THE PSYCHOLOGICAL
AND PHYSIOLOGICAL EFFECTS
OF YOGA ON CHILDREN

Anna Crowley

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School of Social and Behavioural Sciences
Swinburne University of Technology
Hawthorn, Victoria 3122
Australia

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Abstract

The rise in popularity of health practices such as yoga coincides with a period of growing publicity about the benefits of promoting positive health from an early age. Despite this, empirical research in the field is limited. Thus, the aim of the current study was to assess the psychological and physiological impact of a brief yoga program for children using a randomised placebo-control design. Twenty-two school-girls aged 8-10 were recruited to take part in a 6-session after-school program. Participants were randomly allocated to either yoga classes or recreation classes. Heart rate change and respiration rate were measured pre-post program as physiological indicators of relaxation. For mental wellbeing, pre- and post-session mood and pre- and post-program self-esteem and physical self-worth variables were assessed. Later, a replication study was conducted where yoga was offered to the former recreation group.

Contrary to expectations, no significant changes were found on the physiological indicators of relaxation. Global self-esteem and physical self-worth variables also remained constant in both the yoga and recreation groups. As hypothesised, significant reductions in anxious mood were consistently reported from the second session onwards following yoga classes. Contrary to expectations however, depressed mood remained unchanged in either group. Results of the follow-up study confirmed most of the findings of the main study, except for a small improvement on the physical self-worth variable of self-perceived sports competency, and no significant post-session mood changes. Nonetheless qualitative data suggested that this group also experienced anxiety reduction following yoga practice.

The results of the project remain speculative because of the small sample size and generous criteria used to determine statistical significance. Despite this, it was concluded that while brief yoga programs might have little impact on children’s overall self-esteem or physical self-perceptions, especially where children are physically active and already enjoy moderate to high levels of self-esteem, yoga classes may contribute to reductions in immediate anxiety levels. While the ability to relax voluntarily was not demonstrated by the end of program, it was suggested that a longer yoga program which incorporated more overt teaching of relaxation skills might produce such a result. This and other recommendations for future research are presented and the implications for the understanding of positive health are discussed.
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Finally, a big thankyou to Mum and Dad for doing everything that mothers and fathers do.
Declaration

I declare that this thesis does not incorporate without acknowledgement any material previously submitted for a degree at any university or other educational institution and that to the best of my knowledge and belief it does not contain any material previously published or written by another person, except where due reference is made in the text.

I further declare that the ethical principles and procedures specified by the Swinburne University Human Research Ethics Committee have been adhered to in the preparation of this report.

Anna Crowley
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Chapter 1
Introduction and Overview of Thesis

1.1 Introduction

Yoga is an ancient philosophical and religious tradition which is thought to have originated in India in at least 1000 B.C. (Feuerstein, 1990). It refers to a large body of values, attitudes and techniques (Feuerstein, 1990) whose primary objective is the pursuit of enlightenment or self-knowledge (Feuerstein, 1993). The word yoga is probably derived from the Sanskrit word "Yuj" which means to "unite" or "connect" and in the higher levels of yoga this is often said to mean the experience of union of the individual self with the universal self (Feuerstein, 1990).

Over the centuries, the techniques of yoga evolved into a number of different paths, any of which are said to lead a person to self-realisation. Four of the major paths are: Karma Yoga, which is the pathway of selfless service through charity work for example, Jnana Yoga, which means intellectual understanding through philosophical study, Bhakti Yoga, which is the practice of love and devotion, and Raja Yoga, which translates as the “royal path”. Raja Yoga is a psychological approach, which incorporates guidelines about behaviour, physical posture and exercises for steadying the breath and ultimately the mind. The method of Raja Yoga was formally systematized in a body of writing known as the Yoga Sutras, authored by Patanjali sometime between 200 B.C. and 300 A.D. (Feuerstein, 1990).

Hatha Yoga, also known as the yoga of physical discipline (Feuerstein, 1990), is a form of Raja Yoga (Sivananda Yoga Vedanta Centre, 1996) which has recently become extremely popular in the West (Feuerstein, 1990; Corliss, 2001). The techniques of Hatha Yoga place particular emphasis on physical, breathing and concentration methods for the regulation of the body’s energy (Iyengar, 2001). It is estimated that some 15 million Americans now practice this form of yoga (Corliss, 2001), and the figure is rising in Australia as well (Johnson, 2002). There is now even a
daily Australian television program devoted to yoga (Johnson, 2002) and a large number of books on the subject. This includes not only books for athletes, older persons and pregnant women, but also for children, such as “Yoga for Children” (Australian Association of Yoga in Daily Life, 1996) and “I Can’t Believe it’s Yoga for Kids” (Trivell, 2000). The rise in popularity of Hatha Yoga (Yoga Journal, 2001) is perhaps not surprising given that it can be practised at a basic level without adherence to any particular religious or spiritual belief-system. Although the ultimate goal of Hatha Yoga may be the attainment of enlightenment, it also recognizes a number of sub-goals such as physical and mental wellbeing and social harmony (Feuerstein, 1993). These claimed flow-on effects seem to underlie many of the reasons why people take up yoga in the West (Corliss, 2001).

The rise of Hatha Yoga in Australian culture coincides with a period in which the notion of health promotion is being given a great deal of attention by the media, the medical profession and the government. It is reflected in the government’s active support of health promotion campaigns the costs of which, according to a National Health Strategy Report, are already far outweighed by the savings achieved in the prevention of untimely deaths and disability (National Health Strategy, 1993). Children are considered a priority group for health promotion campaigns because of the belief that attitudes and behaviours established in childhood lay the foundations for later adulthood (Commonwealth Department of Health and Family Services, 1998). The State, Territory and Federal ministers of education declare that by the end of their schooling career, students should “have the knowledge, skills and attitudes necessary to establish and maintain a healthy lifestyle” (Commonwealth Department of Education Training and Youth Affairs, 2001, p3). Furthermore, there is enough evidence to suggest that children already experience significant levels of stress at an early age (Zaichkowsky & Zaichkowsky, 1984; Youngs, 1985). Some 14% of children in Australia suffer from mental health problems (Sawyer et al., 2000). This rate is consistent across age groups (4-17) and has been rising over recent decades (Sawyer et al., 2000).
Part of the health promotion approach has involved informing the public about the benefits particularly of physical activity and, to a lesser degree, physical relaxation on physical, social and emotional wellbeing. Researchers and educators expound that inadequate physical activity is a risk factor for a number of diseases including cardiovascular disease, diabetes, certain kinds of cancer, and mental disorders (Australian Institute of Health and Welfare, 1998). There is also some evidence to suggest that inactive children tend to grow into inactive adults (Australian Institute of Health and Welfare, 1998). In the light of an increasingly sedentary lifestyle brought on by rapid technological change, educators argue that even small amounts of moderate physical activity can produce significant physical and mental health benefits (Commonwealth Department of Health and Aged Care, 1999; Wankel & Berger, 1991; Bouchard, Shephard, & Stephens, 1994; Plante & Rodin, 1990). Similarly, relaxation programs such as progressive relaxation and biofeedback are reported to lead to improvements on certain psychological and physiological dimensions, and are currently recommended by many GPs as part of stress management strategies (Hassed, 2000).

Despite this increased public attention on the influence of physical lifestyle choices on physical, mental and social health, the empirical basis upon which these claims are made is still in its development stages. For instance, while psychological wellbeing and physical exercise are clearly associated (International Society of Sport Psychology, 1992), relatively few studies have established a causal link empirically (Morgan, 1997). This is because researchers have tended to examine pre-existing groups of exercisers or made use of inadequate controls (Morgan, 1997). Furthermore, the majority of research has focussed on aerobic or strenuous exercise at the expense of non-aerobic and moderate exercise (Byrne & Byrne, 1993). Although consensus statements from the National Institute for Mental Health in the US declare that exercise produces beneficial emotional effects in children, the evidence to support such statements is actually quite thin (Biddle, 1993). Research which has been conducted into the influence of physical activity on children has focussed predominantly on self-esteem (Gruber, 1986) without recourse to other associated effects such as mood and physical self-worth. In terms of relaxation research, there is empirical evidence to
suggest that relaxation techniques of various kinds can contribute to both mental and physiological wellbeing, but debate remains as to whether relaxation should be considered a general concept or whether different kinds of relaxation exist which are amenable to different kinds of relaxation techniques (Lehrer, Carr, Sargunaraj, & Woolfolk, 1993). In addition, the majority of child relaxation studies have been undertaken in the context of secondary prevention, that is, using relaxation to manage particular physical and/or mental symptoms, with relatively little research conducted so far into relaxation as a primary prevention strategy.

