 3 sections.

(a) Abdominal Breathing or Diaphragmatic Breathing (Adhama)

Sit erect in Vajrasana.(on your calves). Exhale. Inhale completely, slowly and continuously. This is called Puraka. The abdomen is made to bulgecontinuously with the air entering especially into the lower sections of the lungs. Before exhaling stop the breath (Antarya Kumbhaka) for a second. While exhaling (Recaka) the abdomen is drawn inwards continuously and slowly. before the breath is reversed, stop the breath (Bahya Kumbhaka) for a second and inhale. Repeat the breathing cycle. There should be no jerks in the whole process. It should be smooth, continuous and relaxing.

The diaphragm separating the thorax from the abdomen descends during inhalation with the bulging of the abdomen. This increases the air-flow into the lower sections of the lungs.

(b) Thoracic (chest) breathing or intercostal breathing (Madhyama)

In this sectional breathing performed while sitting erect in Majrasana, inhalation and exhalation are performed by expanding and contracting the chest only. Air flows through both nostrils slowly and continuously. The abdomen is controlled to avoid its bulging. The middle lobes are opened up fully by this type of breathing.

(c) Upper lobar breathing or clavicular breathing (Adya)

Sit erect in Vajrasana. Raise the collar bones while inhaling. Keep the abdominal muscles contracted. The air is forced into the uppermost regions of the lungs thus ventilating the upper lobes. The sparingly used upper lobes of the lungs will be properly aerated by this breathing.

(d) Full Yogic Breathing

These three sectionalised breathings are also called >Adhama=, >Madhyama= and >Adya=. In complete Yogic breathing technique, all the above three types will be combined. During inhalation, the Adhama, Madhyama and Adya occur sequentially and during exhalation the same sequence namely abdominal, chest and clavicular breathings occur. The whole process should be relaxing and comfortable, without any tension in the face.

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RELAXATION

Lie down on the ground allowing the back to rest fully. Let the whole body collapse. Legs apart, arms away from waist, palms facing up. Have the feel of the whole body.

Observe abdominal muscles:
Feel the abdominal muscles bulging up and sinking down. The movements automatically get regularised and slow as we keep feeling the same. Count 10 cycles.

Association with breath:
Now recognise the inhalation associated with upward movement of the abdominal muscles and exhalation with the sinking down of the abdomen. Feel the deep breath down through the lungs and full exhalation emptying the lungs each time. No forceful breathing is done, but natural breathing is observed and felt. Continue for 10 cycles.

With feeling:
Each time we exhale, our body relaxes normally. Similarly when we inhale, our body gets energised due to supply of oxygen.

Let us feel these effects as we exhale and inhale in Shavasana. Let us feel the collapse of the body sinking as if into the ground each time we exhale; abdominal muscles going down. A little pause and the abdominal muscles start bulging up. Feel the whole body is getting light and energetic as we inhale fully. Enjoy the feeling of deep relaxation of the whole body as we exhale and strengthen the feeling of energization as we inhale. Repeat the process for 10 cycles. Normally the time taken for this Shavasana varies from 3 to 4 minutes. The patients learn the art of relaxing the body, natural relaxed breathing and develop a sense of deep awareness by this practice.

Awareness of the contact between the body and the floor.

Feel where the back of the head is touching the floor; the shoulders, the upper arms, the elbow; the lower arm; the back of the hand; the upper back; the middle of the back; the lower back; the back of the thighs; the calves; and the heels; feel the contact that the whole body has with the floor.

Body Parts Rotation.

After listening to the instructions, repeat them silently to yourself and take your awareness to that part of the body. Beginning with the right hand side. Right hand thumb; Index finger; middle finger; ring finger and little finger; palm of the hand; back of the hand; Wrist; lower arm, elbow; upper arm; shoulder; right side of the chest; abdomen; pelvic region; right thigh; knee; shin; calf; ankle; upper foot; heel sole of the foot; big toe; second; third; fourth and fifth. Repeat the same on the left side. Then to both heels; calves; back of the knees; back of the thighs; lower back; middle of the back; upper back; back of the neck; back of the head; top of the head; forehead; R & L eyes, nose; R&L cheeks; mouth; chin ; the whole face; front of the neck; chest; abdomen; pelvic region; thighs; knees; shins; feet; both legs, the torso, head and arms; the whole body (repeat several times).

Remain in silence. Then say let go of body awareness and become aware of your body lying on the floor in the room. Familiarize with the room. Then wriggle toes and fingers; move head from side to side; stretch the arms; then roll over onto your right side for a few minutes before slowly getting up.

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PRANAYAMA

Principles used in Pranayama are:
(a) slowing down of breath; and
(b) conscious feeling of breath and other internal changes (developing an inner awareness)
Sit in a comfortable position, with your legs crossed, keeping your back straight.

1. Staircase Breathing (Kapalbhati) -through left, right and both nostrils.

- ❖ Take a full yogic breath, (up the lift).
- ❖ Close the right nostril, forcefully exhale breath through the left nostril from 10 to 50 times.
- ❖ Close the left nostril, forcefully exhale breath through the right nostril from 10 to 50 times.
- ❖ Forcefully exhale breath through both nostrils from 10 to 50 times.

2. Candra Anuloma Viloma (Left Nostril Breathing)

- ❖ Here the inhalation and the exhalation are through the left nostril (Candra Nadi) only. Right nostril is kept closed all the time. (see Anuloma Viloma for other instructions).

3. Surya Anuloma Viloma (Right Nostril Breathing).

- ❖ Here the inhalation and the exhalation are carried out through the right nostril (Surya Nadi) only, keeping the left nostril closed all the time (see Anuloma Viloma for other instructions).

4. Anuloma Viloma (Breathing Through both nostrils)

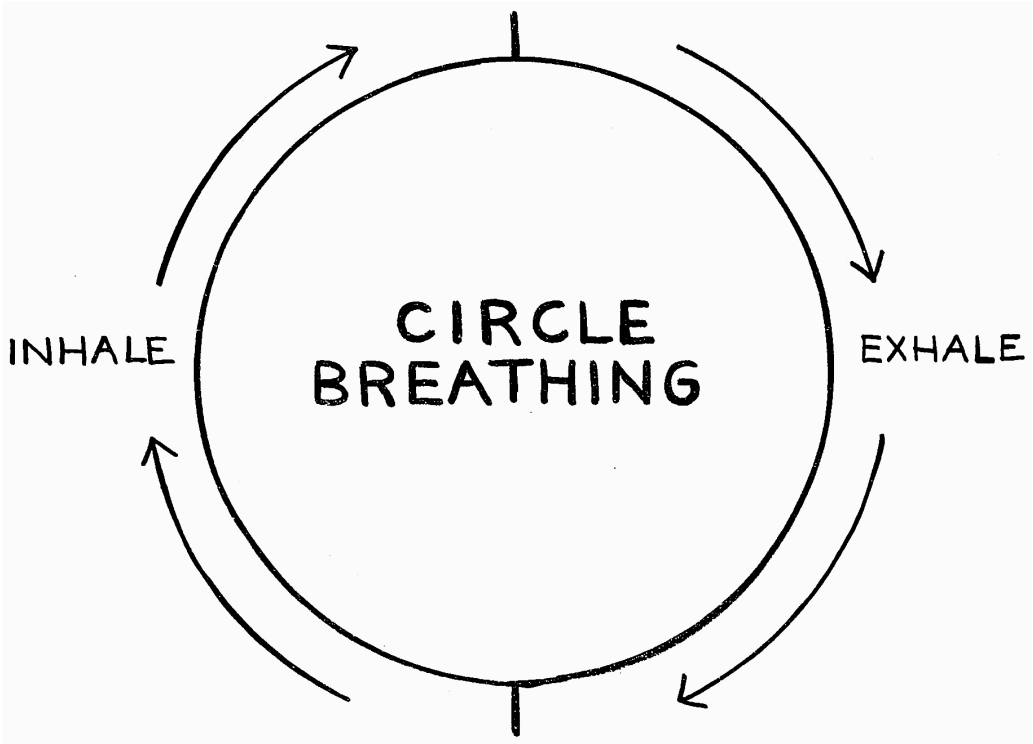
- ❖ Using the circle as a guide, inhale through both nostrils, slowly and steadily.
- ❖ Exhale through both nostrils continuously
- ❖ Inhale and exhale for the same length of time.
- ❖ Do from 5 up to 30 rounds.

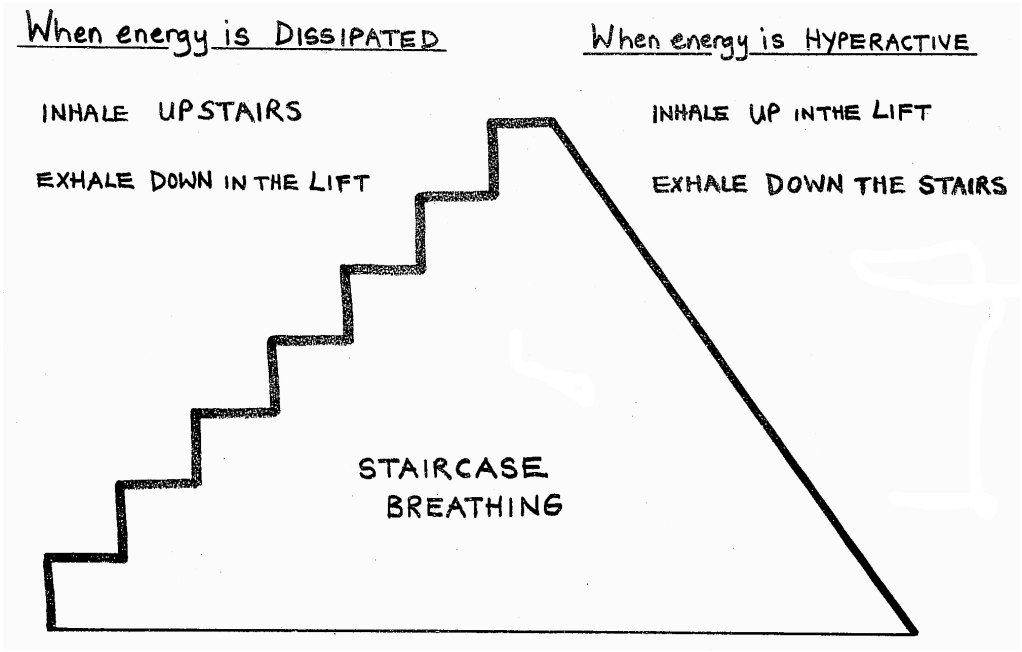
5. Nadi Shodana (Alternate Nostril Breathing)

- ❖ Exhale completely.
- ❖ Close the right nostril with the thumb of the right hand. Inhale slowly, steadily and deeply as long as possible. Follow the entire course of the breath by feeling the movement of air. Do not hold the breath inside.
- ❖ Release the right and close the left nostril with the little and ring fingers of the right hand, and breathe out through the right nostril. Again breathe in through the right nostril and then breathe out through the left nostril. This forms one round of alternate nostril breathing.
- ❖ Inhalation and exhalation from each side should be the same duration (in the beginning the duration may be unequal).
- ❖ Do from 5 or 10 rounds.

6. Bhramari (Humming Bee Breath).
- ❖ Place the thumbs on the soft part of the ear at its entrance.
- ❖ Put gentle pressure with the thumbs to close the entrance to the ear.
- ❖ Breathe in through both nostrils. Allow the breath to stop effortlessly.

- Slowly exhale while producing a sound from the mouth and nose, so as to produce a sweet
- musical humming sound like a female bee. Do at least 5 rounds.





Explanation of the Yoga Nidra Technique Adapted for the Intervention

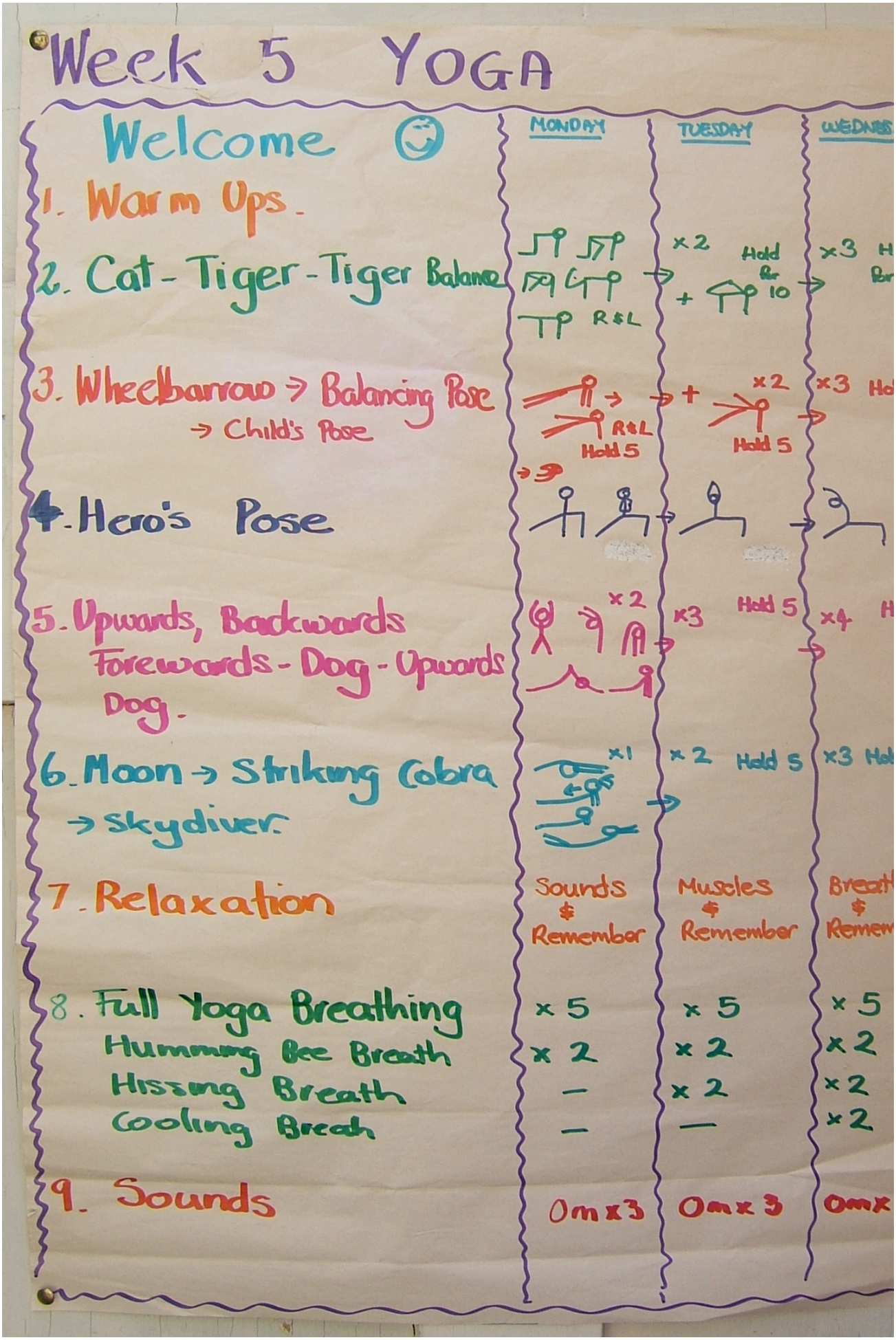
Yoga Nidra begins with instructing the children to lie down on a yoga mat, placing their legs 30-40 cm apart, arms beside their bodies with their palms facing upwards, checking that their spine is straight and in a line with their head and neck, tucking their chin in to lengthen their neck and nudging their shoulders away from their head. With this initial component accomplished, instructions are slowly introduced, beginning with awareness of environmental sounds, initially for 30 seconds which over time was increased to several minutes. During sound awareness children were asked to hear the sounds without thinking about what was making the sound or their response to the sounds. Most students seemed to experience this component as they generally remained quiet and still. Once they displayed competence in this component of *Yoga Nidra*, a silent affirmation was introduced stating once only, that "I can remain still and quiet throughout the practice of *Yoga Nidra*". The next phase required firstly becoming aware of the breath in the nostrils, chest then abdomen without manipulation then silently counting the breaths backwards from a specified number. The next phase involves becoming systematically aware of the parts of the body that are in contact with the floor, feeling sensations and weight followed by abstract sensory awareness of body parts, moving progressively through the body starting with fingers, hands, arms and down the front of the body to the toes on the right side then the left side and then up the back of the body to the head. The practice ends with listening to sounds, then slowly orienting back to external awareness by slowly moving toes and fingers and visualising the room in which they are lying. With some

groups of students the practice eventually went as long as 20 minutes and with others only up to five minutes. However, in this study the *Yoga Nidra* practice was 10 minutes.