Finally, new forms of physical practice such as Hatha Yoga as discussed above are emerging within mainstream culture (Corliss, 2001; Johnson, 2002), and research has yet to reflect these changing activity patterns (H.R. Nagendra, personal communication August 24, 2002). While a small number of studies have begun to focus on Hatha Yoga specifically, this has taken place mainly in the context of disease management and a great deal less is known about its role in the maintenance or enhancement of positive mental and physical health. As will be discussed in the forthcoming chapters, Hatha Yoga as it is practised in the West can be said to represent both a physical exercise and a relaxation technique, and in the absence of comprehensive information as to its effects, the physical exercise and relaxation literature may provide some indication. However, it is possible that Hatha Yoga, as a particular combination of these two practices, produces its own unique outcomes which are yet to be understood. It is the purpose of this thesis then to highlight the dearth of research into the impact of Hatha Yoga on physical and mental health, and to explore its effects on an under-studied population, namely children, using a randomised controlled experiment.

1.2 Overview of the Thesis

Chapter 2 of this thesis defines and discusses the concept of positive health as an overarching concept within which the main variables of this investigation are presented. In terms of physical wellbeing, it is argued that the development of the capacity to relax is a component of positive health. As such, two physiological indices of relaxation are discussed in detail: heart rate and respiration rate. In terms of psychological wellbeing,
the concepts of mood and global self-esteem are defined and discussed. Then, the concept of physical self-worth is presented, which is the mediating variable by which physical exercise theorists have suggested that participation in general physical activity might alter global self-esteem. It is said to be made up of four components: perceived strength adequacy, stamina, sports competence and body attractiveness.

Chapter 3 presents the background literature to the topic. The lack of research in the field of yoga has necessitated the expansion of the scope of inquiry into two related health fields, namely physical exercise and relaxation. Thus, Chapter 3 begins with a more specific definition of yoga as it is practised in the West and explains its relationship to these two other practices. The wellbeing variables as defined in chapter 2 are then reviewed in terms of the literature in these three fields: general physical exercise, relaxation and yoga. The lack of research into yoga, and children’s yoga in particular, is highlighted. More specifically, it will be argued that greater evidence for “normal” children’s capacity to learn relaxation has been found in relaxation training studies than in yoga studies. While no studies have been found relating the impact of yoga on children’s mood, adult yoga studies suggest that mood change can result from participation in yoga. Although these adult studies are quasi-experimental, they appear to be supported by similar findings in the general physical exercise and relaxation literatures. No research appears to have been conducted on yoga and children’s self-esteem, and adult studies and relaxation studies have produced mixed results. Nonetheless, reviews of general physical exercise studies have shown that physical activity in general can improve children’s overall self-esteem. Finally, some studies in yoga and relaxation research concerning the effects of such programs on individuals’ physical self-acceptance will be presented. Other kinds of physical self-perceptions such as perceived physical competence have received little if any attention. Thus, it will be argued that there is a need to examine a broader range of physical self-perceptions, such as those proposed by physical exercise theorists.

The main themes emerging from the literature review are summarized in Chapter 4. This chapter then presents the rationale and main aim of the study, that is, to identify any physiological and psychological changes which might occur in a group of
children participating in a brief yoga program. For the purposes of the experiment, the construction of a three-week yoga program and an equivalent placebo-control recreation program, is described. Children were randomly allocated to one of these two groups. This constituted the main study of the project. Because of ethical considerations (i.e. delivering a yoga program to all those who signed up to try yoga), the participants of the recreation group were then offered the same yoga program for a further three weeks. Outcome measurements were repeated with this group, and this constituted the replication study of the project. The research methodology, the materials and procedures used to measure the variables of heart rate change, breath rate, self-esteem, physical self-worth and mood are outlined.

Chapter 5 presents the results of the study. While no significant changes were found in heart rate change, breath rate, self-esteem or the physical self-worth variables, anxious mood did decline significantly in the yoga group immediately after each session (from session 2 onwards). The results of the replication study on the second yoga group confirmed most of the findings of the main study, except that self-perceived sports competence (one of the physical self-worth variables) improved slightly with this group and mood remained unchanged.

Chapter 6 discusses the results and interprets them in the light of the literature reviewed in Chapter 3. Despite the implications made, the interpretation of results remains speculative because of the small sample size and the generous criteria used to establish statistical significance. This issue and several other measurement and methodological concerns are discussed in further detail. Finally, Chapter 6 draws conclusions from the program as a whole and offers recommendations for future research in this area.
Chapter 2
Physical and Psychological Wellbeing

2.1 Overview of Chapter
The purpose of this chapter is to define positive health generally and then specifically in terms of physical and psychological wellbeing. The intention is not to form a complete comprehensive theoretical framework of health but rather to outline a range of indices of positive health and highlight some of the more widely used ones. Section 2.2 defines positive health as a level of optimum functioning in multiple domains of functioning such as the physical, mental and social domains. Section 2.3 provides a broad definition of physical wellbeing and Section 2.3.1 outlines certain physiological indices which can be used in the measurement of positive physical health. In Section 2.4, some of the major components of psychological wellbeing are introduced, and the definition and measurement of mood, self-esteem and physical self-worth are discussed in greater detail. Section 2.5 summarizes the points raised in this chapter.

2.2 Definition of Positive Health
It is clear that health cannot be conceptualised in terms of the physical body alone, but must also include the mental and social spheres of functioning. In accordance with this view, the World Health Organization (WHO) has defined health as “a state of complete physical, mental and social wellbeing and not merely the absence of disease” (World Health Organization, 1946). It is important to note that this definition structures health as a continuum. In other words, one is not simply healthy or sick. There are many degrees of health between morbidity and optimal functioning in life. This is also reflected in the definition of health determined by recent international proceedings on physical activity, fitness and health: positive health is “associated with a capacity to enjoy life and withstand its challenges”, whereas negative health can be defined as “any departure, subjective or objective, from a state of physical or psychological wellbeing short of death” (Bouchard et al., 1994).
Beyond the fact that positive health is more than the mere absence of disease, the concept of “wellness” has not been precisely defined (Bowling, 1997). Nonetheless, Cowen (1994) has noted that, beyond the absence of disease, wellbeing implies the presence of positive markers of physical, social and psychological functioning. These include but are not limited to: the maintenance of social support networks, nutrition, hormone and immune function, life satisfaction, resilience to stress, psychological wellbeing and levels of physical fitness (Bowling, 1997; Cowen, 1994; Setterlind, 1983). In the next two sections, a small number of such indicators are defined and discussed in greater detail.

2.3 Definition and Measurement of Physical Wellbeing

The assessment of physical health has been dominated by a focus on the presence or absence of disease (Bernard & Krupat, 1994); however, it is clear that when it comes to the measurement of positive health, that is, moving beyond a neutral state to an optimum state of functioning, the notion of disease is no longer relevant. Indicators of positive physical health therefore tend to centre on physiological and biochemical processes such as physical fitness or fluctuating levels of immunity and stress hormone levels (Seeman, 1989). Physical fitness for example has been used as an indicator of positive health because of its association with reduced heart disease risk, hypertension and diabetes, and because it enables individuals to comfortably carry out physical tasks and recreation activities (Bouchard et al., 1994).

Another important factor which has recently been identified as contributing to optimum functioning is the ability to relax when needed (Gilbert & Orlick, 1996; Hassed, 2000). This has been found to be particularly significant in situations which require high-level performance and have the potential to induce stress (Gilbert & Orlick, 1996). Researchers in the relaxation and stress reduction fields have found that physical relaxation can contribute to the reduction of blood pressure, heart rate and levels of stress hormones such as cortisol and adrenalin, in lowered levels of cholesterol, and in increased immune function (Hassed, 2000). Relaxation of the skeletal musculature reduces activity in neuromuscular circuits including the brain itself
(McGuigan, 1993). Therefore, the ability to relax voluntarily suggests that a person is able to develop some level of control over his or her own levels of autonomic arousal.

Relaxation can be examined in several different ways. For example, one can focus on general base levels of relaxation, or on rates of return to a state of relaxation following exposure to a stressor (Dunn & Blair, 1997; Bera, Gore, & Oak, 1998). Alternatively, as has been conceived in some of the positive health literature, one can view relaxation as a skill which can be practiced and developed for use at any time (Gilbert & Orlick, 1996; Setterlind, 1983). The state of relaxation is associated with reduced sympathetic arousal and increased parasympathetic activity (Rice, 1987). These processes can be observed via multiple physiological indicators, some of which are discussed in greater detail in the following section.

2.3.1 Physiological Indices

The state of relaxation can be identified via multiple physiological parameters. For instance, it is associated with a decrease in oxygen consumption, respiratory rate and heart rate (Patel, 1993). Other indicators include but are not limited to: increased electrical skin resistance, reduced sweat gland activity, reduced muscle tension, blood pressure, and changes in brain activity patterns (Lehrer & Woolfolk, 1993a).

Cardiovascular variables are important and widely-used indicators of relaxation in stress research (Krantz & Falconer, 1995). Investigators have noted that heart rate is usually low in restful situations and during sleep, and increases during wakefulness and moderate activity, reaching highest levels during periods of stress or intense activity (Krantz & Falconer, 1995). Physical fitness researchers tend to focus on changes in base heart rates, whereas stress investigators are often more interested in heart rate recovery following exposure to a physical or psychosocial stressor (Krantz & Falconer, 1995). Positive health researchers have used all of these as well as the notion of heart rate change over a set time as an indicator of voluntary relaxation and control over autonomic responses (Gilbert & Orlick, 1996).

The simplest way to measure heart rate is by manually feeling for pulse at the wrist or neck. More accurate methods include electrocardiography, which uses a set of
electrodes at the body’s surface to record cardiac electrical activity on a computer screen.

Regular abdominal breathing is a pattern which is associated with reduced sympathetic arousal and a calm emotional state, and which also underlies many stress-management techniques (Lehrer & Woolfolk, 1993). Berger and Owen (1988) point out that rapid shallow thoracic breathing is a common stress symptom and that slow deep abdominal breathing is thought to help regulate the autonomic nervous system. Abdominal breathing has been found to be related to reductions in blood pressure and anxiety (Patel, 1993). This view is supported by traditional yoga texts, where breath is considered to be the regulator of the autonomic nervous system, and quality of respiration is said to be a barometer of physical and psychological well-being (Harvey, 1983). According to yoga theory, healthy respiration is: slow, deep, nasal, abdominal, quiet, even and regular (Morse, Cohen, Furst, & Martin, 1984). By contrast, unhealthy respiration is said to be rapid, oral, noisy, uneven, and predominantly in the chest (Morse et al., 1984). Fried (1993) has argued that irregular shallow breathing is responsible for hypoxia, a condition characterized by a lack of oxygen in the brain. This seems to be associated with failure of neurotransmitter mechanisms (Fried, 1993). For a more detailed discussion of the relationship between breathing and emotions, see Patel (1993) or Fried (1993).

Techniques for respiration measurement range in complexity. Many studies in this area have simply measured breath rate over a set period of time by placing a piece of cardboard on participants’ abdomens and counting the rise and fall of the cardboard (Zaichkowsky & Zaichkowsky, 1984; Zaichkowsky, Zaichkowsky, & Yeager, 1986; Jacobson, 1978). Others have utilised more sophisticated equipment such as a volumetric pressure transducer, which allows researchers to gauge the regularity of breath as well (Telles, Narendran, Raghuraj, Nagarathna, & Nagendra, 1997).

2.4 Definition and Measurement of Psychological Wellbeing

Psychological wellbeing is a broad term which encompasses but is not limited to the notions of happiness, morale, life satisfaction, social support, depression and elation (Bowling, 1997). Research into psychological wellbeing typically includes some study
of emotion, where wellbeing is said to denote a preponderance of positive over negative
emotion (Diener, 1984). This is not limited to a person’s disposition to feel a particular
emotion. It could also refer to a person’s actual experience of a particular emotion
(Diener, 1984). Emotion is a term which is said to cover at least two categories of
feeling: affect and mood. Considerable debate exists as to the distinctions between these
two kinds of emotion (Morris, 1989). For the purposes of this thesis, mood is
considered to be more pervasive and less specific than affect; in other words, whereas
affect tends to be directed towards a particular object, mood does not (Morris, 1989).
Mood is an important aspect of mental health which has been found to significantly
impact upon memory, coping ability and other health-related behaviour (Morris, 1989;

Self-esteem has also been regarded as a major component of the construct of
well-being, closely connected to subjective well-being and happiness (Diener, 1984;
Fox, 2000) and associated with adaptability and resilience to stress (Wylie, 1989). High
self-esteem is associated with choice, persistence and success in a range of health-
related behaviours and is one of the most widely used indicators of psychological health
(Fox, 2000). The following sections define mood and self-esteem in greater detail, as
well as physical self-worth, a highly significant aspect of self-esteem.

2.4.1 Mood

Much debate still exists over what is and is not included in the concept of mood
(Stone, 1995). However, researchers tend to agree that mood consists of behavioural,
physiological and cognitive processes (Hull, 1991). The behavioural component of
mood includes facial expressions and motor reactions (Hull, 1991). The physiological
component is typically understood in terms of the level of activation of the autonomic
and endocrine systems (Hull, 1991). The cognitive element includes subjective feeling
states and an individual’s awareness of them, in other words, those phenomena which
are accessible upon interior reflection and can be assessed via self-report (Hull, 1991).

The issue as to whether or not mood is composed of numerous discrete states
(e.g. Izard, 1977), or is better referred to in terms of gliding positions along some
fundamental dimensions (e.g. Watson, Clark, & Tellegen, 1988) is still fiercely debated.
(Stone, 1995). However, the majority of studies on the psychological outcomes of exercise and relaxation have focused on two well-recognized feeling states: anxiety and depression. Anxiety has been defined as a general foreboding about some impending disaster, which may be real, potential, or imaginary (Wankel & Berger, 1991). It is characterized by feelings of uneasiness, nervousness or apprehension and is often accompanied by physiological symptoms such as sweating and shallow breathing (Reber, 1985). Depression is a state characterized by generalized feelings of pessimism, despondency, sadness, inadequacy, irritability or hopelessness (Reber, 1985; Wankel & Berger, 1991).