Although it could not be ascertained that the students were experiencing all the guided instructions, students remained still and quiet which are states not usually consistent with these frequently, non-compliant, oppositional students. Sleep was not observed in any of the participants.

The process of *Yoga Nidra* gives the participants the experience of consciously and willingly directing their attention to the passive task of listening to environmental sounds in contrast to an active task like a comprehension exercise, that has the potential of inducing stress. Of course, sounds may induce stress; however ,environmental sounds tended to be the sounds of traffic, general school noises, birds, rain, wind which did not discernibly arouse stress. Further, passive listening is an experience of observation without any expectation of label or outcome. Moving from the external stimulus of sounds to the internal stimulus of breath awareness brings the consciousness closer to the internal workings of the body. Observing the breath is informative of irregular breathing patterns, pace and rhythm. The process of such observations can have a soothing and calming effect. The experience of being an observer is an additional skill gained in the process, while feeling the sensation of parts of the body develops attentional skills. During the process of *Yoga Nidra*, the instructor draws attention to any thoughts and emotions that may be arising and gives instructions to be aware of thoughts and emotions without continuing them by bringing the attention back to the subject of awareness. This experience gives students practice at not acting on thoughts and emotions which are frequently acted on impulsively with frequent negative outcomes both in the classroom setting and in social and family relations. This technique may therefore promote both relaxation and self-control.

Visual Agenda for Yoga Classes



Visual Agenda for Joint Warm Ups

Visual Agenda for Leg and Spinal Warm Ups

Appendix G

Inter-rater Reliability Table

Inter-rater Reliability Results for Three Raters of Videoed Yoga Classes

Table 1: Inter-rater reliability for three raters for on– and off-task behaviour

On-Task Behaviour Percentage			
Observed Student	% On-task Rater 1 MR	% On-task Rater 2 B.I.	% On-task Rater 3 B.I.
1	99	96	98
2	92	91	91
3	86	89	80
4	61	58	51
5	72	67	72
6	62	60	82
7	95	90	96
8	95	88	91
9	82	76	
10	100	100	100
11	96	100	97
12	84	71	
Mean	85.33	82.17	85.8

Table 2: Inter-rater reliability for three raters for ADHD and ODD behaviours

ADHD and ODD BASC-POP Behaviour Count			
Observed Student	Rater 1 MR	Rater 2 B.I.	Rater 3 B.I.
1	3	2	1
2	29	40	30
3	25	31	41
4	7	6	17
5	25	24	18
6	16	13	7
9	16	14	18
Mean	**21.3**	**21.5**	**22**

Appendix H

Example of School Staff Observation Notes

Example of School Staff Observation Notes Taken during Yoga Class August 15 2005

Present: **Fred, Bill, John, Abdul (Names have been changed to protect privacy)**

Introduction:

Fred Inappropriate comments
Bill Silly comments, giggling
All listening to talk.

1st Stretch:

Fred of mat not following instructions
Others following instructions - Bill fidgeting
Bill hand up
Fred silly laughing
John calling out

Talk about breathing:

Bill interrupting inappropriate comment 'breathe out of his bum'. John 'out of his dick you mean'.
Warning #1 Fred rolling around.
Bill pushed out at Fred
Abdul and John appropriate listening and talking.

Breathing Technique:

John, Abdul and Bill on task
Fred off task - interrupting, calling out.

Warming up Joints:

Abdul following instructions immediately.
All started on task.
Fred not listening, not following instructions.
Bill swinging arms, accidentally knocked John – John inappropriate reaction.
Abdul working very well – paying attention, following instructions.
Fred very silly.
John not following instructions, arguing he couldn't do it, then tried hard and succeeded.

Warming up spine:

Fred rolling around off mat.
Bill raucous laughing at Abdul then rolling around.
Fred not listening.
Abdul & John trying hard to complete activities appropriately.
Warning #2 Fred not following instructions.

Standing poses:

Bill talking while working.
Abdul trying hard.
Fred silly behaviour – pretending to snore and sleep while standing.
'John working well.
Fred trying hard, but then looking to see what others were doing and then acting up.

Relaxation:

Bill rolling up mat., asking sensible questions. Talking over presenter, silly comments.
Fred silly, laughing at Bill's comments.
Abdul working very well.
John talking over presenter.
Bill and Fred off task – talking, silly comments.
Abdul on task and still working very well.

Table 1: Example of how observation notes were recorded for each student in the subgroup of randomly selected students and for case studies

Session for Participant	On- Task Comments	Count	Off-Task Comments	Count
3. 30/8/05	Participated fully	1		
	Did yoga breathing easily	1		
	Did warm-ups	1		
	Did well in spinal warm-ups	1		
	Did well in standing poses	1		
	Cat pose with steadiness	1		
	Did well in breathing and relaxation	2		
Sub-total		*8*		
4. 8/9/05	Very engaged	1	Became fidgety in last relaxation	1
	Active participant	1		
	Challenging himself, requesting long holds in balances	1		
	Trying very hard, attempting all exercises in breathing	1		
	Good effort in relaxation	1		
Sub-total		*5*		*1*
5. 13/9/05	Quiet in relaxation	1	Moving feet in relaxation	1
	Trying in warm-ups	1	Vocal in joint warm-ups	1

	Did well in lunges	1	A little unsettled (had just taken ADHD medication)	1
	Very good, well balanced with book on head in balances	1	Complaining of sore back in cat and dog	0
			Distracted in 3 minute relaxation	1
Sub-total		*4*		*5*

Appendix I

RESULTS

Psychometric Measures
Pre-test Results

Table 1: CTRS-R: L Mean, SD, F and P Values Yoga and Control Groups

CTRS-R:L Subscales	Group	N	Mean	Std. Deviation	F	p
Pre Control/Yoga Oppositional	Control group	21	78.81	12.35		
	Yoga group	71	78.86	13.27	0.50	0.481
Pre Control/Yoga Cognitive Problems/Inattention	Control group	21	64.52	9.79		
	Yoga group	71	63.49	12.47	3.22	0.076
Pre Control/Yoga Hyperactivity	Control group	21	72.33	11.85		
	Yoga group	71	68.89	13.43	0.69	0.407
Pre Control/Yoga Anxious-Shy	Control group	21	69.81	14.08		
	Yoga group	71	69.54	14.23	0.24	0.626
Pre Control/Yoga Perfectionism	Control group	21	63.9	15.41		
	Yoga group	71	62.32	13.95	0.49	0.485
Pre Control/yoga Social Problems	Control group	21	63.67	17.12		
	Yoga group	71	65.48	15.45	0.32	0.573
Pre Control/Yoga ADHD Index	Control group	21	72.48	11.47		
	Yoga group	71	67.83	12.94	0.4	0.714
Pre Control/Yoga Global Index Restless/Impulsive	Control group	21	71.52	12.68		
	Yoga group	71	68.97	13.56	0.46	0.546
Pre Control /Yoga Global Emotional Lability	Control group	21	83.14	9.41		
	Yoga group	71	75.76	14.68	0.004	8.66
Conners Teachers Pre Control/Yoga Global Index:Total	Control group	21	78.67	11.88		
	Yoga group	71	73.45	14.18	0.26	1.271
Pre Control/Yoga DSM-IV: Inattentive	Control group	21	65.19	10.84	0.42	0.655

	Yoga group	72	63.86	12.50		
Pre Control/Yoga DSM-IV: Hyperactive/Impulsive	Control group	21	71.86	10.71		
	Yoga group	71	68.76	13.12	0.27	1.244
Pre Control/Yoga DSM-IV: Total	Control group	21	70	11.19		
	Yoga group	71	67.35	13.63	0.19	1.748
Pre Control/Yoga DSM IV Symptoms Subscale-Inattentive	Control group	21	2.38	2.38		
	Yoga group	71	2.35	2.45	0.47	0.534

Table 2: CPRS-R: L Mean, SD, F and P Values Yoga and Control Groups

CPRS-R:L Subscales	Group	N	Mean	SD	F	p
Pre Control/Yoga Oppositional	Control group	14	79.43	9.83		0.589
	Yoga group	28	73.75	10.94	0.3	
Pre Control/Yoga Cognitive Problems/Inattention	Control group	14	66.64	12.25		0.191
	Yoga group	28	65.04	9.77	1.77	
Pre Control/Yoga Anxious-Shy	Control group	14	61.71	14.78		0.317.
	Yoga group	28	58.39	11.72	1.03	
Pre Control /Yoga Hyperactivity	Control group	14	73.14	16.07		.153
	Yoga group	28	71.75	13.75	2.12	
Pre Control/Yoga Perfectionism	Control group	14	60.43	14.92		0.169.
	Yoga group	28	56.11	10.80	1.96	
Pre Control/Yoga Social Problems	Control group	14	67.71	18.919		749
	Yoga group	28	66.89	17.58	0.10	
Pre Control/Yoga Psychosomatic	Control group	14	60.36	20.53		.018*
	Yoga group	28	57.89	14.68	6.09	
Pre Control /Yoga ADHD Index	Control group	14	66.64	10.27		0.978
	Yoga group	28	65.79	10.00	0	

Pre Control/Yoga Global Index Restless/Impulsive	Control group	14	69.21	13.979	2.28	0.139
	Yoga group	28	69.46	10.74		
Pre Control /Yoga Global Emotional Lability	Control group	14	72.14	10.87	0.34	0.563
	Yoga group	28	68.43	11.33		
Pre Control/Yoga Global Index: Total	Control group	14	71.5	12.302	0.37	0.545
	Yoga group	28	70.93	10.57		
Pre Control/Yoga DSM-IV: Inattentive	Control group	14	65.71	12.99	1.51	0.226
	Yoga group	28	64	9.87		
Pre Control/Yoga DSM-IV: Hyperactive/Impulsive	Control group	14	75.71	14.307	0.61	0.44
	Yoga group	28	73.04	12.69	.	
Pre Control /Yoga DSM-IV Total	Control group	14	71.86	13.928	.37	548
	Yoga group	28	68.11	11.69		
Pre Control /Yoga DSM IV Symptoms Subscale-Inattentive	Control group	14	3.64	3.5	4.39	0.042
	Yoga group	28	2.39	2.5		
Pre Control/Yoga DSM-IV Symptoms Subscale-Hyperactive/Impulsive	Control group	14	3.21	2.81	0.2	0.66
	Yoga group	28	2.36	2.58		

Table 3: TEA-Ch Mean, SD, F and P Values Yoga and Control Groups

TEA-Ch Subtests	Group	N	Mean	SD	F	p
Pre Control/Yoga -Focused Attention -Sky Search test g	Control group	21	7.67	3.31	0.11	.746
	Yoga group	64	8.06	3.25	.	
Pre Control/Yoga -Focused Attention -Map Mission test u	Control group	21	7.1	2.81	.72	.789
	Yoga group	63	7.76	2.91		
Pre Control/Yoga -Sustained Attention-Score test h	Control group	20	7.65	3.57	0.003	0.958
	Yoga group	64	8.16	3.49	.	
Pre Control/Yoga -Sustained Divided Attention -Sky Search DT	Control group	18	5.28	4.42	.84	362

Divided Attention -Sky Search DT test t	Yoga group	62	6.58	3.86		
Pre Control/Yoga -Sustained Attention-Score DT test x	Control group	20	8.2	3.99		0.303
	Yoga group	61	8.44	3.55	1.07	
Pre Control/Yoga -Sustained Attention Response Inhibition-Walk, Don't Walk test y	Control group	21	6.86	3.34		0.311 .
	Yoga group	61	7.2	3.727	1.04	
Pre Control/Yoga -Sustained Attention-Code Transmission test bb	Control group	19	6.11	3.45		.214
	Yoga group	59	6.51	3.96	1.57 .	
Pre Control/Yoga - Switching Attention-Creature Counting test i	Control group	21	8.95	3.41		.867
	Yoga group	61	9.69	3.11	.28 .	
Pre Control/Yoga - Switching Attention- Creature Counting Timing Score test l	Control group	19	7.37	3.20		0.433
	Yoga group	59	7.58	3.87	62 .	
Pre Control/Yoga - Switching Attention- Opposite Worlds-Same World Total test z	Control group	20	7.25	4.01		0.722
	Yoga group	63	7.97	3.83	0.13	
Pre Control/Yoga - Switching Attention- Opposite World Total test aa	Control group	20	7.15	3.3		0.385
	Yoga group	62	7.44	3.87	0.76	

Table 4: SDQ I and II Mean, SD, F and P Values Yoga and Control Groups

SDQ I and SDQ II Subscales	Group	N	Mean T-Score	SD	F	p
Physical Abilities	Control group	19	45.63	12.65	1.02	0.314
	Yoga group	67	46.66	10.42		
Physical Appearance	Control group	19	43.79	14.23	0.74	0.391
	Yoga group	67	47.81	10.88		
General School	Control group	19	47.68	12.56	0.97	326
	Yoga group	67	44.72	10.74		
Peer Relations-(SDQ I)	Control group	17	47.35	9.81	2.42	0.125
	Yoga group	40	45.78	14.12		
Parents Relations-(SDQ I)	Control group	19	43.47	10.57	1.13	0.29
	Yoga group	67	40.13	13.94		
Reading	Control group	19	47.89	12.6	1.34	0.25
	Yoga group	67	47.76	11.24		
Mathematics	Control group	19	50.89	10.87	.13	721
	Yoga group	67	47.37	11.36		
General Self	Control group	13	45.31	19.75	1.23	0.3
	Yoga group	57	41.3	13.09		
Total Non-Academic (SDQ I)	Control group	17	44.88	10.5	1.09	0.272
	Yoga group	40	45.18	15.22		
Total Academic(SDQ I)	Control group	17	48.35	15.37	2.27	0.138
	Yoga group	40	46.32	12.35		
Total Self Concept	Control group	19	46.11	12.31	0.15	0.695

	Yoga group	67	44.57	11.14		
Emotional Stability-(SDQ II)	Control group	2	42.5	0.70	3.40	0.076
	Yoga group	27	46.15	9.28		
Same Sex- (SDQ II)	Control group	2	40	5.66	0.59	448
	Yoga group	27	50.11	13.57		
Opposite Sex Relations-(SDQ II)	Control group	2	46.50	3.54	.99	.328
	Yoga group	27	54.52	9.28		
Honesty and Trustworthiness (SDQ II)	Control group	2	44.00	4.24	1.57	.221
	Yoga group	27	45.70	11.36		

Pre-test and Post-test Results

Table 5: CTRS-R: L Pre- and Post-Test Means, SD, F and P Values for Yoga and Control Group

CTRS-R: L Subscales	Yoga Group (n= 64)						Control Group (n= 20)					
	Pre-test Mean (S.D.)	Post-test Mean (S.D.)	F	p	Eta2	Ob. Power	Pre-test Mean (S.D.)	Post-test Mean (S.D.)	F	p	Eta2	Ob. Power
Oppositional	79.25 (12.9)	76.7 (13.76)	3.98	0.050*	0.015	0.44	78.2 (12.34)	78.75 (11.61)	0.74	0.79	0.01	0.056
Cognitive Problems- Inattention	64.11 (12.03)	64.39 (12.53)	0.08	0.770	0.001	0.06	63.9 (9.6)	66.35 (12.45)	1.97	0.176	0.09	0.27
Hyperactivity	69.19 (13.38)	70.34 (14.1)	0.66	0.430	0.010	0.12	72.05 (12.08)	69.55 (14.06)	1.01	0.328	0.50	0.16
Anxious/Shy	69.84 (14.39)	68.28 (15.45)	0.95	0.330	0.015	0.16	68.75 (13.56)	71.45 (14.45)	0.86	0.365	0.04	0.14
Perfectionism	62.98 (14.21)	60.81 (15.55)	1.75	0.190	0.027	0.26	62.55 (14.47)	64.8 (14.44)	0.75	0.398	0.04	0.13
Social Problems	66.17 (15.82)	66.12 (15.66)	0.002	0.960	0.000	0.50	62.3 (16…34)	65.4 (14.75)	1.39	0.253	0.07	0.20
ADHD Index	68.3 (12.71)	69.14 (12.68)	0.6	0.440	0.009	0.12	71.95 (11.5)	70.55 (13..25)	0.37	0.551	0.02	0.09
Global Index Restless/Impulsive	69.24 (13.49)	69.57 (12.86)	0.1	0.750	0.001	0.06	71.2 (12.92)	71.15 (14.08)	0	0.986	0.01	0.05
Global Index Emotional Lability	76.06 (14.54)	75.67 (15.07)	0.05	0.830	0.001	0.05	82.75 (9.46)	76.8 (13.67)	3.88	0.064	0.02	0.46

Global Index Total	73.92 (14.06)	74.37 (13.54)	0.11	0.740	0.001	0.05	78.1 (11..9)	74.45 (12.93)	0.54	0.176	0.09	0.27
DSM 1V-Inattentive	64.47 (12.1)	64.53 (11.76)	0.003	0.960	0.001	0.05	64.75 (10..93)	64.5 (12.8)	0.01	0.902	0.01	0.05
DSM1V Hyperactive/Impulsive	69.28 (13.61)	70.34 (13.91)	0.7	0.400	0.011	0.13	71.5 (10.86)	69.75 (12.6)	0.54	0.473	0.03	0.11
DSM-1V Total	67.97 (13.36)	68.67 (12.93)	0.38	0.540	0.01	0.09	69.55 (11..29)	67.7 (15..37)	0.47	0.5	0.02	0.1
DSM-1V Symptoms Inatten	2.5 (2.4)	2.77 (2.84)	0.65	0.420	0.01	0.12	2.1 (2.05)	2.45 (.86)	0.33	0.572	0.02	0.08
DSM-1V Symptoms Hyp/Imp	2.03 (2.3)	3.03 (3.24)	0.93	0.003*	0.13	0.85	2.7 (2.27)	2.15 (2.74)	0.73	0.403	0.04	0.13

Note 1:Significant p< .05; 2 Although significant group by time interaction is seen in DSM-IV Symptoms Hyperactive/Implusive for the control group, this value is not important as it represents the number of symptoms indicated by informer. If informer indicates over six out of nine symptoms, it is suggestive of a diagnosis.

3.70+ T-score -Markedly Atypical Significant Problem; 66-70 T-score Moderately Atypical Significant Problem; 61-65 T-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

Table 6: Post-Intervention Difference, Change Over Time and Group by Time for TEA-Ch for Yoga and Control Groups

TEA-Ch Subtests	Post-yoga group n=40 Mean (SD)	Post-control group n=19 Mean (SD)	Mean difference 95% CL	p value for post intervention difference	p value for change over time	p value for time-group interaction
Focused attention -Sky Search test c	9.92 (3.38)	8.26(2.76)	-1.66	0.67	.001	0.95
Focused attention -Sky Search test g	9.52 (3.08)	8.89 (2.96)	-0.63	0.46	.001	0.33
Focused attention -Map Mission test u	10.02 (4.42)	8.44 (2.68)	-1.58	0.17	.104	0.12
Sustained Attention - Score test h	7.15 (3.44)	6.26 (2.88)	-0.89	0.33	.057	0.27
Sustained Divided Attention - Sky Search DT test t	8.36 (3.33)	7.5 (2.89)	-0.87	0.37	.000	0.16
Sustained Attention -Score DT test x	8.34 (3.53)	7.52 (3.62)	-0.81	0.44	.309	0.14
Sustained Attention Response Inhibition -Walk, Don't Walk test y	8.84 (3.38)	8.88 (4.12)	0.04	0.97	.329	0.59
Sustained Attention-Code Transmission test bb	7.88 (3.84)	6.4 (3.83))	-1.48	0.21	.717	0.10
Switching Attention - Creature Counting test i	10.23 (2.89)	11.58 (2.62)	1.36	0.1	.006	0.05*
Switching Attention - Creature Counting Timing test l	8.33 (3.70)	9.05 (3.36)	0.72	0.49	.045	0.21
Switching Attention - Opposite World Same World Total test z	7.97 (3.34	8.82 (4.58)	0.85	0.43	.367	0.42
Switching Attention - Opposite World Total test aa	8.13 (3.58)	8.61 (3.14)	0.47	0.63	.509	0.58

Note: significance *(p<.0

Table 7: SDQ I Pre- and Post-Test Means, SD, F and P Values for The Yoga Group.

SDQ I Subscales (for children)	Yoga Group						
		Pre-test		Post-test			
	n	Mean	S.D.	Mean	S.D.	F	p
Physical Abilities	29	45.97	9.88	44.86	12.05	0.59	.447
Physical Appearance	29	48.38	10.68	48.31	13.60	0.00	.971
Peer Relations	29	44.90	13.46	44.86	13.99	0.00	.982
Parent relations	29	36.62	15.70	35.83	14.97	0.17	.684
Reading	29	50.93	9.55	49.07	10.25	2.24	.145
Maths	29	49.72	12.56	48.72	10.00	0.29	.594
General School	29	46.90	9.93	46.00	9.95	0.45	.506
General Self	20	41.50	15.19	40.80	16.50	0.08	.787
Non Academic	29	44.24	16.11	41.69	14.36	1.89	.180
Academic	29	48.38	9.82	48.24	11.22	0.01	.938
Total self	29	45.21	11.67	44.21	13.52	0.47	.497

Note :General Self T-scores were not provided for years 3 and 4 in the SDQ 1I Manual which explains n=20

Table 8: SDQ I Pre- and Post-Test Means, SD, F and P Values the Control Group.

Control Group SDQ 1 Subscales	Pre-test			Post-test			
	n	Mean	S.D.	Mean	S.D.	F	p
Physical Abilities	16	46.38	13.60	46.25	11.61	0.00	.949
Physical Appearance	16	44.50	15.42	49.19	11.93	2.22	.157
Peer Relations	16	48.25	9.38	49.38	12.77	0.14	.717
Parent relations	16	44.31	11.28	41.00	13.13	1.16	.299
Reading	16	48.63	13.63	49.50	10.14	0.24	.633
Maths	16	52.44	10.70	50.31	10.13	3.08	.100
General School	16	48.44	13.60	48.00	9.77	0.04	.850
General Self	10	50.30	17.97	48.70	12.12	0.09	.765
Non Academic	16	45.69	10.29	46.25	10.33	0.06	.869
Academic	16	49.13	15.53	49.06	12.05	0.001	.978
Total self	16	47.97	12.48	47.00	9.17	0.28	.602

Note :General Self T-scores were not provided for years 3 and 4 in the SDQ 1I Manual which explains the n=10

Table 9: SDQ II Pre- and Post-Test Means, SD, F and P Values for the Yoga Group

SDQ II Subscales (for adolescents)		Yoga Group					
		Pre-test		Post-test			
	n	Mean	S.D.	Mean	S.D.	F	p
Physical Abilities	21	46.33	11.98	47.71	10.55	0.31	.582
Physical Appearance	21	46.48	9.36	47.38	9.36	0.21	.649
Parent relations	21	40.48	10.53	41.57	13.29	0.21	.649
Verbal	21	45.43	8.91	46.24	10.39	0.16	.694
Maths	21	47.05	9.40	48.33	15.27	0.24	.631
General School	21	42.52	8.91	44.86	12.25	1.27	.273
General Self	21	37.52	10.81	40.71	13.10	1.73	.203
Total Self	21	42.62	8.54	45.38	11.04	1.49	.237
Emotional Stability	21	45.90	9.54	47.10	12.43	0.50	.486
Same Sex Relations	21	50.00	11.68	53.00	10.65	0.98	.333
Opposite Sex Relations	21	52.48	9.38	54.62	7.13	1.34	.261
Honesty and Truth	21	45.14	12.26	47.52	12.85	2.72	.115

Subgroups Results

Table 10: CTRS-R: L Pre- and Post-Test Means, SD, F and P Values for 20≥ Yoga Classes

CTRS-R: L Subscales	Yoga Group= 23						
20 plus classes	Pre-test		Post-test				
	Mean	S.D.	Mean	S.D.	F	p	Eta2
Oppositional	73.57	13.52	68.57	15.24	5.42	0.029*	0.198
Cognitive Problems-Inattention	60.13	9.06	61.39	9.07	0.748	0.386	0.034
Hyperactivity	64.09	12.47	65.43	15.41	0.324	0.575	0.015
Anxious/Shy	66.04	14.18	767.43	14.52	0.58	0.58	0.014
Perfectionism	61.57	13.98	62.17	15.98	0.047	0.831	0.002
Social Problems	64.35	15.95	65.26	15.89	0.221	0.643	0.01
ADHD Index	64.65	11.28	65.7	11.24	0.373	0.548	0.017
Global Index Restless/Impulsive	64.78	13.2	66.09	11.73	0.423	0.522	0.019
Global Index Emotional Lability	71.48	13.12	70.96	15.82	0.043	0.838	0.002
Global Index Total	78.1	11.89	74.45	12.93	1.977	0.176	0.014
DSM 1V- Inattentive	64.75	10.93	64.5	12.8	0.015	0.902	0.042
DSM1V Hyperactive/Impulsive	71.5	10.86	69.75	12.6	0.537	0.473	0.04
DSM-1V Total	69.55	11.28	67.7	15.37	0.473	0.5	0.025
DSM-1V Symptoms Inatten	2.1	2.5	2.45	2.86	0.331	0.572	0.017

DSM-1V Symptoms Hyp/Imp	2.7	2.27	2.15	2.74	0.732	0.403	0.14

Note: significance= p> .05

Table 11: CTRS-R: L Pre- and Post-Test Means, SD, F and P for 25≥ Yoga Classes

CTRS-R: L Subscales	25≥ Yoga Classes				
	Pre-test Mean (S.D.)	Post-test Mean (S.D.)	F	p	Eta2
Oppositional	72.23 (14.19)	68.69 (16.66)	1.79	0.206	0.13
Cognitive Problems- Inattention	58.46 (9.11)	60.69 (10.9)	1.05	0.325	0.08
Hyperactivity	65.69 (12.76)	67.92 (16.20)	0.39	0.540	0.03
Anxious/Shy	68.48 (15.24)	71.08 (17.70)	0.45	0.515	0.04
Perfectionism	60.85 (13.67)	64.62 (16.88)	0.83	.0.381	0.06
Social Problems	68.62 (16.79)	68.85 (17.71)	0.01	0.946	0.00
ADHD Index	64.54 (11.12)	67.00 (10.77)	2.14	0.169	0.15
Global Index Restless/Impulsive	64.69 (12.66)	66.54 (12.16)	0.75	0.403	0.06
Global Index Emotional Lability	75.08 (13.61)	74.08 (14.65)	0.08	0.782	0.01

Table 12: Pre- and Post-Test Means, SD, F and P Values on the Tea-Ch for 20< Yoga Classes Subgroup

TEA-Ch Subtests	Yoga Group 20< Classes							
		Pre-test		Post-test				
	n	Mean	S.D.	Mean	S.D.	F	p	Eta^2
Focused attention -Sky Search test b	17	10.41	2.55	9.76	2.56	0.814	0.38	0.05
Focused attention -Sky Search test c	17	8.52	3.5	10	3.62	7.331	**0.016**	0.31
Focused attention -Sky Search test g	17	8.64	3.2	9	2.85	0.193	0.667	0.31
Focused attention -Map Mission test u	17	8.35	3.12	9.35	3.27	1.007	0.33	0.01
Sustained Attention- Score test h	17	7.35	3.33	7.52	3.44	0.023	0.88	0.01
Sustained Divided Attention- Sky Search DT test t	16	5.87	3.63	7.87	2.3	3.75	**0.072**	0.2

Sustained Attention-Score DT test x	16	8.12	4.03	8.81	3.95	0.299	0.593	0.02
Sustained Attention Response Inhibition-Walk, Don't Walk test y	16	7.68	4.52	8.75	3.37	0.889	0.361	0.06
Sustained Attention-Code Transmission test bb	14	6.64	4.49	7.21	4.33	0.216	0.65	0.02
Switching Attention- Creature Counting test i	16	11.62	2.57	10.62	2.55	2.791	0.116	0.16
Switching Attention- Creature Counting Timing test l	16	7.43	4.67	8.31	3.96	1.771	0.203	0.11
Switching Attention- Opposite World Same World Total test z	17	7.52	4.36	8.11	3.78	0.523	0.48	0.03
Switching Attention- Opposite World Total test aa	17	7.11	5.12	8.52	2.16	2.167	0.16	0.12

Table 13: Pre- and Post-Test Means, SD, F and P Values for the TEA-Ch for 25< Yoga Classes Subgroup

TEA-Ch Subtests	Yoga Group 25< Classes					
		Pre-test	Post-test			
	n	Mean	Mean	F	p	Eta^2
Focused attention -Sky Search test b	10	10.8 (2.3)	9.4 (2.7)	1.69	0.226	0.16
Focused attention -Sky Search test c	10	8.0 (3.6)	9.8 (2.89)	8.68	**0.016***	0.49
Focused attention -Sky Search test g	10	8.4 (3.43)	9.8 (2.82)	3.5	**0.094#**	0.28
Focused attention -Map Mission test u	10	7.3 (3.19)	10 (3.12)	7.62	**0.022***	0.46
Sustained Attention- Score test h	10	7.8 (2.69)	8 (3.01)	0.18	0.896	0.00
Sustained Divided Attention- Sky Search DT test t	9	6.78 (3.96)	7.89 (2.84)	0.6	0.462	0.07
Sustained Attention-Score DT test x	9	6.89 (2.52)	9.33 (4.33)	4.05	**0.079#**	0.34
Sustained Attention Response Inhibition-Walk, Don't Walk test y	9	7.89 (5.06)	9.78 (3.27)	2.32	0.166	0.22
Sustained Attention-Code Transmission test bb	9	5.12 (3.98)	6.37 (3.96)	0.73	0.420	0.95
Switching Attention- Creature Counting test i	9	11.33 (3.64)	10.44 (2.35	1.08	0.330	0.12