Regarding the measurement of mood, numerous published scales exist which can be classified in terms of whether they focus on: momentary mood or long-term mood (over several days or weeks), clinical extremes or day-to-day fluctuations in mood, and quick administration or obtaining greater detail. These considerations also apply to the measurement of mood in children. Most of the standard published children’s scales measure long-term mood rather than momentary mood states. For instance, The Children’s Depression Inventory (Kovacs, 1980-1981), What I Think and Feel (Reynolds & Richmond, 1997) and the Spence Children’s Anxiety Scale (Spence, 1998) measure long-term mood. The Spielberger State-Trait Anxiety Inventory (Spielberger, 1970) measures both momentary (“state”) and long-term (“trait”) anxious mood. Adjective checklist-type scales are easily adapted and are most often used to measure momentary mood. One such scale is the Youth Depression Adjective Checklist (Carey, Lubin, & Brewer, 1992), based on the well-publicized Depression Adjective Checklist by Lubin (1981). It is suitable for older children and adolescents but the vocabulary is too complex for younger children (under 10 years; R. Galligan, personal communication, August 8, 2001). The Positive and Negative Affect Scale for Children (PANAS-C) (Laurent et al., 1999) uses an adjective checklist format and is short with language appropriate for a younger age-group, but rather than measuring anxious and depressed mood (two discrete states), it measures positive and negative affect (two dimensions). These concepts are linked to, but differ from and are not easily translated into, the more commonly discussed constructs of anxious and depressed mood. Scales
such as the Cognitive Triad Inventory for Children (Kaslow, Stark, Printz, Livingston, & Tsa, 1992) and the Children’s Depression Inventory (Kovacs, 1980-1981; Kaslow et al., 1992) are particularly focused on the clinical end of the mood spectrum. These are useful when dealing with clinical participants, but must be used with caution because the nature of some of the questions pose a greater risk of upsetting respondents. Other considerations when selecting or evaluating measures include the cost and the length of the scales themselves. The Spence Children’s Anxiety Scale (Spence, 1998), the Spielberger State-Trait Anxiety Inventory (1970), and What I Think and Feel (Reynolds & Richmond, 1997) are widely-used scales which are also expensive and lengthy. Stone (1995) has suggested the use of visual analogue scales (VAS) for simple adjective or broad mood descriptions (e.g. happy versus sad). In a VAS, two adjectives are separated by a horizontal line and the respondent is asked to mark a point along that line to indicate his or her current mood. This method is useful where cost-effectiveness and quick administration are considered more essential than obtaining detail or diagnosing clinical levels of depressed and anxious mood.

2.4.2 Global Self-Esteem

Early theories of self-esteem proposed that it was a unitary concept made up of overlapping pieces of information (Byrne, 1996). That is, one could ask questions about different aspects of a person’s life, add them up, and these would produce a single score indicative of that person’s overall self-esteem (Byrne, 1996). However, much of today’s self-esteem theory is based on research which indicates that self-esteem is multidimensional and possibly even hierarchical in structure (Marsh, Richards, Johnson, Roche, & Tremayne, 1994; Harter, 1990; Fox & Corbin, 1989). This means that while judgements about the self as a global entity are still useful, evaluations of the self in relation to specific domains such as academic, physical and social arenas may each be correlated to differing degrees with a person’s global self-worth and perhaps only weakly correlated with each other (Harter, 1990). For this reason, Harter (1985) and Marsh (1994) in particular advocate the use of a self-concept profile, which generates separate scores for the domain of global self-worth and various sub-domains such as academic self, social self and physical self.
It seems that not only is self-concept multidimensional, this multidimensionality increases in complexity and differentiation with age (Harter, 1990). In her extensive research with a range of age-groups, Harter (1990) found that four- to seven-year olds can articulate judgements about their own cognitive competence, physical competence, social acceptance and behavioural conduct. However, at this age, they do not seem to discriminate clearly between these constructs. By middle childhood (8-12 years) however, children not only make reliable judgements but also differentiate a number of domains such as scholastic competence, athletic competence, peer social acceptance, behavioural conduct and physical appearance, as well as being able to verbalise a global sense of their own self-worth (Harter, 1985).

2.4.3 Physical Self-Worth

Of all the domains which make up the self-concept, the sphere of the physical self is said to be particularly significant because the body, through its appearance, attributes and abilities, acts as the interface between the individual and the world (Fox, 2000). Studies indicate that physical self-perceptions are moderately strongly correlated with global self-esteem throughout the life-span (Fox, 2000). Physical self-concept has been found to be especially prominent during childhood, as interpersonal and psychological self-concepts do not develop until later in adolescence (Byrne, 1996).

Theorists have argued that physical self-perceptions can be divided along two dimensions: competence and self-acceptance (Sonstroem & Morgan, 1989; Harter, 1983). Competence relates to the idea of mastery over one’s self and one’s environment, and this is said to be derived from perceptions of self-efficacy in a range of contexts, in this case, mastery over one’s own body (Sonstroem, Harlow, & Josephs, 1994). Self-acceptance, on the other hand, is defined by Wylie as “respecting oneself, including one’s admitted faults” (Sonstroem & Morgan, 1989) and has been discussed by Sonstroem et al. (1994) as being allied to the deeper, more instinctual process of self-love. In applying these concepts to physical self-perceptions, what shall be referred to here as physical acceptance, that is, the degree to which one likes or feels satisfied with the appearance of one’s body, is referred to by Franzoi and Shields (1986) and

Physical acceptance is clearly a very important component of self-esteem (Fox & Corbin, 1989). Studies consistently demonstrate its strong correlation with overall self-regard across the lifespan (Secord & Jourard, 1953; Harter, 1990; Sonstroem et al., 1994). Harter has found satisfaction with physical appearance to be the most important contributor to self-worth for both elementary and middle-school children (Harter, 1990). So important, in fact, does Harter believe this aspect to be, that she has even considered raising its status to one of equal centrality to global self-worth (Harter, 1990). That is, physical acceptance would represent the outer-self whereas self-esteem would represent the inner self. She hypothesises a reciprocal relationship of influence between these two domains (Harter, 1990).

Not a great deal is known at this stage about the antecedents of physical acceptance (Sonstroem & Morgan, 1989). The factors contributing to physical competence, are better understood. According to the Exercise and Self-Esteem Model (EXSEM), recently proposed by Sonstroem and Morgan (1989), the dimension of physical competence consists of a global domain, physical self-worth, which expresses overall perception of physical competence, and four sub-domains. These are self-perceptions of: physical strength adequacy (e.g. how confident a person feels about doing activities which require muscular strength), physical condition or stamina (e.g. how much a person feels they can do vigorous exercise without fatiguing), sports competence (e.g. how competent a person feels trying different kinds of sports) and body attractiveness or appearance (e.g. how much a person likes the way they look). According to Sonstroem and Morgan (1989), these sub-domains can be influenced by a person’s degree of physical self-efficacy in relation to specific physical activities. The concept of physical self-efficacy is derived from Bandura (1977)’s work and is defined as the level and strength of a belief that one can successfully perform a particular activity.

The association between physical acceptance and physical competence remains unclear. The researchers acknowledge that increased physical competence is likely to
somehow improve physical acceptance, and exercise in a supportive environment which promotes healthy attitudes, is also likely to benefit physical acceptance (Sonstroem & Morgan, 1989). This has been found in some studies (Salusso-Deonier & Schwarzkopf, 1991; Tucker & Maxwell, 1992). On the other hand, researchers have consistently found that the physical competence sub-domain of body attractiveness is not only the highest correlating component of physical self-worth (Sonstroem, Speliotis, & Fava, 1992; Sonstroem et al., 1994; Fox & Corbin, 1989), it is also the only sub-domain which is significantly directly associated with global self-esteem (Sonstroem et al., 1994). This has led researchers to muse that body attractiveness may be better conceived of as belonging to the acceptance dimension of self-esteem, that is, as physical acceptance, rather than in the mastery dimension of physical competence. A look at the nature of questionnaire items which have been used to assess body attractiveness and body acceptance clearly reveals their conceptual similarities. For instance: “Some kids are pleased with how their bodies look physically” (From a physical competence scale by Whitehead, 1995) and “I’m pretty happy with the way I look” (From a body esteem scale by Mendelson & White, 1982).

Regarding the measurement of physical self-perceptions, scales can broadly be classified as measuring physical acceptance or physical competency. Most of the physical acceptance scales originate from the eating disorder literature, and incorporate other concepts such as body image (e.g. the Body Satisfaction Scale in Hartley, 1995, and the Body Image Scale in Manley, Tonkin and Hammond, 1988). One of the most well-known physical acceptance scales is the Body Esteem Scale by Franzoi and Shields (1986). It has been developed for adults, and asks men and women to rate their satisfaction with gender-specific lists of body parts and sexual and physical functions. Clance, Mitchell and Engelman (1980) reported adapting this test for a study with children but did not give details as to what changes were made. Mendelson and White (1982) also developed a Body Esteem Scale specifically for children; however, no reliability or validity estimates were provided other than face validity.

Recent scales for the assessment of physical self-competence have been developed in a much more psychometrically rigorous manner (Byrne, 1996). The best
known of these is the Physical Self-Perception Profile of Fox and Corbin (1989). These authors used factor analyses to develop a series of questions reflecting the multiple physical competence sub-domains mentioned above. Marsh and Redmayne (1994) also used extensive factor analyses to develop their own multi-dimensional scale of physical self-perceptions which includes six physical self-concept domains and five physical fitness domains. The main purpose of these scales has been to determine the relationships between physical self-perceptions, degree of participation in physical activity, and global self-esteem. Several studies have indicated moderate correlations among these variables (Fox & Corbin, 1989; Biddle et al., 1993; Marsh & Redmayne, 1994).

Thus it is clear that physical self-worth is a very important component of overall self-esteem. It is said to consist of two elements: physical acceptance and physical competence. Based on extensive primary data collection, researchers have conceptualised physical competence as containing multiple sub-domains of perceived physical strength adequacy, stamina, sports competence and body attractiveness. However, there is some evidence to suggest that body attractiveness overlaps with the concept of physical acceptance. Nonetheless, this framework has generated a greater understanding of the links between self-esteem, physical self-worth and physical activity.

2.5 Summary

Chapter 2 defined positive health as a level of optimum, not just neutral functioning, in multiple areas of life including the physical, mental and social domains. Rather than attempting to provide a comprehensive description of all aspects of positive health, Sections 2.3 and 2.4 defined and discussed a small number of indicators of positive health which are widely used in the research field. Section 2.3 focussed on some physiological indices of relaxation, a factor which has been identified as contributing positively in high-level performance situations, and which mitigates the harmful effects of inappropriate stress (Gilbert & Orlick, 1996; Hassed, 2000). Section 2.4 focussed on two major mood states, anxiety and depression, and on self–esteem and physical self-worth. Self-esteem was defined as a construct made up of multiple
domains, of which perhaps the most significant one, especially with regards to children, was physical self-worth. Physical self-worth was described as consisting of two major dimensions, physical acceptance and physical competence, although current scales of physical competence were found to contain items which overlapped with the notion of physical acceptance. Finally, it was argued that changes in physical self-worth might provide the link which explains how participation in some form of exercise contributes to positive global self-esteem.
Chapter 3
Literature on the Effects of General Exercise, Relaxation and Yoga on Wellbeing

3.1 Overview of Chapter

This literature review focuses on past research into the effects of yoga under two broad sections: physical health and mental health. Research in this field is limited; however, as discussed in Section 3.2, Hatha Yoga as it is practised in the West incorporates both movement and relaxation. Therefore, in order to develop a more comprehensive picture of the effects of Hatha Yoga on wellbeing, studies in exercise and relaxation have been included to form the background of the literature review. Studies of the effects of general exercise, relaxation and Hatha Yoga on physical health are discussed under Section 3.3. Studies of the effects of general exercise, relaxation and Hatha Yoga on mental health are reviewed under Section 3.4. Methodological issues arising from the past literature are discussed separately in Section 3.5. As summarized in Section 3.6, the literature review will reveal the lack of controlled research into the effects of Hatha Yoga on mental health in particular, and furthermore, will indicate that research to date on children with respect to Hatha Yoga is scarcer still.

3.2 Western Yoga Practices and their Relationship to General Exercise and Relaxation

The most commonly performed practices of Hatha Yoga in the West are physical postures (“asana”), breathing exercises (“pranayama”) and meditation (“dhyana”). Although the term Hatha Yoga also has a more specific meaning, to connote a special set of internal cleansing methods known as “shat karmas” (Saraswati, 1987), these rarely form part of general yoga classes. Asanas are physical postures which stretch and strengthen different parts of the body, massaging and bringing fresh blood to internal organs while rejuvenating the nervous system and lubricating joints, muscles and ligaments (Sivananda Yoga Vedanta Centre, 1996). Each asana is purported to have different effects. Some are stimulating to the nervous and circulatory systems, some develop coordination and concentration, while others have a calming effect on the body. Some postures, such as the corpse pose, are used for elongated
periods of deep relaxation (Sivananda Yoga Vedanta Centre, 1996). Pranayama consists of a variety of techniques for the regulation of the breath, usually by encouraging it to become slower, more regular and more refined (Iyengar, 2001). Yogi (practitioners of yoga) consider pranayama to be important because of the connection between breathing patterns and emotional states, something which Western scientists are now beginning to elucidate (Fried, 1993). In general, slow steady breathing seems to be associated with a calm mental and physiological state (Fried, 1993). This makes it an ideal preparation for the more subtle practice of meditation in yoga, as well as an essential tool often used within Western stress-management programs (Berger & Owen, 1992). Meditation in Hatha Yoga typically involves staying in a steady seated position with a straight spine, and focussing the mind on an object (such as the breath, a sound, an aspect of nature, a picture) for the purposes of bringing it into stillness (Sivananda Yoga Vedanta Centre, 1996). According to yogic theory, this allows deeper levels of awareness to emerge, accompanied by feelings of restfulness and peace, and ultimately ecstasy or bliss (Feuerstein, 1990).

Although classical yoga practitioners might argue that Hatha Yoga can only be viewed as a method of spiritual advancement, Hatha Yoga (henceforth referred to simply as “yoga”), perhaps because of its subordinate goals (discussed in Section 1.1), has been variously described in Western literature as a form of physical exercise as well as a method of relaxation and meditation (Saraswati, 1987; Berger & Owen, 1988; Iyengar, 2001; Benson, 1976). As mentioned, it contains muscular and joint strengthening postures which increase blood pressure and heart rate, as well as methods of relaxation and passive attention which bring a calming effect to the system (Iyengar, 2001; Saraswati, 1987). Yoga seems to fit into this dual category, and as such, will be discussed within the contexts of both physical activity and relaxation in the following chapters. However, it may ultimately be more useful to define yoga as it is typically practised in the West as relaxation in physical activity. This is because practitioners are encouraged to carry out all movements in a slow and relaxed way (Saraswati, 1987), as discussed in greater detail below.
If yoga is to be described as a particular type of physical activity, then, according to yoga authorities, it can be differentiated from many mainstream forms of exercise in a number of ways. One obvious difference is that while most kinds of physical exercise are competitive, yoga is non-competitive, placing greater emphasis on a person’s relationship to themselves than to others (Marshall, 1978; Iyengar, 2001; Iyengar, 2001). In addition, traditional physical exercises often involve quick, forceful, repetitive movements with heavy breathing (Iyengar, 2001; Saraswati, 1987). These exercises help to develop the skeletal and muscular systems but can also result in overwork, tension and fatigue (Iyengar, 2001). Such exercises increase energy levels by boosting nerve function, but can also exhaust endocrine glands and cellular reserves, thus increasing cellular toxins (Iyengar, 2001). Asanas, on the other hand, are executed slowly and in a relaxed way, bringing stability to the body, senses and mind (Iyengar, 2001; Saraswati, 1987). The slowness of the movements allows the practitioner to develop a greater feeling for the muscles and joints as they are being used, reducing the chances of injury (Marshall, 1978). Although many postures are stimulative, they nonetheless do not lead to breathlessness, and are said to result in a sense of rejuvenation rather than fatigue following the practice (Iyengar, 2001). Asanas usually offer a more complete range of movement for the body, especially in terms of their focus on movement of the spine, which is integral to nervous system functioning (Marshall, 1978). It is argued that the qualities of slowness, concentration and relaxation with which the movements are performed allow the asanas to influence not only the skeletal and muscular systems, but also the nervous system, endocrine glands, internal organs, and the mind (Saraswati, 1987; Iyengar, 2001; Sivananda Yoga Vedanta Centre, 1996). This is why yogis consider the practice of yoga to be one of the most complete forms of health practice (Sivananda Yoga Vedanta Centre, 1996; Saraswati, 1987).