Switching Attention- Creature Counting Timing test l	9	7.33 (4.97)	8.44 (4.50)	1.33	0.282	0.28
Switching Attention- Opposite World Same World Total test z	10	7.5 (2.22)	8.3 (3.83)	0.74	0.411	0.08
Switching Attention- Opposite World Total test aa	10	7.0 (4.9)	7.8 (3.19)	0.42	0.534	0.04

Note: significance= p>0 .05, borderline significance= p> 0.1

Table 14: CTRS-R: L Significant Improvement Over Time for Subgroup of Students Who Acted as Their Own Controls

CTRS-R: L Subscales	N	Mean	Std. Deviation	F	p
Pre-Control - ADHD Index	14	71	12.60	3.31	.053
Post-Control/Pre-Yoga - ADHD Index		65.5	10.57		
Post-Yoga - ADHD Index		65.21	9.36		
Pre-Control - Global Emotional Lability	14	83.29	8.9	5.64	.009
Post-Control Pre/Yoga - Emotional Lability		72.71	13.97		
Post-Yoga - Emotional Lability		73.86	10.16		

Table 15: CPRS-R: L Significant Improvement Over Time for Subgroup of Students Who Acted as Their Own Controls

CPRS-R: L Subscales	N	Mean	Std. Deviation	F	p
Pre-Control - Cognitive Problems/Inattention	4	68.25	10.21	4.85	0.055
Post-Control/Pre-Yoga - Cognitive Problems/Inattention	4	60	11.63		
Post-Yoga - Cognitive Problems/Inattention	4	57.5	11.36		
Pre-Control - Global Index Restless/Impulsive	4	74.25	14.15	10.1	0.012
Post-Control/Pre-Yoga - Global Index rest/Impulsive	4	71	14.72		
Post Yoga - - Global Index Restful/Impulsive	4	64.25	11.76		
Pre-Control - Global Index-Total	4	76	15.14	4.37	0.067
Post-Control/Pre - Yoga Conners' Global Index Total	4	72.5	16.62		
Post-Yoga - Global Index Total	4	68.5	12.61		
Pre-Control - DSM-IV - Inattentive	4	68	14.99	4.23	.072
Post-Control/Pre-Yoga -DSM-IV - Inattentive	4	63.5	12.77		
Post-Yoga - DSM-IV -Inattentive	4	59.5	12.58		

Table 16: TEA-Ch Significant Improvement Over Time for the Subgroup of Students Who Acted as Their Own Controls

TEA-Ch Age Scaled Scores	n	Mean	Std. Deviation	F	p
Pre-Control - Focused attention – Sky Search test c	12	7.33	3.28	7.67	0.003
Post-Control/Pre Yoga - Focused attention - Sky Search test c		9.08	2.50		
Post-Yoga - Focused attention - Sky Search test c		10.33	2.10		
Pre-Control - Focused attention – Sky Search test g	12	7.42	3.45	5.92	.009
Post-Control/Pre Yoga - Focused attention - Sky Search test g		9.75	2.49		
Post-Yoga -Focused attention - Sky Search test g		9.92	2.35		
Pre-Control -Focused attention – Map Mission test u	12	7.16	3.43	5.84	.009
Post-Control/Pre-Yoga - Focused attention- Map Mission test u		9	2.6		
Post-Yoga - Focused attention - Map Mission test u		9.67	3.2		
Pre-Control – Sustained divided attention –Sky Search DT test t	10	4.7	4.5	4.63	.024
Post-Control/Pre-Yoga - Sustained divided attention -Sky Search DT test t		7.6	2.18		
Post-Yoga - Sky Search DT Sustained divided attention-test t		9	2		
Pre-Control – Sustained attention-response inhibition - Walk, Don't Walk test y	11	7.45	3.67	3.36	.055
Post-Control/Pre-Yoga - Sustained attention-response inhibition - Walk, Don't Walk test y		9.64	4.3		
Post-Yoga Sustained attention response inhibition - Walk, Don't Walk test y		9.09	3.42		
Pre- Control - Switching attention - Creature Counting test i	11	9.54	3.01	8.05	.003
Post-Control/Pre-Yoga - Switching attention-Creature Counting test i		13.09	.54		
Post-Yoga – Switching attention-Creature Counting test i		11.64	2.25		
Pre-Control - Switching attention- Creature Counting test l	10	8.4	2.06	4.8	.021
Post-Control/Pre-Yoga - Switching attention- Creature Counting test l		10.4	3.63		
Post-Yoga - Switching attention - Creature Counting test l		10.9	1.37		
Pre-Control Switching attention - Opposite World Same/World Total test z	12	8.08	2.02	8.12	.002
Post-Control/Pre-Yoga - Switching attention- Opposite World/Same World Total test z		8.75	2.1		
Post-Yoga- Switching attention- Opposite World/Same World Total test z		10.92	1.78		

Table 17: CTRS-R: L Pre- and Post-Test Means, SD, F and P Values On the for High Interest School

High Interest School (n=7)								
	Pre-test Yoga		Post-test Yoga					
CTRS-R:L Subscales	Mean	S.D.	Mean	S.D.	F	p	Eta2	Ob. Power
Oppositional	67.71	13.73	64.43	14.55	0.49	0.509	0.08	0.09
Cognitive Problems-Inattention	60.29	12.99	53.86	11.13	3.73	0.102#	0.38	0.37
Hyperactivity	61.29	15.55	58.57	16.6	0.72	0.428	0.11	0.11
Anxious/Shy	60.57	12.21	48.43	4.72	4.9	0.069#	0.45	0.46
Perfectionism	54.86	16.76	44.86	2.61	3.05	0.131	0.34	0.31
Social Problems	61.71	17.74	58.57	16.19	2.61	0.157	0.30	0.28
ADHD Index	61.14	16.57	57.29	14.19	2.02	0.205	0.25	0.22
Global Index Restless/Impulsive	61.57	16.62	59.57	16.6	0.48	0.514	0.07	0.09
Global Index Emotional Lability	63.71	16.43	53.14	9.33	3.95	0.094#	0.4	0.39
Global Index Total	63.14	16.38	58.14	14.59	2.59	0.159	0.30	0.27
DSM 1V- Inattentive	60.43	13.62	54.86	12.89	5.68	0.055	0.49	0.51
DSM1V Hyperactive/Impulsive	61.29	16.34	56.71	16.35	3.43	0.113	0.36	0.34
DSM-1V Total	62.14	16.11	56.71	15.89	4.69	0.073#	0.44	0.44
DSM-1V Symptoms Inattention	2	3.1	1	2.24	1.31	0.296	0.179	0.165
DSM-1V Symptoms Hyp/Impulsive	1.43	2.51	0.86	1.86	2.4	0.172	0.286	0.259

Note: # Borderline significance

Non-Standardised Measures Results

Table 18: FFS Means, SD, Minimum and Maximum Scores for the Happiness Subscale

Happiness Scale	N	Minimum	Maximum	Mean	Std. Deviation
Week 1	8	2	5	3.75	.89
Week 2	35	1	5	4.09	.98
Week 3	29	1	5	4.00	1.13
Week 4	26	3	5	4.08	.93
Week 5	34	3	5	4.09	.83
Week 6	24	1	5	4.04	1.04
Week 7	21	1	5	4.05	1.28
Week 8	25	1	5	4.24	1.01
Week 9	27	1	5	4.04	1.16
Week 10	26	1	5	4.15	1.08
Week 11	24	1	5	3.96	1.2
Week 12	27	1	5	4.19	1.07
Week 13	16	1	5	3.81	1.05
Week 14	12	3	5	4.50	.8
Mean Total				4.07	1.03

Table 19: FFS Means, SD, Minimum and Maximum Scores for the Calmness Subscale

Calmness Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Week 1	17	1	5	4.12	1.16
Week 2	34	1	5	3.97	1.0
Week 3	29	1	5	3.83	1.284
Week 4	25	1	5	3.72	1.14
Week 5	32	1	5	3.97	1.231
Week 6	23	2	5	4.22	.95
Week 7	21	1	5	4.14	1.15
Week 8	25	1	5	4.28	.98
Week 9	25	1	5	4.04	1.31
Week 10	27	3	5	4.19	.88
Week 11	23	1	5	3.74	1.32
Week 12	26	1	5	4.27	1.08
Week 13	16	1	5	3.94	.998
Week 14	12	1	5	4.08	1.311
Mean Total				4.04	1.13

Table 20: FFS Means, SD, Minimum and Maximum Scores for the Enjoyment Subscale

Enjoyment Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Week 1	17	1	5	3.71	1.26
Week 2	36	1	5	3.81	1.26
Week 3	30	2	5	3.97	.93
Week 4	27	2	5	3.96	1.05
Week 5	36	1	5	4.00	1.07
Week 6	24	1	5	4.17	1.05
Week 7	21	1	5	3.90	1.09
Week 8	27	1	5	4.33	.96
Week 9	28	1	5	4.11	1.13
Week 10	25	3	5	4.24	.88
Week 11	25	3	5	4.28	.84
Week 12	27	3	5	4.26	.813
Week 13	16	3	5	4.13	.72
Week 14	13	3	5	4.46	.66
Mean Total				4.09	.1

Table 21: FFS Means, SD, Minimum and Maximum Scores for the Competence Subscale

Competence Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Week 1	17	1	5	3.82	1.07
Week 2	36	1	5	4.03	1.08
Week 3	29	1	5	4.07	.96
Week 4	29	1	5	3.97	1.15
Week 5	34	1	5	3.94	1.28
Week 6	23	3	5	4.17	.83
Week 7	23	1	5	3.83	1.34
Week 8	24	1	5	4.04	1.08
Week 9	25	1	5	3.88	1.13
Week 10	28	1	5	4.11	1.17
Week 11	23	1	5	3.74	1.14
Week 12	25	1	5	4.28	1.02
Week 13	15	3	5	4.20	.68
Week 14	13	3	5	4.46	.78
Mean Total				4.04	1.05

Case Study Results

Case Study 1

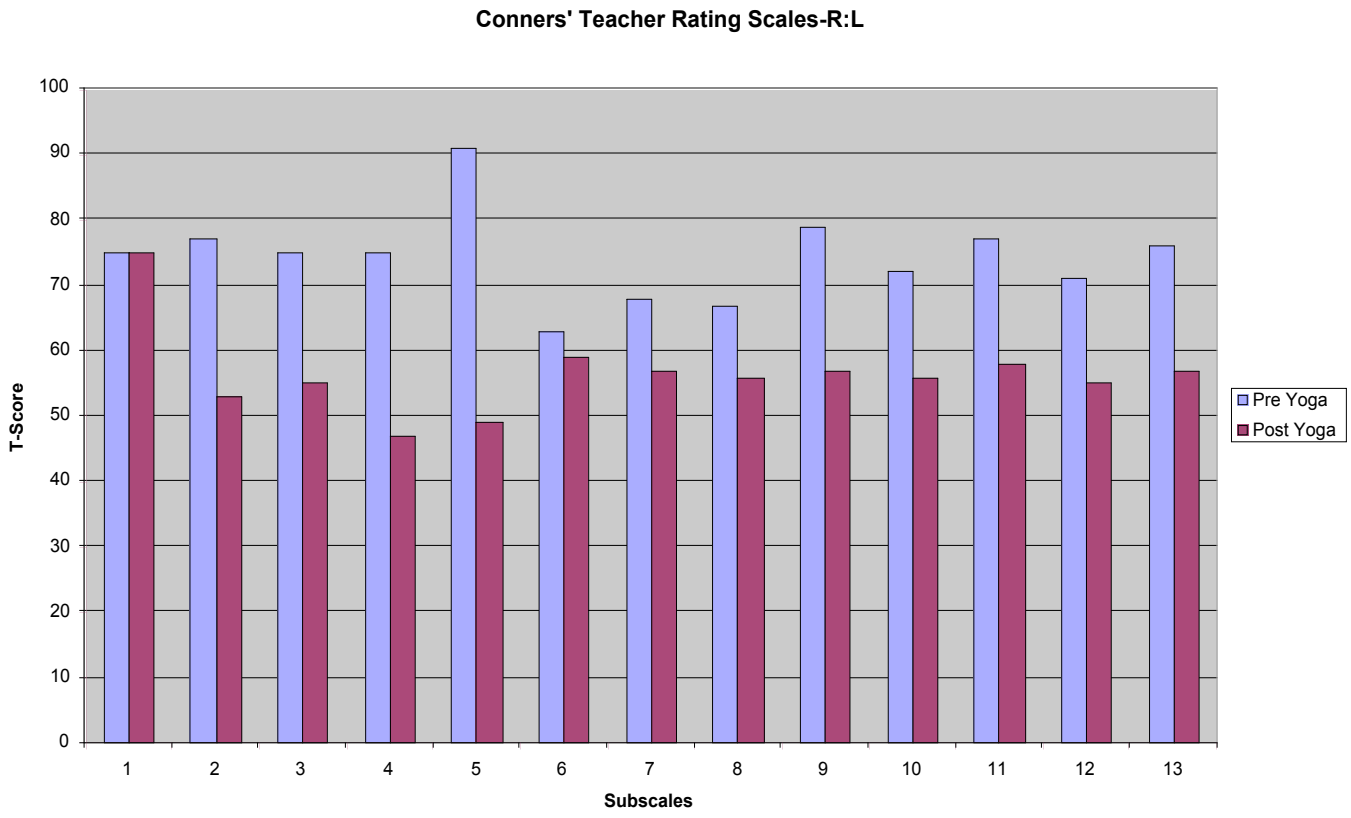


Figure 1: CTRS -R: L Results for Case Study 1

Note: 1. Oppositional; 2. Cognitive Problems- Inattention;3. Hyperactivity; 4. Anxious/Shy; 5. Perfectionism; 6. Social Problems; 7. ADHD Index; 8. Global Index Restless/Impulsive; 9; 9. Global Index Emotional Lability; 10. Global Index Total; 11. DSM 1V- Inattentive; 12. DSM1V Hyperactive/Impulsive; 13.DSM IV Total.

2. 70+ T-score -Markedly Atypical Significant Problem; 66-70 T-score Moderately Atypical Significant Problem; 61-65 T-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

Table 22: STAI-Y Pre- Mid- And Post-Test Raw Scores and Total Raw Scores, T-Scores and Percentiles for Case Study 1.