The qualities of slowness, concentration and relaxation are what allow asanas to be considered a particular kind of relaxation in physical movement. As well as asana work, typical yoga classes tend to incorporate a wide range of techniques which focus specifically on relaxation, in a lying down or seated posture. A common practice, called
Yoga Nidra, involves instructing the practitioner to consciously relax individual parts of the body one at a time (Patel, 1993). This bears similarities to progressive relaxation (PR), which is a method of alternately tensing and relaxing individual parts of the body for the purposes of developing greater sensitivity and hence control over various parts of the body (McGuigan, 1993); however, unlike PR, Yoga Nidra does not typically include the tensing of individual muscles. If asanas have been performed beforehand then the assumption is that they have already stimulated and directed attention to individual parts of the body (Saraswati, 1987). Other relaxation techniques include using creative visualisation to induce a state of calmness (Sivananda Yoga Vedanta Centre, 1996; Patel, 1993), and focussing on long slow abdominal breathing. While yoga embraces a wide range of relaxation techniques, arguably the underlying feature which links them together is the choice of a single object of focus for the purposes of bringing about a state of relaxed passive attention (Benson, 1976).

A great variety of styles of yoga have evolved over the years, mainly centring around and named after well-known teachers or gurus and the schools which they have established. As a result of this diversity, some controversy actually exists as to whether or not children should be taught yoga. For instance, the American Yoga Association writes on its website that “yoga exercises are not recommended for children under 16 because their bodies’ nervous and glandular systems are still growing and the effect of yoga exercises on these systems may interfere with natural growth” (American Yoga Association, 2002). On the other hand, the Yoga Research and Education Centre, which was established by the well-respected yoga practitioner and academic, Georg Feuerstein, claims that “so long as they are able to pay attention and execute simple exercises, children can benefit greatly from Yoga” (Yoga Research and Education Centre, 2000).

The debate can be resolved by looking more closely at just what kind of yoga one is expecting a child to do. It seems that the argument against giving children formal yoga classes stemmed from the fact that if postures are maintained for extended periods of time (e.g. 2-3 minutes), they start to impact upon the endocrine glands. Manipulating hormone levels while children are still growing is not advised (C. Mangiamele, personal
communication, May 9, 2002); however, as Mangiamele points out, children do not have the attention spans to hold asanas for any great length of time even if they were asked to. Children move around constantly, and are known to experiment with all kinds of body postures in the playground out of a natural sense of curiosity. Yoga classes which are conducted in a flowing and playful way, as they have been taught, for example, at Mangala Yoga Studios in Melbourne for over twenty years, pose no danger to the child, and indeed are said to promote flexibility, relaxation, coordination and concentration (C. Mangiamele, personal communication, May 9, 2002). Similarly, a lot of other major schools around the world encourage the teaching of yoga to children from as young as age 6, including Desikachar (Krishnamacharya Yoga Mandiram, n.d.), Iyengar (Iyengar, 2001) and Vivekananda (G. Raju, personal communication, November 16, 2001). If anything, the one posture that would generally be avoided would be the headstand, because of the pressure this would place on children’s necks, which are still soft (C. Mangiamele, personal communication, May 9, 2001; N. Smith, personal communication, May 9, 2001).

3.3 Effects of General Exercise, Relaxation and Yoga on Physical Wellbeing

3.3.1 General Exercise and Physical Wellbeing

General physical exercise is commonly known to be beneficial for general physical health (Australian Institute of Health and Welfare, 1998). In terms of alleviating disease and disorders, the accumulated evidence indicates that regular physical activity is inversely related to the incidence of coronary heart disease, high blood pressure, diabetes, osteoporosis and colon cancer (Australian Institute of Health and Welfare, 2000; Bouchard et al., 1994; Bouchard et al., 1994). Of further interest is the fact that major adult diseases such as coronary heart disease and hypertension have antecedents in childhood (Bar-Or, 1994). However, any possible relationship between childhood physical activity level and risk of chronic adult disease has yet to be empirically demonstrated (Bar-Or, 1994).

Physical activity may play a role in regulating the physiological mechanisms which underlie disease outcomes (Dunn & Blair, 1997). Cross-sectional studies have found differences between physically active and less active groups, especially in
relation to blood pressure, lipoprotein profiles and mineral bone mass (Bar-Or, 1994). Further evidence suggests that low-intensity exercise is beneficial to the immune system (Bouchard et al., 1994; Kamei, Toriumi, Kimura, & Kimura, 2001). High intensity or long duration exercise, on the other hand, appears to be associated with unfavourable changes in immune function (Bouchard et al., 1994). Child populations have received much less research attention, although a recent study by Eliakim et al. (1997) suggests that exercise-induced changes in children’s immune systems (10-12 year-olds) parallel those in adults.

Cardiorespiratory variables have been a central feature of physical exercise outcome studies, perhaps because of the strength of evidence accumulated linking physical inactivity with heart disease (Dunn & Blair, 1997). Most studies in this area have assessed cardiovascular adaptation resulting from aerobic training (Dunn & Blair, 1997). Although some concepts such as slower resting heart rate and faster recovery heart rate after exercise overlap with those used in the yoga literature, these result primarily from the long-term strengthening and conditioning of the heart, rather than from relaxation of the skeletal musculature, or regulation of the breath as occurs in yoga, and are therefore less relevant for comparative purposes to the sorts of changes experienced in yoga. A better understanding of how yoga practices might affect heart and respiration variables can be derived from an examination of the relaxation literature, which is reviewed in the following section.

3.3.2 Relaxation and Physical Wellbeing

This section firstly seeks to explain more precisely the concept of relaxation as it has been used in this literature review. It then briefly reports findings of the effects of relaxation training techniques on heart and respiration rates in adults. Current knowledge of relaxation methods used in children’s management of physical problems is also summarised; however, the main purpose of this section is to outline the results of research using relaxation training in children in a non-clinical context. It will be shown that the majority of research in this area examines heart and/or respiration rate as an indicator of the ability to relax rather than as an indicator of relaxation state, and
suggests that children can successfully be taught relaxation skills within a limited time frame.

The state of relaxation (sometimes termed “the relaxation response”) has been defined as a state of ‘restful alertness’ or ‘active calmness’ (Benson, 1976; Rice, 1987). That is, deep physical relaxation and mental clarity co-occur. In terms of physiological indices, meditation and relaxation states are associated with reduced oxygen consumption, lower respiratory and heart rates, decreased blood pressure, and increased electrical skin resistance (Carrington, 1993). While meditation and relaxation share many subjective and physiological processes, they also seem to differ in certain ways, showing slightly different effects for instance on muscle metabolism, circulation and EEG coherence (Jevning, Wallace, & Beidebach, 1992). This research provides some support for the hypothesis proposed by Davidson and Schwartz (1976) which states that there may be specific effects for different relaxation procedures superimposed upon a generalised relaxation response (Jevning et al., 1992; Lehrer, Woolfolk, Rooney, McCann, & Carrington, 1983). However, other studies have suggested that the similarities between the two kinds of techniques are greater than the differences (Lehrer et al., 1983). In addition, relaxation training programs often employ a variety of techniques such as progressive relaxation (PR), visualisation, breathing techniques and other meditation forms in combination (Vempati & Telles, 2002). This also applies to relaxation in yoga classes (Patel, 1993). For this reason, the review in this section and Sections 3.4.3 and 3.4.4 discusses literature on both meditation and relaxation in general.

Several adult studies have examined immediate changes in physiological parameters following a single session of relaxation, and have tended to find the conscious employment of relaxation techniques to be slightly more effective than undirected rest. For instance, a session of guided muscular relaxation has been shown to be more effective in reducing heart rate than control supine rest (Sakakibara, Takeuchi, & Hayano, 1994). Furthermore, heart rate recovery following exercise has been shown to be faster with individuals practising guided relaxation compared with control supine or seated rest (Bera et al., 1998). Another recent study found that while heart rate
reductions might be comparable between a group practising yoga-based relaxation and a
group resting in supine position, the guided relaxation yielded significantly greater
decreases in oxygen consumption and breath volume (Vempati & Telles, 2002).