STAI-Y Items Absence of Anxiety 1= Almost always, 2= Often, 3=Sometimes, 4= Almost never	Pre-Yoga	Mid-Yoga	Post-Yoga
I feel pleasant	3	2	2
I feel satisfied with myself	3	2	2
I feel rested	3	2	2
I feel calm, cool and collected	3	2	2
I am happy	2	2	2
I feel secure	2	2	2
I am content	3	2	2
I make decisions easily	3	3	2
I am a steady person	3	3	3
Total Absence of Anxiety	25	20	19
Anxiety 4= Almost always, 3= Often, 2=Sometimes, 1= Almost never			
I feel nervous and restless	2	2	2
I wish I could be as happy as others seem to be	2	2	2
I feel like a failure	3	2	2
I feel difficulties are piling up and I cant overcome them	2	2	2
I worry too much over something that doesn't really matter	3	3	2
I have disturbing thoughts	2	3	2
I lack self confidence	2	2	2
I feel inadequate	2	2	3
Some unimportant thoughts run through my mind and bothers me	2	2	2
I take disappointments so seriously that I cant put them out of my mind	2	2	2
I get tense and stressed when I think of my recent concerns	3	3	2
Total Anxiety	26	25	23
Total Raw Scores	51	45	42
Total T-Scores	60	54	52
Total Percentile Scores	87th	68th	60th

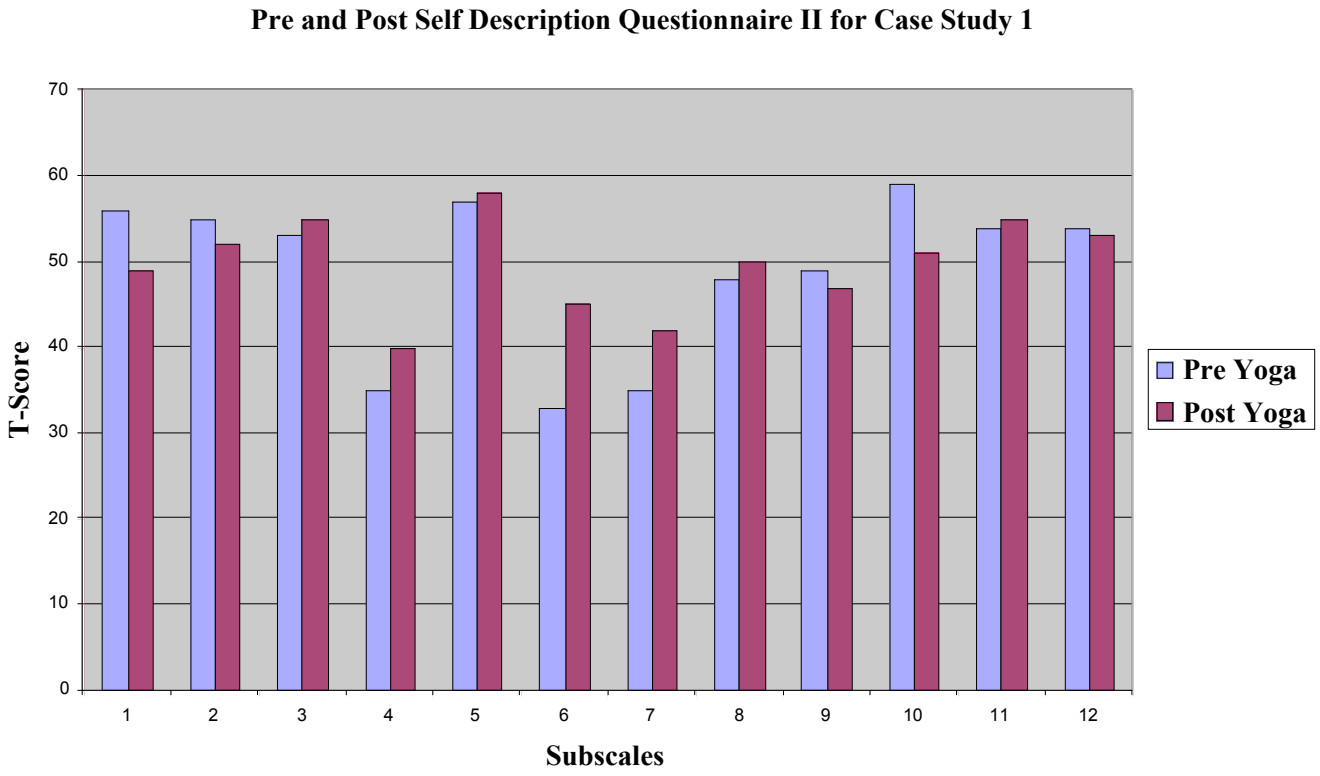


Figure 2 :Results for SDQ II for Case Study 1

Note:1.Physical Abilities; 2.Physical Appearance; 3. Parents Relations; 4.Verbal; 5.Mathematics; 6.General School; 7.General Self; 8. Total Self Concept; 9.Emotional Stability; 10.Same Sex Relations; 11.Opposite Sex Relations; 12.Honesty and Trustworthiness

Table 23: On- and off-task descriptors student's behaviour during yoga classes

On-Task Comments	Count	Off-Task comments	Count
Great	2	ADHD and ODD behaviours	
Did well (in practices)	12	Not following instructions	2
Engagement		Unsettled	4
Tried	6	Distracted	5
Participated	4	Inappropriate interactions	2
Settled	10	Noisy	2
Accepting assistance	2	Silly	7
On-task	36		
Listened	6		
Enjoyment	2		
Followed instructions	6		
Mood			

Enjoyed	1		
Relaxed	1		
Settled	7		
Still ,Quiet, Calm	3		
Excited	1		
Total	**99**	**Total**	**22**

Table 24: Results from the BASC-POP of Yoga Lesson at the Beginning and at the End Of Intervention.

BASC-POP Behaviours	Beginning of Yoga Program	End of Yoga Program
ADHD		
Inattentive Total	3	1
Hyperactive Total	2	0
Impulsive Total	5	0
Total ADHD Behaviour	5	0
ODD		1
Total ODD Behaviour	5	0

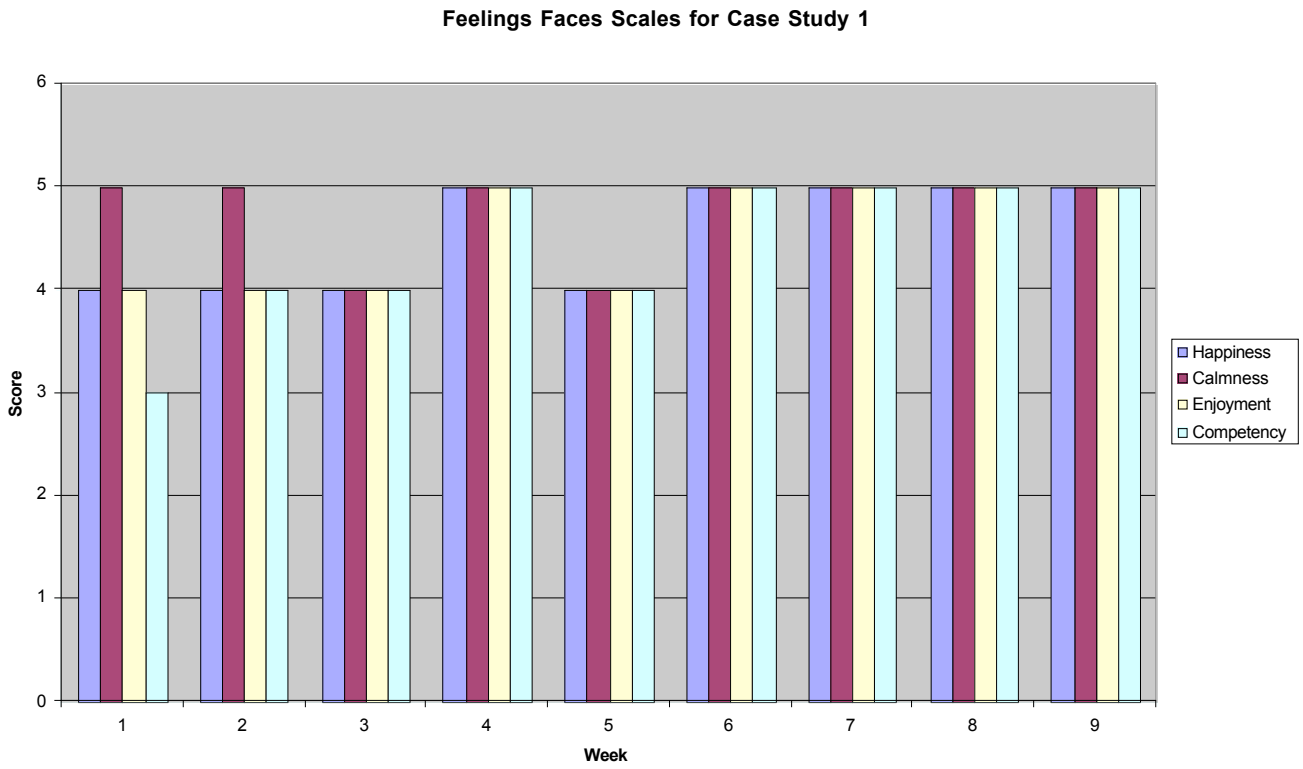


Figure 3: Results for Student During the Yoga Program.

Note: Weeks in chart are not sequential

.Note: Happiness: 5 Very Happy, 4 Happy, 3 Nothing, 2 Sad, 1 Very Sad. Calmness: 5 Very Calm, 4 Calm, 3 Nothing, 2 Angry, 1 Very Angry. Enjoyment:5. Very Much Enjoy, 4 Enjoy, 3 Nothing, 2 Shy, 1 Very Shy; Competence: 5 All Postures, 4 Most Postures, 3 Some Postures, 2 Few Postures, 1 No Postures.

Table 25: Pre- and Post-Yoga Session Responses on the Physical, Emotional and Mental States (PEMS)

		Physical		Emotional		Mental	
PEMS	Date	Before Class	After Class	Before Class	After Class	Before Class	After Class
Session 1	19.9.05	8	10	5	8	8	9
Session 2	21.9.05	8	7	8	8	8	9
Session 3	17.10.05	4	8	8	8	8	9
Session 4	21.10.05	5	9	8	9	8	8
Session 5	24.10.05	0	8	5	8	5	10
Session 6	31.10.05	0	10	0	10	0	10
Session 7	7.11.05	5	10	5	10	5	10
Session 8	9.11.05	8	10	7	10	6	10
Session 9	14.11.05	9	10	8	10	8	10
Session10	16.11.05	8	10	7	10	10	10

Session11	21.11.05	9	10	10	10	10	10
Session12	23.11.05	9	10	10	10	10	10
Session 13	28.11.05	10	20*	10	20*	10	20*

Note: * Student actually stated a score of 20 but the rating was set at a maximum of 10

Case Study 2

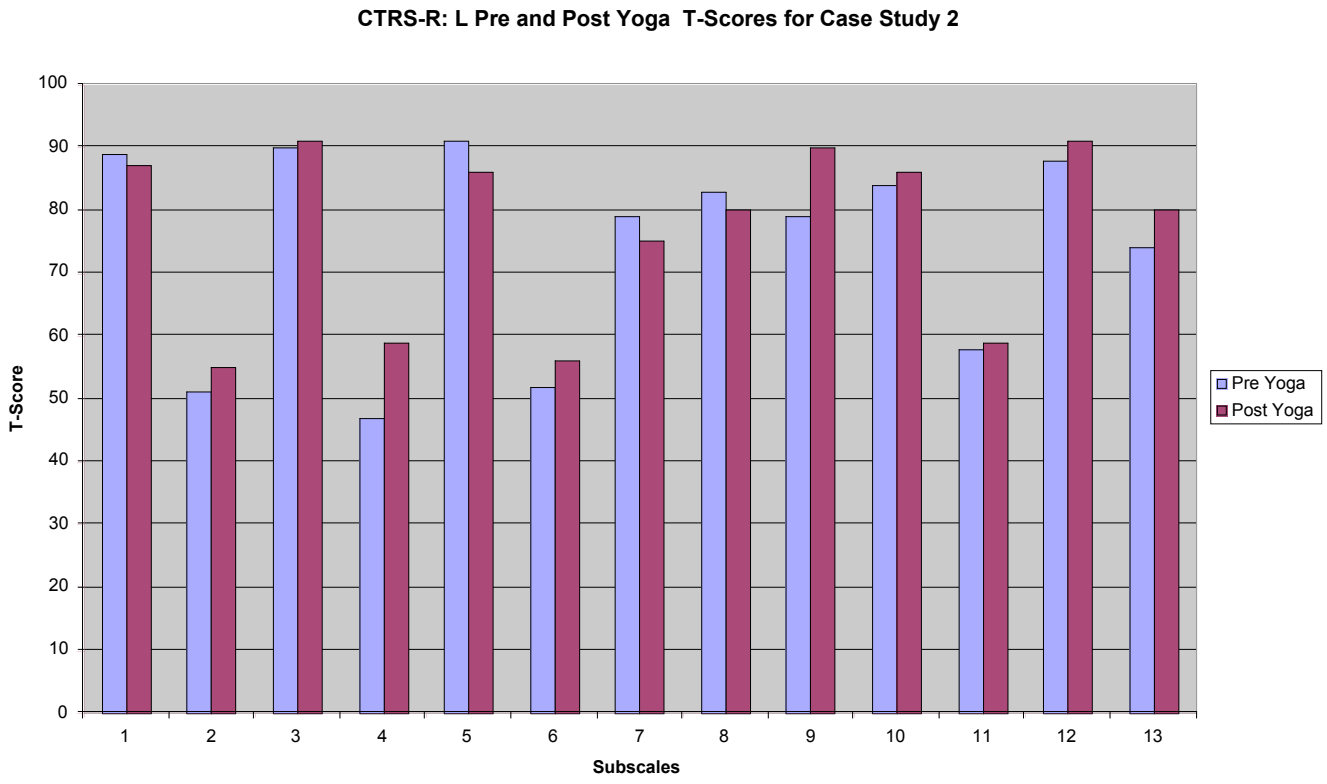


Figure 4: Pre And Post-Yoga Scores for the CTRS-R: L for Case Study 2

Note:

70+ T-score -Markedly Atypical Significant Problem; 66-70 T-score Moderately Atypical Significant Problem; 61-65 T-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55

1. Oppositional; 2. Cognitive Problems- Inattention;3. Hyperactivity; 4. Anxious/Shy; 5. Perfectionism; 6. Social Problems; 7. ADHD Index; 8. Global Index Restless/Impulsive; 9; 9. Global Index Emotional Lability; 10. Global Index Total; 11. DSM 1V- Inattentive; 12. DSM1V Hyperactive/Impulsive; 13.DSM IV Total.

Table 26: TEA-Ch Aged-Scaled Scores and Percentiles for Pre and Post-Yoga for Case Study 2

TEA-Ch (Nine Tests)	Pre-Yoga T-Score	Post-Yoga T-Score
1.Focused attention -Sky Search b-Targets found	13	13
- Sky Search c-Time per target	16	18
- Sky Search g-Attention Score	15	6
2.Focused attention -Map Mission u	13	4
3.Sustained Attention- Score h	12	1
4.Sustained Divided Attention- Sky Search DT t	6	6
5.Sustained Attention-Score DT x	13	8
6.Sustained Attention Response Inhibition-Walk, Don't Walk y	15	8
7.Sustained Attention-Code Transmission bb	11	14
8.Switching Attention-Creature Counting I Accuracy	11	13
Creature Counting Timing t l-Timing score	16	14
9.Switching Attention- Same World Total z-Total time	19	14
Opposite World Total aa- Total time	16	13

Table 27: STAI-Y Pre- Mid- and Post-Test Raw Scores and Total Raw Scores T-Scores and Percentiles for Case Study 2

State Trait Anxiety Inventory –Y Items Absence of Anxiety 1= Almost always, 2= Often, 3=Sometimes, 4= Almost never	Pre-test	Postest
I feel pleasant	3	2
I feel satisfied with myself	2	2
I feel rested	3	4
I feel calm, cool and collected	4	4
I am happy	3	3
I feel secure	4	3
I am content	3	2
I make decisions easily	3	2
I am a steady person	3	3
Total Absence of Anxiety	28	25
Presence of Anxiety 4= Almost always, 3= Often, 2=Sometimes, 1= Almost never		
I feel nervous and restless	4	3
I wish I could be as happy as others seem to be	2	2

I feel like a failure	2	1
I feel difficulties are piling up and I cant overcome them	3	2
I worry too much over something that doesn't really matter	4	2
I have disturbing thoughts	4	2
I lack self confidence	3	1
I feel inadequate	1	1
Some unimportant thoughts run through my mind and bothers me	4	2
I take disappointments so seriously that I cant put them out of my mind	3	2
I get tense and stressed when I think of my recent concerns	4	2
Total Anxiety	34	20
Total Raw Score	62	45
Total T-Score	71	55
Total Percentile Score	98th	68th

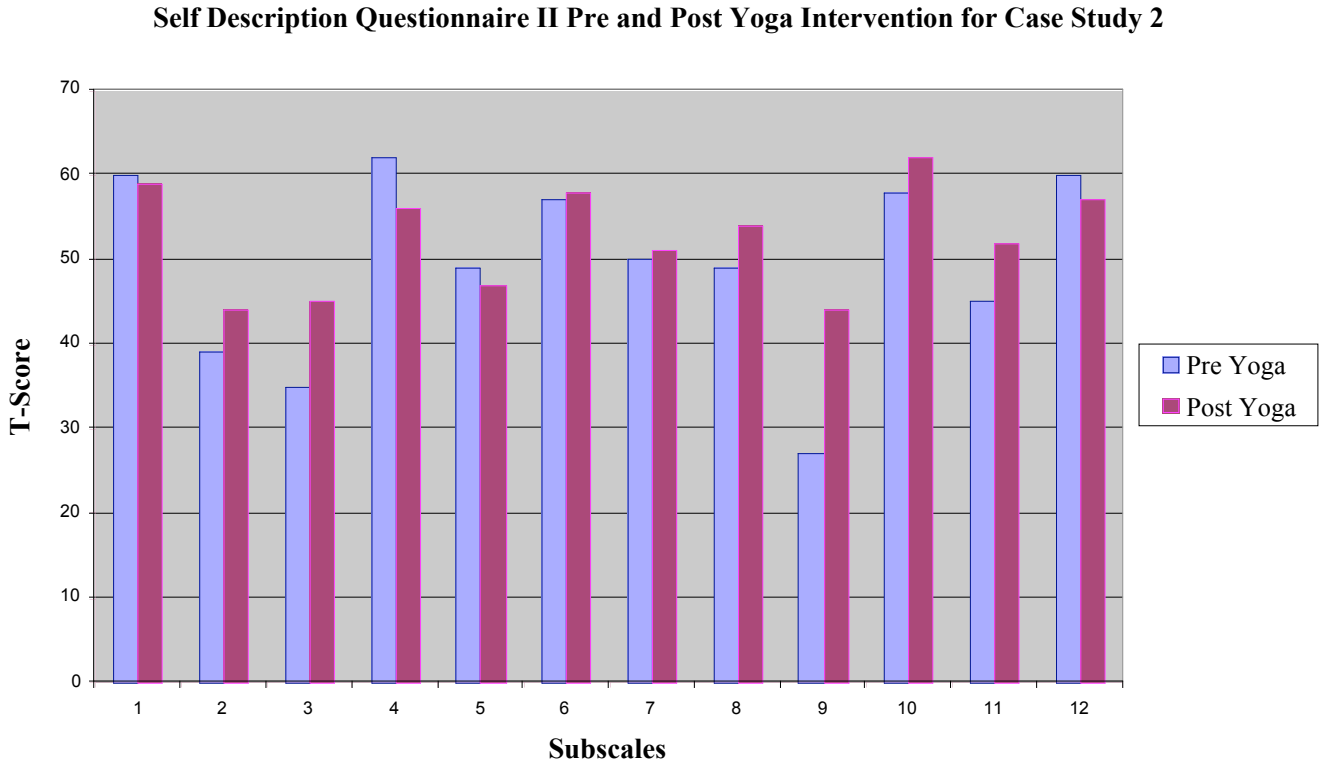


Figure 5; SDQ II Results for Case Study 2

Note:1.Physical Abilities; 2.Physical Appearance; 3. Parents Relations; 4.Verbal; 5.Mathematics; 6.General School; 7.General Self; 8. Total Self Concept; 9.Emotional Stability; 10.Same Sex Relations; 11.Opposite Sex Relations; 12.Honesty and Trustworthiness

Table 28: Descriptors and Frequency of On and Off-Task Behaviours Observed Over 22 Yoga Classes for Case Study 2

On-Task Comments	Count	Off-Task comments	Count
Competence		ADHD and ODD Behaviours	
Excellent	2	Interrupted	1
Good (referring to behaviour and practices)	9	Fidgety	
Did well (in practices)	12	Restless	1
Properly /correctly(practiced)	2	Fidgety	1
Engagement		Unsettled	3
Participated	13	Distracted	2
Tried	4	Disruptive	4
Attempted	3	Talkative	6
Coped	1	Not concentrating	1
Co-operative	3	Not attentive	1
Mood		Lethargic	1
Enjoyed	3	Silly	4
Enthusiastic	2	Uncooperative	5
Full of Energy	1	Not Following instructions	7
Concentration	2	Anti-Social Behaviours	
Relaxed	8	Teased	1
Settled	4	Verbally abuse and swearing	5
Still	2	Physically abusive	2
Quiet	5	Silly	
		Criticising	1
		Complaining	1
		Disobedient	1
Total	**77**	**Total**	**48**

Table 29: Example of On- And Off-Task Comments by School Staff for Case Study 2

Session and Date	On-Task Comments	Count	Off-Task Comments	Count
1. 9.3.05	Admitted to not being able to settle	1	Disruptive	1
	Managed to stay settled	1	Distracted	1
	Involved	1	Rarely paid attention	1
	Asking more questions	1	Trouble concentrating	1
	Wanted to do yoga every day	1	Made some distracting sounds	1
			Quite lethargic	1
	Subtotal	5	Subtotal	6
15 3.5.05	Quiet and relaxed when lights out.	1	All students a bit restless	1
	Warmed up really well, although other students still restless	1	Made silly noises.	1
	Joined in again and did extension	1	Continued to make silly noises	1
	Eager to lie down and do breathing practices.	1	Lay down during warrior	1
	Very quiet and relaxed	1		
	Deep concentration	1		
	Subtotal	6	Subtotal	4

Table 30: Pre-Yoga Classroom and Beginning and End of the Yoga Program Yoga Class Observations on the BASC-POP.

BASC-POP Behaviours	Pre-test Classroom	Beginning. Yoga	End Yoga
Inattentive	5	1	7
Hyperactive	3	5	2
Impulsive	2	3	13
ADHD Total	**10**	**9**	**22**
ODD	13	0	3
Total	**25**	**9**	**25**

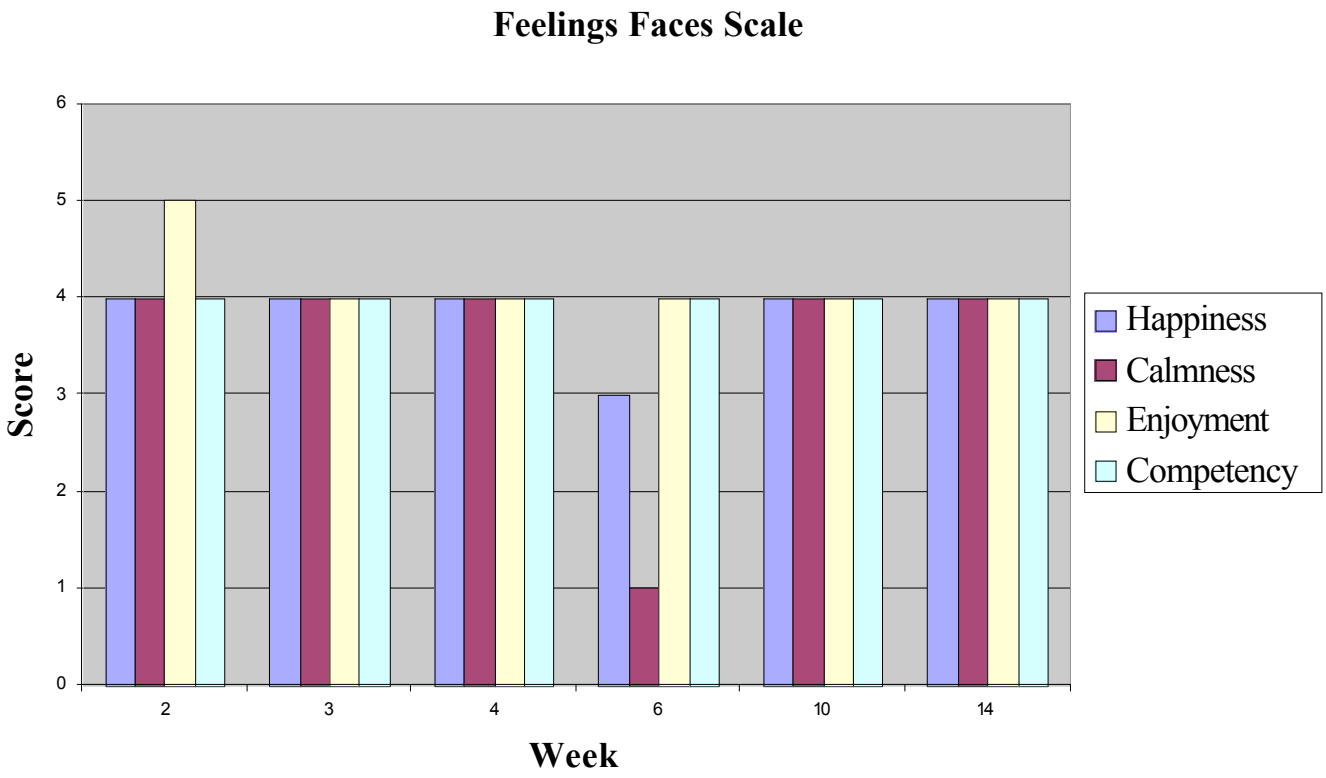


Figure 6: Feelings Faces Scale scores for Case Study 2

Note: Happiness: 5 Very Happy, 4 Happy, 3 Nothing, 2 Sad, 1 Very Sad. Calmness: 5 Very Calm, 4 Calm, 3 Nothing, 2 Angry, 1 Very Angry. Enjoyment: 5 Very Much Enjoy, 4 Enjoy, 3 Nothing, 2 Shy, 1 Very Shy. Competence: 5 All Postures, 4 Most Postures, 3 Some Postures, 2 Few Postures, 1 No Postures

Case Study 3

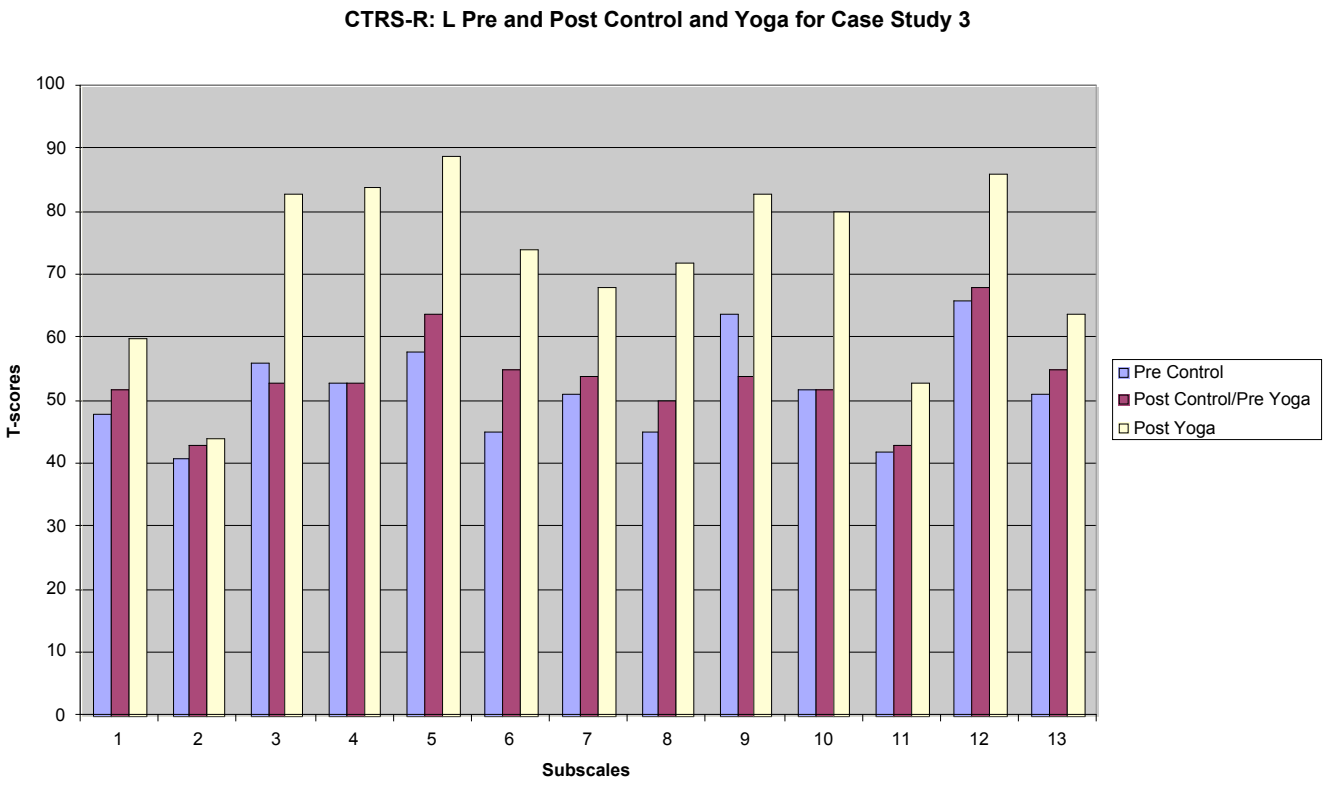


Figure 7: CTRS-R: L Results for Case Study 3

Note:

1.70+ T-score -Markedly Atypical Significant Problem; 66-70 T-score Moderately Atypical Significant Problem; 61-65 T-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

1. Oppositional; 2. Cognitive Problems- Inattention;3. Hyperactivity; 4. Anxious/Shy; 5. Perfectionism; 6. Social Problems; 7. ADHD Index; 8. Global Index Restless/Impulsive; 9; 9. Global Index Emotional Lability; 10. Global Index Total; 11. DSM 1V- Inattentive; 12. DSM1V Hyperactive/Impulsive; 13.DSM IV Total.