The majority of research into the effects of relaxation on children has focussed
on secondary prevention, that is, using relaxation to help children cope with physical
difficulties such as asthma or headaches (Lohaus, Klein-Hessling, Vogele, & Kuhn-
Hennighausen, 2001). In a review of studies conducted across school and non-school
based settings, Richter (1984) concluded that relaxation training can be at least as
effective as other treatment approaches in addressing a wide range of physiological
problems such as migraine headaches, asthma, insomnia, and autistic “excitement
responses”.

Numerous school programs have evolved which teach some form of relaxation
to non-clinical populations, but controlled research in the field remains limited (Lohaus
et al., 2001; Richter, 1984). Studies conducted to date have used a mixture of relaxation
techniques, and have often included heart rate and/or breath rate as outcome measures.
In these cases, heart and breath rates have been used, not as indicators of immediate
relaxation, but as evidence of the development of the capacity to relax voluntarily. For
example, Richardson, Beall and Jessup (1982) conducted an 11-session stress
management program with high school students. The sessions included stress theory,
and lessons in PR, yoga, meditation, imagery and biofeedback. The authors found that,
by the end of the program, students had significantly lower heart rates when given the
command to relax as much as possible over one minute, compared to at the start of the
program. In the same vein, Zaichkowsky and Zaichkowsky (1984) conducted a six-
week relaxation program on fourth-grade children. This involved abdominal breathing
and progressive muscle relaxation as well as visual imagery exercises. The authors
measured heart rate and respiration rate while children were resting quietly on their
backs once at the start and once again at the conclusion of the program. Both heart and
breath rates were found to have decreased significantly over the course of the program
compared to a control group. They subsequently extended and replicated the program
study, using more training sessions, incorporating biofeedback training, and including
children from grades 1 to 4 (Zaichkowsky, Zaichkowsky, & Yeager, 1986). Once again, both heart rate and respiration rate were lower for the relaxation group, indicating that children could gain a certain amount of control over physiological responses. This supported findings of a large-scale Swedish study of seventh grade pupils which showed that students who had received relaxation training displayed a more rapid return to normal respiration rate than a control group following cycling exercise (Setterlind, 1983). Similarly, Gilbert and Orlick (1996) found that following a 9-week “life skills intervention program”, a program which included a combination of physical and cognitive relaxation skills, children were more able to relax at will, as measured by heart rate, than a group of controls.

An investigation by Lohaus, Klein-Hessling, Vogele and Kuhn-Hennighausen (2001) confirmed children’s ability to relax according to certain physiological parameters, but displayed contradictory results regarding progressive muscle relaxation and heart rate. The aim of the study was to compare the effects of progressive muscle relaxation (PR), imagery-based relaxation and a control condition (neutral story reading) on children’s heart rate, skin temperature and skin conductance level. A physiological pattern of relaxation was most clearly associated with the imagery-based relaxation condition. This demonstrates the power of children’s imaginations to influence physiological states. Interestingly, progressive muscle relaxation (PR), the condition perhaps thought most likely to bring about physiological changes (as per Davidson and Schwartz’ specificity model, 1976), did not show any pattern of relaxation during or after training, and was found to actually increase heart rate. This may have been due to the fact that measures were taken over a very short time interval and thus affected by the tensing of muscles which occurs alternately with relaxation in typical PR (Lohaus et al., 2001). On the other hand, the authors note evidence to suggest that substantial training might be required before reaping the benefits of PR (Lohaus et al., 2001).

In sum, relaxation programs tend to incorporate a wide variety of techniques which can include a combination of both meditation and relaxation styles. Research with adults suggests that relaxation states can be evidenced in terms of immediate
changes in heart and respiration parameters. Limited controlled research exists exploring the effectiveness of relaxation programs with children who are not suffering from any particular physical or mental ailments. The literature produced so far in this area has examined the development of the ability to relax, rather than on relaxation or recovery states. The evidence seems to indicate that children can develop significant control over their heart and breathing rates in as little as six weeks. Further research is needed to replicate and extend these findings, for example by determining the minimum length of time required to teach such skills, and understanding which if any kinds of relaxation techniques might be most effective for this age-group.

3.3.3 Yoga and Physical Wellbeing

This section briefly summarizes knowledge regarding yoga and general physical and physiological health, and then focuses on the evidence produced to date for the effect of yoga practices on children’s heart and breath rates. It must be noted that several of the relaxation techniques described in the review of the relaxation literature (see Section 3.3.2) are derived from yogic practices and therefore apply to this section but will not be repeated here.

In terms of general physical health, the accumulated evidence suggests that yoga practices are effective in the management of symptoms of a wide range of diseases and disorders such as diabetes (Jain, Uppal, Bhatnagar, & Talukdar, 1993), asthma (Nagarathna & Nagendra, 1985), hypertension (Patel, 1993), carpel tunnel syndrome (Garfinkel et al., 1998) and epilepsy (Yoga Site Inc., 2001). Current knowledge regarding the physiological effects of yoga in adults has also been summarised: stabilisation of the autonomic nervous system, improvement of the thermoregulatory system, improved respiratory function, improvement in endocrine system function, and alpha wave activation (Kimura, Ohno, Kumano, & Kimura, 2000).

In terms of heart rate, two adult studies suggest that adults are more relaxed immediately following yoga sessions and can also learn self-relaxation by the end of a yoga program. A study by Cusumano and Robinson (1992) indicated that both yoga and progressive relaxation participants’ heart rates were lower immediately after yoga sessions compared to before. Most recently, Telles and Vani (2002) explored voluntary
heart rate reduction in a group of yoga novices following a one-month yoga program. They found that, using biofeedback apparatus over a six-minute period, participants were able to reduce their heart rates “at will” to a significantly greater degree than matched controls.

Only a small number of studies have examined heart and breathing parameters in children. One study randomly allocated 4th and 5th grade students to a 10-week program of running, yoga, or physical education class, and failed to find significant differences among groups or across time on pulse (Smith, 1984). It is possible that the program design of one hour per week was not frequent enough to produce sustained effects. An Indian study of community home girls (12-16 years) used a matched pairs design and randomly allocated one of each pair to a daily program of yoga or games (Telles, Narendran, Raghuraj, Nagarathna, & Nagendra, 1997). The community home girls were found to be initially higher than average children of the same age on measures of physiological arousal. At the end of six months, heart rate and breath rate were measured while children were sitting at ease for 15 minutes. Both the yoga and the games group showed a decrease in heart rate relative to initial values, while the yoga group also displayed a significant reduction in breath rate with breathing becoming more regular (Telles et al., 1997). Another study of visually impaired children (11-17 years) indicated that participants in a three-week yoga program exhibited significant decreases in breathing rate but not heart rate compared to gardening controls (Telles & Srinivas, 1998). Children in this sample were also found to have significantly higher initial breath and heart rates compared to age-matched controls.

In sum, yoga has been demonstrated to aid the management of symptoms of various physical diseases, and has also been found to improve physiological function in adults. The majority of child studies have included teenagers in their sample, and there is reason to believe that they would be experiencing different environmental pressures and have more developed learning skills than younger children. The only study using children under 10 years of age failed to find any change on pulse after 10 weeks of yoga. Two of the studies used children who already had high levels of physiological arousal compared to “normal” controls. These children would be more likely to show
improvements than children with average initial scores. From this small number of reports, it is clear that not enough research has yet been conducted to draw any general conclusions about the effects of yoga on children’s physiological parameters.

3.4 Effects of General Exercise, Relaxation and Yoga on Psychological Wellbeing

3.4.1 General Exercise and Mood

General physical exercise is well-known for its association with positive indices of mental health (Commonwealth Department of Health and Family Services, 1998; Berger, Friedmann, & Eaton, 1988; Lehrer & Woolfolk, 1993b), and has been advocated as a means of enhancing and sustaining emotional well-being in people of all ages (Raglin, 1997; International Society of Sport Psychology, 1992). In the search to understand what kinds of physical exercise might be most likely to enhance mood, Berger and Owen (1992) recently proposed a so-called taxonomy of critical ingredients which are thought to underlie such exercise forms. According to these authors, physical activities are more likely to produce mental health benefits if they are: (1) pleasing and enjoyable (2) aerobic or facilitate abdominal breathing, (3) non-competitive (4) temporally and spatially certain, and (5) repetitive and rhythmical. In addition, they believe that such exercise should be of moderate intensity, and practised about two or three times a week for 20 –30 minutes.