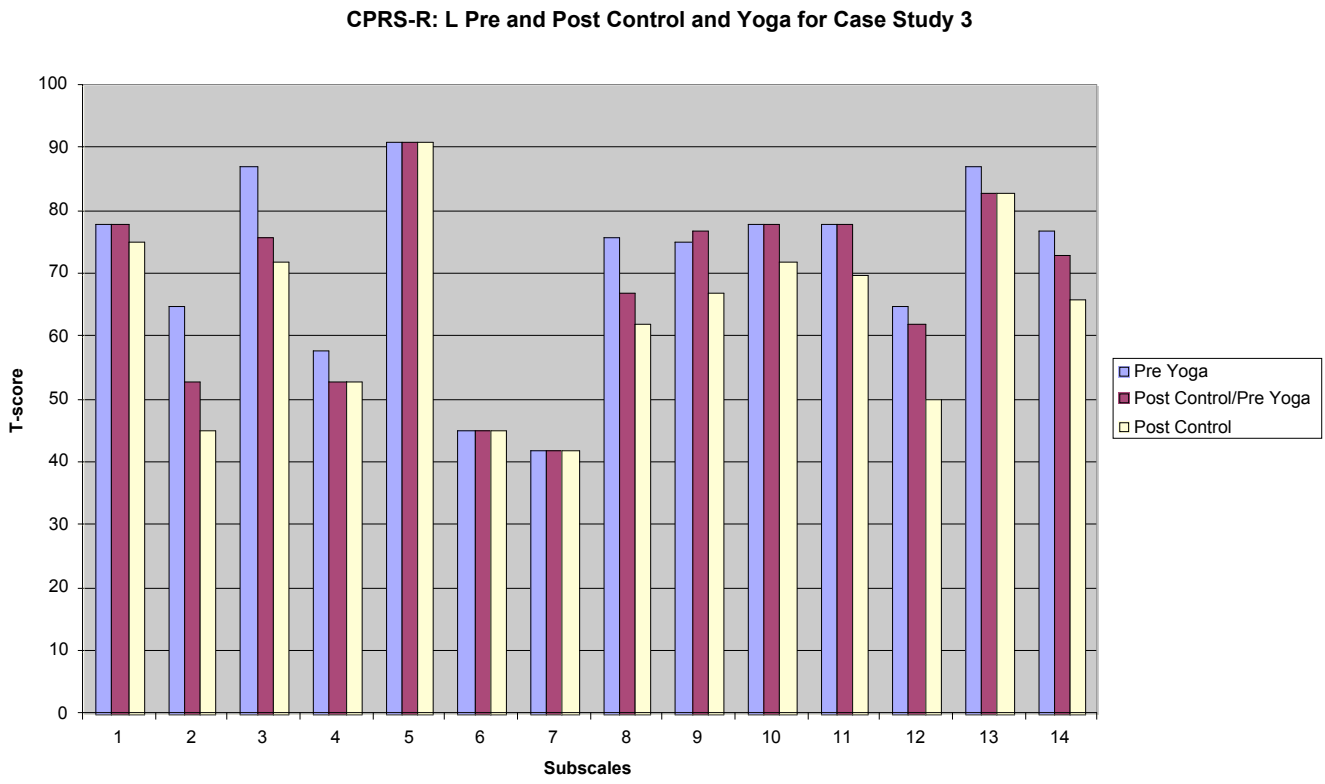


Figure 8: CPRS-R: L Subscales for Case Study 3

Note:

1.70+ T-score -Markedly Atypical Significant Problem; 66-70 T-score Moderately Atypical Significant Problem; 61-65 T-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

1. Oppositional; 2. Cognitive Problems- Inattention;3. Hyperactivity; 4. Anxious/Shy; 5. Perfectionism; 6.Psychosomatic;7. Social Problems; 8. ADHD Index; 9. Global Index Restless/Impulsive; 10. Global Index Emotional Lability; 11. Global Index Total; 12. DSM 1V-Inattentive; 13. DSM1V Hyperactive/Impulsive; 14 .DSM IV Total.

Table 31: Pre- and Post-Control and Yoga Aged–Scaled Scores an The TEA-Ch for Participant Case Study 3

	Pre Control	Post Control/ Pre Yoga	Post Yoga
Focused attention – Sky Search test g	10	13	13
Focused attention -Map Mission test u	6	8	10
Sustained Attention - Score test h	5	7	7
Sustained Divided Attention- Sky Search DT test t	7	8	7
Sustained Attention	11	7	8

-Score DT test x			
Sustained Attention Response Inhibition-Walk, Don't Walk test y	9	13	10
Sustained Attention -Code Transmission test bb	7	N/A	9
Switching Attention - Creature Counting test i	10	13	8
Switching Attention - Creature Counting Timing test l	8	9	11
Switching Attention-Opposite World Same World Total test z	5	8	6
Switching Attention - Opposite World Total test aa	7	11	13

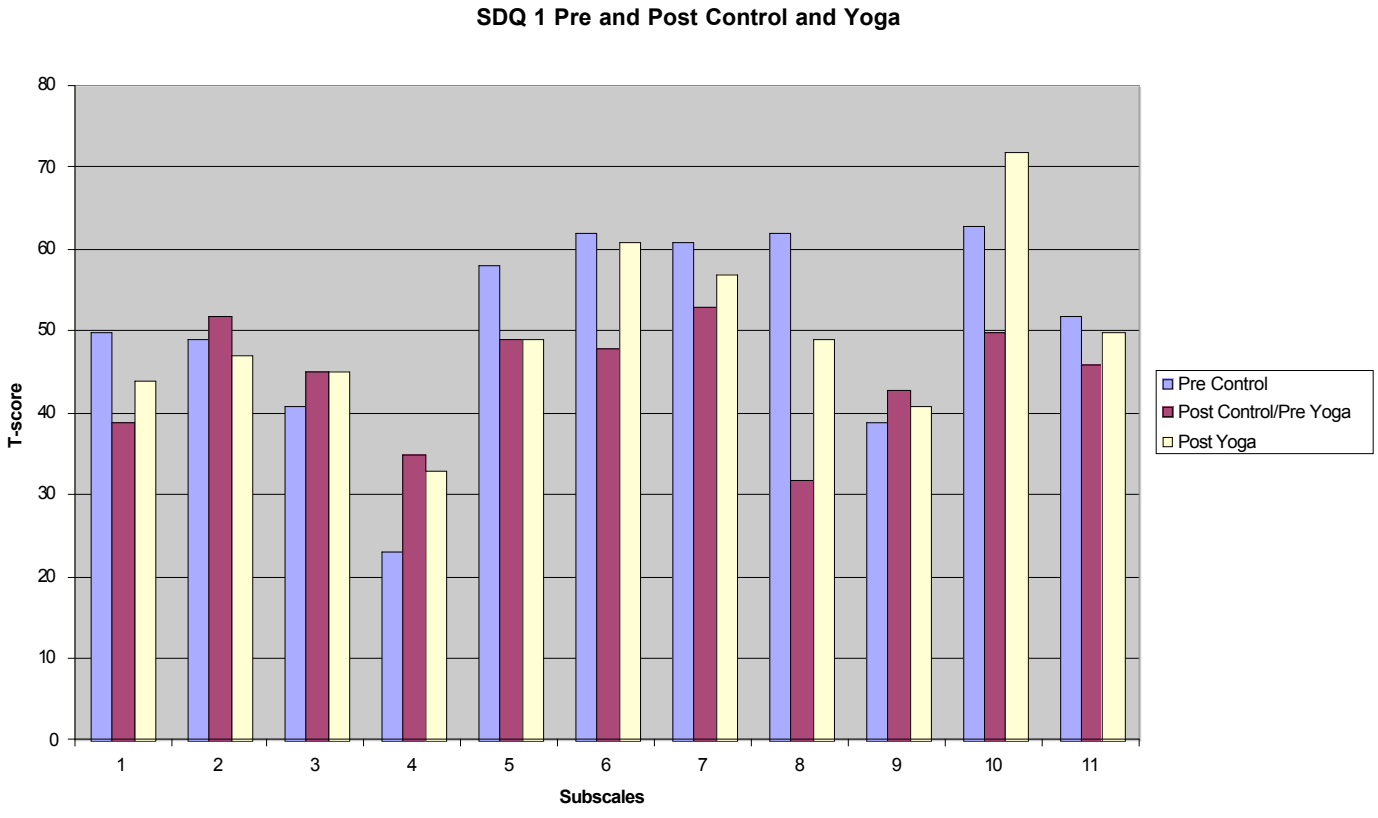


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Figure 9:Results for Case Study 3 on the SDQ I.

Note: 1-1.Physical Abilities; 2.Physical Appearance; 3.Peer Relations; 4. Parents Relations;

5.Reading; 6.Mathematics; 7.General School; 8. General Self ; 9.Non-Academic; 10. Academic; 11.Total Self Concept

Table 32 : Descriptors and Frequencies of On- and Off-Task Behaviours Descriptors and Frequencies of On- and Off-Task Behaviours

On-Task Comments	Count	Off-Task comments	Count
Competence		ADHD and ODD behaviours	
Did very well	4	Restless	1
Did well (in practices)	24	Talkative	2
Improved	1	Silly	2
Successful	1	Noisy	1
Followed instructions	1	Unsettled	3
Participated	4	Uninvolved	1
Tried	4	Disturbing behaviours	2
Focused	1	Arguing	1
Joined in	9	Play fighting	3
Co-operative/compliant	3		
On –task	1		
Engaged/involved	5		
Willing	3		
Effort	2		
Balance	1		
Enormous gains	1		
Control	1		
Mood			
Successful	1		
Relaxed	2		
Settled	5		
Quiet	2		
Total	77	Total	15

Table 33: Extract from Staff Notes of On- and Off-Task Comments While Observing Yoga Classes. for Case Study 3.

Session	On-Task Comments	Count	Off-Task Comments	Count
Session 1 25.8.04	Willing to participate	1	Talkative	1
	Cooperative and willing	1		
	Didn't object to warm ups	1		
6.9.04	Did the wheelbarrow	1	A fight in the playground	

			involving all primary students effected mood.	
7.9.04 V	Quiet and settled	1		
8.9.04	Engaged well from beginning	1		
	Participated very well as a group doing 'the circle'	1		
27.10.04	Joined in from the beginning	1	Bit silly doing ha breathing	1
	Following instructions	1		
	Tried very hard	1		
1.11.04	Was compliant	1	Involved in argument	1
2.11.04	Involved	1		
	Participated well	1		
	Did relaxation together	1		
	Participated in breathing	1		

Table 34: ADHD Behaviours Observed in the Classroom and the Yoga Class on the BASC-PO

BASC-POP Behaviours	Pre Control Classroom	Post Control/ Pre Yoga Classroom	Pre Yoga Classroom	Beginning of Yoga Program Yoga Class	End of Yoga Program- Yoga Class
ADHD					
Inattentive Total	9	5	3	0	0
Hyperactive Total	15	8	7	3	0
Impulsive Total	7	1	0	0	0
Total ADHD Behaviour	31	14	12		0
ODD Behaviours	1	0	2	0	
Total Behaviour	**32**	**14**	**14**	**3**	**0**

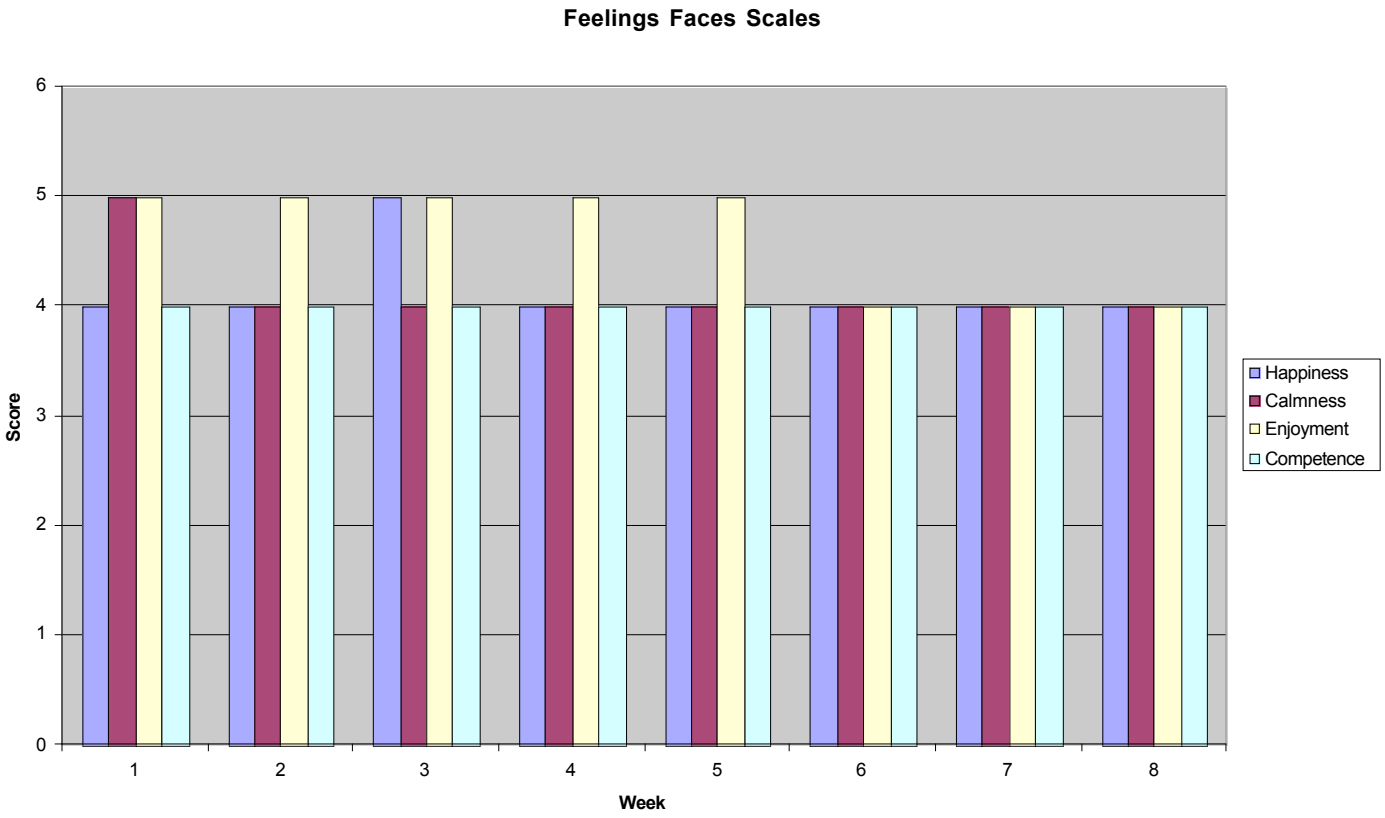

Figure 10 :Feelings Faces Scale for Case Study 3.

Note: Happiness: 5 Very Happy, 4 Happy, 3 Nothing, 2 Sad, 1 Very Sad.

Calmness: 5 Very Calm, 4 Calm, 3 Nothing, 2 Angry, 1 Very Angry.

Enjoyment: 5 Very Much Enjoy, 4 Enjoy, 3 Nothing, 2 Shy, 1 Very Shy.

Competence : 5 All Postures, 4 Most Postures, 3 Some Postures, 2 Few Postures, 1 None

Table 35: Scores for Individually Assessed Yoga Class for Case Study 3

	Score
Ability to concentrate and focus in posture correctly and hold for 5 breaths where required – Maximum score 28 (4 per sequence).	22
Perform the warm ups slowly and with awareness - Maximum score 6.	6
Ability to hold relaxation pose after posture where required - Maximum score 6.	6
Ability to relax for 3-5 minutes - Maximum score 10.	10
Ability To remain calm/quiet throughout program - Maximum score 10	9
Ability to do breathing practices - Maximum score 5.	5
Ability to calmly chant - Maximum score 5.	5
Total on the lesson performance	63/70
Attendance over the course of the program - Maximum score 10.	9

Attitude over the course of the program - Maximum score 20.	18
Total - Maximum score 100	94/100

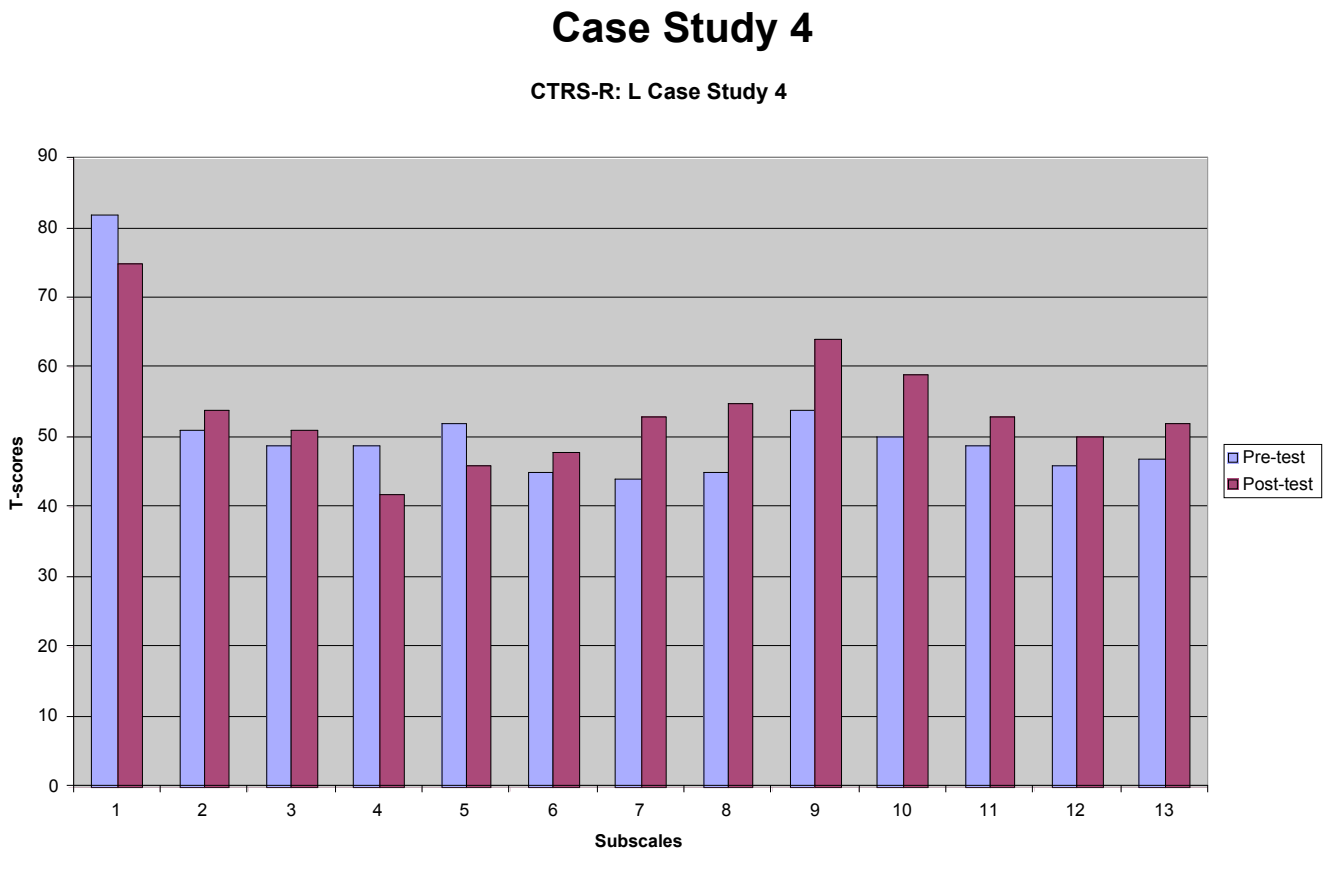

Figure 11: Pre and post T-scores on the CTRS-R :L for Case Study 4.

Note : 1. Oppositional; 2. Cognitive Problems- Inattention;3. Hyperactivity; 4. Anxious/Shy; 5. Perfectionism; 6. Social Problems; 7. ADHD Index; 8. Global Index Restless/Impulsive; 9; 9. Global Index Emotional Lability; 10. Global Index Total; 11. DSM 1V- Inattentive; 12. DSM1V Hyperactive/Impulsive; 13.DSM IV Total

.2. 70+ T-score -Markedly Atypical Significant Problem; 66-70 T-score Moderately Atypical Significant Problem; 61-65 T-score -Mildly Atypical Possible Significant Problem; Slightly Atypical (borderline: should raise concern) scores 56-60; Average (typical score) 45-55.

Table 36: Pre- and Post-Control and Yoga Aged–Scaled Scores on the TEA-Ch for Case Study 3

	Post Control/ Pre Yoga	Post Yoga
Focused attention – Sky Search test g	6	10
Focused attention -Map Mission test u	4	6
Sustained Attention - Score test h	7	5
Sustained Divided Attention- Sky Search DT test t	9	1
Sustained Attention -Score DT test x	8	11
Sustained Attention Response Inhibition- Walk, Don't Walk test y	3	7
Sustained Attention -Code Transmission test bb	2	3
Switching Attention - Creature Counting test i	6	13
Switching Attention - Creature Counting Timing test l	6	9
Switching Attention- Opposite World Same World Total test z	5	6
Switching Attention - Opposite World Total test aa	6	7

Table 37: STAIC/T Pre-and Post-Test Raw Scores and Total Raw Scores T-Scores and Percentiles for Case Study 4

State Trait Anxiety Inventory for Children Items 1= Hardly-ever, 2=Sometimes, 3= Often	Pre-test	Post-test
I worry about making mistakes	1	1
I feel like crying	1	1
I feel unhappy	2	2
I have trouble making up my mind	2	3

It is difficult for me to face my problems	2	1
I worry too much	1	1
I et upset at home	2	2
I am shy	1	1
I feel troubled	2	3
Unimportant things run through my mind and bother me	1	2
I worry about school	2	2
I have trouble deciding what to do	2	1
I notice my heart beats fast	1	1
I am secretly afraid	1	1
I worry about my parents	2	1
My hands get sweaty	1	2
I worry about things that may happen	1	3
It is hard for me to fall asleep at night	1	1
I get a funny feeling in my stomach	1	1
I worry about what others think of me	1	1
Total Raw Score	**28**	**31**
Total T-Score	**36**	**40**
Total Percentile Score	**41**	**68**

Figure 12: SDQ I Results for Case Study 4

.

Note: 1-1.Physical Abilities; 2.Physical Appearance; 3.Peer Relations; 4. Parents Relations; 5.Reading; 6.Mathematics; 7.General School; 8. General Self ; 9.Non-Academic; 10. Academic; 11.Total Self Concept

Table 38: Extract from Staff On- and Off-Task Comments While Observing Yoga Classes for Case Study 4.

19/8/05				
Relaxation	He lay down some of the time, sat down and finally lay down during relaxation.	3	In an unstable mood and restless rolled himself up in the mat, walked around Was tapping during the silence.	3
Breathing	All did consistently	1		
Check list	All filled in	1 (5)		3(3)

15/8/05				
Relaxation	Did well	1		
Rock & roll & stretch	Did most of it	1		
Squat	Good attempt	1		
Lunge	Did well	1		
Cat & dog poses	Did what he could	1		
Balance	Did well	1		
Deep breathing	Did well	1		
Relaxation	Did well	1(8)		(0)

14/10/05				
Relaxation			Unsettled, continuously talking	2
Warm-up	Good	1		
Hula hoops	Good attempt	1		
Stretching	Good attempt,	1	though unsettled	1
Sequence	Did well	1		
Relaxation	Didn't quite make 1 minute	1(5)	Didn't quite make 1 minute	1 (4)

27/10/05				
Relaxation	Did well	1		
Breathing left nostril	Very good	1		
Warm-ups	Did well & enjoyed hoola hoop	1		
Ha-breathing			Didn't participate	1
Angle pose	Did well	1		
Squat	Did a little	1		
Cat & dog			Didn't participate	1
Parachute			Didn't participate	1
Balance			Didn't participate	1
Chanting	-			
Relaxation	Good effort	1(6)		(4)

1/11/05				
Relaxation			Refused to participate	1
Breathing			Refused to participate	1
Warm-up			Continually verbalised his disapproval to participate	1
Balance			Didn't do too well	1
Relaxation	Participated for 1 minute	1 (1)		(4)

3/11/05				
Relaxation	Did well	1		
Warm-up	Did well	1		
Sequence	Did well	1		
Eagle hold 20 secs.	Did well	1		
Chanting	Did well	1		
Relaxation 2 mins.	Did well – finished early	1(6)		(0)

Note: Total On-task behaviours from total intervention= 80; Total off task behaviours = 41

Table 39: Descriptors and Frequencies From Staff Observation Notes of On- and Off-Task Behaviours for Case Study 4

On-Task Descriptors	Count	Off-Task Descriptors	Count
Competence		ADHD and ODD behaviours	
Did well	42	Restless	3
Joined in	2	Talkative	1
Engagement	4	Struggled	3
Followed instructions	3	Unsettled	4

Participated	4	Restless	3
Good/Positive effort	3	Distracted	1
Focused	1	Tapping	2
Joined in	2	Didn't want to	2
		Didn't attempt	7
Good attempt	1	Didn't try	1
Worked well	1	Un-cooperative	1
Very good	1	Poor effort	1
Lay down	1	Refused	1
Enjoyed	1	Went back to class	2
Quiet	5	Unstable mood	1
		Verbally aggressive	2
Total	71		35

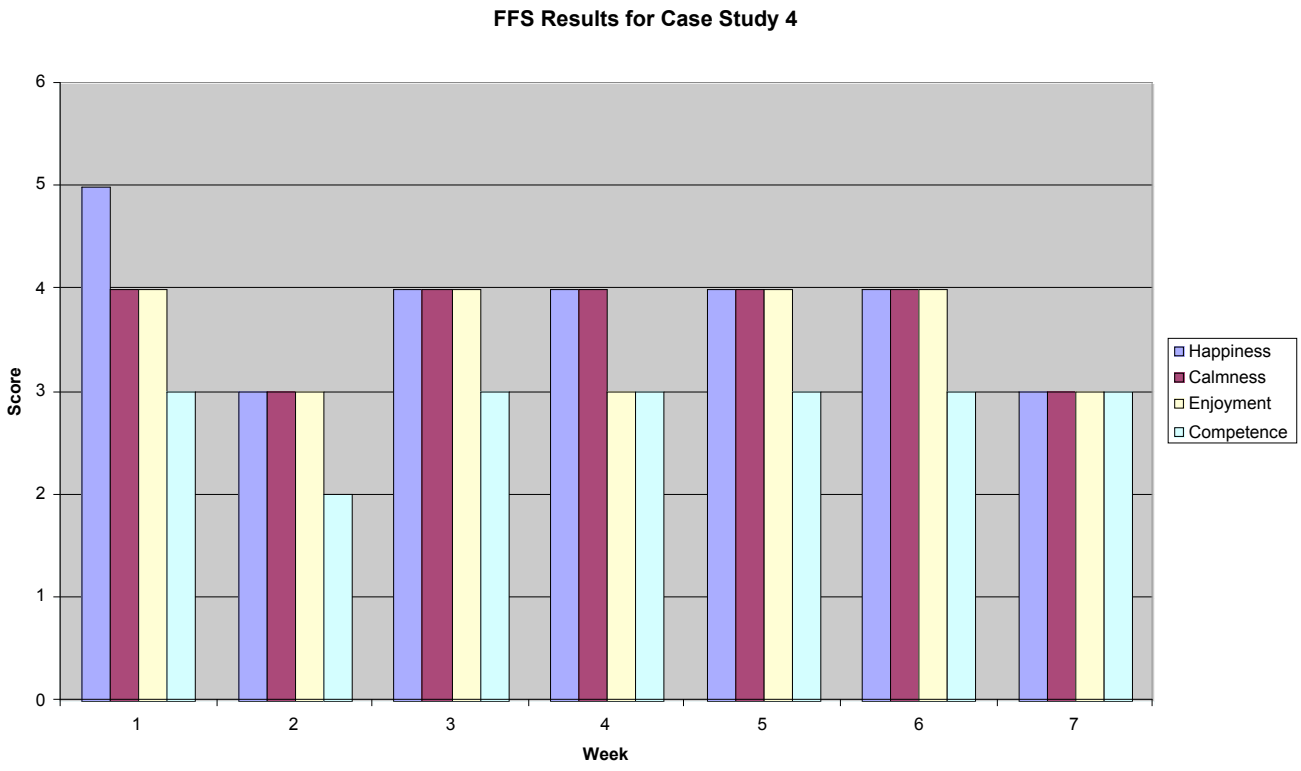

Figure 13: Results on the FFS for Case Study 4

Table 40: Pre- and Post-Yoga Session Responses on the PEMS for Case Study 4

	Physical		Emotional		Mental	
PEMS	Before Class	After Class	Before Class	After Class	Before Class	After Class
Session 1	5	10	9	9	8	9

Session 2	5	10	5	10	9	10
Session 3	5	10	9	10	3	10
Session 4	6	6	5	6	3	6
Session 5	7	5	1	10	7	8
Session 6	8	9	8	0	8	9
Session 7	2	5	8	5	5	5
Session 8	1	7	9	4	0	5
Session 9	5	7	6	8	8	9

Table 41: Yoga Survey Results for Case Study 4

Question	
1.Do you have more energy?	Yes
2.Are you a calmer person?	Yes
3.Are you more flexible?	No
4.Do you feel stronger?	-
5.Are you able to relax easier?	Yes
6.Do you have less mood swings?	No
7.Do you experience as much anger?	Yes

Appendix J

EMAILS EXPRESSING INTEREST IN YOGA AND ADHD

List of correspondence received between 2002 and 2008 from researchers, health professionals and students interested in the previous research by Jensen, P. and Kenny D, (2004) 'The Effects of Yoga on the Attention and Behaviour of Boys with ADHD' Journal of Attention Disorders 7 (4).

1. Johann Haffner, Department of Child and Adolescent Psychiatry, Centre for Psychosocial Medicine, University of Heidelberg, a yoga researcher whose study has been referred to in this thesis.
2. Dr. Richard Brown and Dr Patricia Gerbarg Associate Professors of Clinical Psychiatry, Columbia College of Physicians and Surgeons. Yoga researchers whose studies have been referred to in this thesis.
3. Dr. Josh Backon, Jerusalem, Israel. A yoga researcher whose studies have been referred to in this thesis.
4. Felicia Tomasko, The Washington Post and writer and researcher working for the Yoga Alliance, the US organization that registers yoga teachers
5. A medical journal, Medical Science Monitor, NY
6. A librarian-Carole Ferrel-Chapus Université Paris
7. Anna Evangeli, Science News Editor, ABC Science Online
8. Rick Hodges, a writer for a U.S. magazine called ADDitude
9. Carlos Salgado, MD, MS, Psychiatrist, Brasil
10. , Thawatchai Krisanaprakornkit, Department of Psychiatry, Faculty of Medicine KhonKaen University,Thailand re inclusion in the Cohrane Review,
11. Dr.Ganesan D. MD Psychiatry National Institute of Mental Health and Neurosciences, Bangalore, India,
12. Dr. Rolando P. Sylwan Provincia de Buenso Aires, Argentina

13. Yuval Oded, a clinical neuropsychologist

14. Dr. L.P. Tibrewala, a medical doctor from India

15. Dr. Luuk den Hartog, The Netherlands

17.Dr. Alarik Arenander, PhD, Director, Brain Research Institute, Maharishi University of Management, India

16. Ian Vollum, a British undergraduate student from University of Washington.

17. Melody Raph, a student from Sonoma State University

18. Dianne DiPasquale, a student from D'Youville College, Buffalo, NY, USA

19. Marcela Alexandra, Santiago,Chile

20. .Mahima Saxena, a PhD student in Industrial Organizational Psychology from Purdue University, USA

21. Kris Melbourne, a student in the Administration and Supervision program from Hunter College in NY.

22. A graduate student at the University of Houston, a Senior at Southeast Missouri State University

23. Kelly Larson -doctoral student researching Yoga and health –California Institute of Integral Studies, 2008

Journalists and other researchers were wanting to review the above mentioned article and required more information. Most other correspondents were requesting suggestions and advice on appropriate methods to assist them in formulating research projects in the same field.