This taxonomy is useful because it provides a framework within which to place yoga in the general physical exercise literature. Indeed, Berger and Owen (1988) themselves placed yoga within the category of physical exercise, and noted that yoga satisfies each of these criteria, as do jogging and swimming. Unlike tennis or fencing for example, yoga provides predictable activities which are self-paced and at times, rhythmical, allowing the practitioner to “tune out” of the environment and become more introspective (Berger & Owen, 1988). Yoga postures and breathing techniques are said to facilitate abdominal breathing, and the emphasis in classes is not on competing with others but on participating to the extent that feels enjoyable (Desikachar, 1995). Thus Berger and Owen’s taxonomy, while still a work in progress, explicates to some extent the relationship between yoga and other forms of general physical activity and begins to identify elements which might contribute to mental wellbeing. Thus, the following
section examines the mood in relation to some of these aspects of exercise which are held in common with yoga.

Research into the effects of general physical exercise has typically examined two kinds of subjective mood change, namely reductions in depression and anxiety (Morgan, 1997). Two timeframes are generally used for assessing the impact of exercise on mental functioning: acute and chronic exercise (Morgan, 1997). Acute physical activity means exercise lasting anywhere from a few minutes to several hours (Morgan, 1997). Its effects are measured immediately or up to a couple of hours after exercise (here referred to as short-term effects). Chronic physical activity refers to a series of acute episodes repeated several times per week for a number of weeks or months (long-term effects) (Morgan, 1997). Effects are usually measured anytime from the last week of an exercise program to several weeks after its conclusion.

Numerous reviews exist summarizing the benefits of exercise in alleviating both short and long-term depression and anxiety in clinical populations (Raglin, 1997; Martinsen & Morgan, 1997; Fillingim & Blumenthal, 1993); however, studies of exercise participants from “normal” populations have failed to produce conclusive evidence for long-term affect change following chronic exercise (Martinsen & Morgan, 1997; Berger & Owen, 1992; Berger et al., 1988). Improvement in the transient states of anxious and depressed mood has been more convincing (Weinberg, Jackson, & Kolodny, 1988). According to Morgan (1987), anxiety reduction is the main benefit to be derived from acute exercise for non-clinical populations and this effect is known to last up to two hours for normotensive subjects (Raglin & Morgan, 1987). While the evidence for short-term reductions in depressed mood is less solid (Martinsen & Morgan, 1997), some researchers have found that exercise can reduce not only immediate feelings of depression but also tension and anger (Berger & Owen, 1992a; Berger & Owen, 1988), and increase feelings of vigour (Fillingim & Blumenthal, 1993). The fact that changes in non-clinical populations have generally been found after acute bouts of exercise without necessarily building over longer periods of time highlights the importance of regular exercise in order for non-clinical populations to enjoy sustained benefits.
There is some evidence to suggest that moderate exercise can be at least as beneficial as vigorous exercise when it comes to mood (Steptoe, Kearsley, & Walters, 1993). This is significant because yoga represents a moderate form of exercise. One study found that moderate exercisers experienced immediate reductions of tension/anxiety and confusion where vigorous exercisers did not (Moses, Steptoe, Mathews, & Edwards, 1989). It was suggested that moderate exercise may have been more enjoyable, allowing participants to achieve their goals without experiencing distress from over-exertion (Moses et al., 1989). However, a later study found that both vigorous and moderate exercise could result in improved mood, although the greater initial ratings on tension/anxiety in the vigorous exercise group make interpretation more difficult (Steptoe et al., 1993). In evaluating psychological outcomes after a one-year intervention, Stewart, King and Haskell (1993) concluded that intensity and format of exercise are not determinants of the extent of psychological improvement. Therefore, it is reasonable to expect that yoga, as a form of moderate exercise, could also result in mood changes.

Most studies which have reported mood improvement following exercise have used aerobic treatments (Byrne & Byrne, 1993). This might lead to the assumption that mood changes result from physiological changes in aerobic fitness, but further evidence suggests that physical activity need not be aerobic in order to achieve mood gains (Byrne & Byrne, 1993; Berger & Owen, 1992). For example, weightlifting (anaerobic) has been found to be just as effective as running (aerobic) in alleviating depression (Doyne, Osip-Klein, Bowman, McDougall-Wilson, & Neimeyer, 1987). Yoga (anaerobic) improved short-term mood to the same extent as swimming (aerobic) in a sample of college students (Berger & Owen, 1992). In the development of their exercise taxonomy, Berger and Owen (1992) suggest that the key common ingredient in yoga and swimming may be the facilitation of regular abdominal breathing, a pattern which is associated with reduced sympathetic arousal and a calm emotional state, and which also underlies many stress-management techniques (Lehrer & Woolfolk, 1993).

Biddle (1993) has noted that even though major health associations have developed position statements about the mood benefits that physical exercise can bring...
to children, research evidence for this is actually very sparse. The opinions expressed are largely based on the large number of adult studies in the field such as those reviewed above (Biddle, 1993; Williamson, Dewey, & Steinberg, 2001). One of the few studies to have examined immediate mood change in a non-clinical child sample was that by Williamson, Dewey and Steinberg (2001). In that study, nine and ten year old children took part in a 15-minute exercise session and a 15-minute video-watching session. Using a simple self-report adjective scale developed specifically for the study, the researchers found significant increases in a factor called positive mood and significant decreases in another factor called negative mood after the exercise session, in contrast to significant decreases in positive mood and increases in negative mood following the video session.

To summarize, it is well established that various forms of physical exercise can improve anxious and depressed states in non-clinical populations of all ages. The focus of research lately has been in determining what kinds of exercise might be more or less effective in producing these results. Recent studies suggest that moderate and non-aerobic exercise can be at least as beneficial as high intensity aerobic exercise in contributing to mood change. Most of the research published so far has been correlational or quasi-experimental in nature, rendering causality impossible to establish.

3.4.2 General Exercise, Self-Esteem and Physical Self-Worth

Self-esteem has been regarded as a component of the construct of well-being, closely connected to subjective well-being and happiness (Diener, 1984) and associated with adaptability and resilience to stress (Wylie, 1989). It is now well documented that exercise is linked to positive self-esteem not only in adults, but also in adolescents and older children (Calfas & Taylor, 1994). It has been argued that self-esteem is the psychological variable with the most potential for benefit from participation in physical activity (McAuley, 1994). The most comprehensive review to date of the effects of exercise on younger children was conducted by Gruber (1986) who analysed 27 studies, where children participated in a range of physical activities including gymnastics, sports, dance and aerobic activity. Self-esteem was increased in 61% of studies and the
average effect size was .47, although he noted that few randomised studies have been conducted in this area. The greatest effects on self-esteem in children have been found with fitness and aerobic activities (Gruber, 1986). Nevertheless, strength training is also now considered to be an important element of youth fitness conditioning programs (Faigenbaum & Zaichkowsky, 1997) and anecdotal reports from pre-pubescent children and their parents suggests that it may lead to improved self-esteem (Faigenbaum & Zaichkowsky, 1997). This is significant because the asanas used in yoga also involve a degree of strength training. However, a recent study by Faigenbaum and Zaichowsky (1997) failed to establish this statistically, perhaps due to ceiling effects on self-esteem measures.

In a recent review of research into the effects of exercise on self-esteem in the general population, Fox (2000) noted that half of the studies reported no change in self-esteem. While it is clear that self-esteem improvement can be achieved in some populations some of the time (especially in younger people and those with physical disabilities or low initial self-esteem), the exercise-self-esteem link is not direct (Fox, 2000). What seems more likely, as discussed in Section 2.4.3, is that successful exercise participation affects physical self-constructs such as physical self-efficacy and physical self-worth, which may then in turn lead to changes in the more stable and global construct of self-esteem. This is borne out by the finding that specific self-perceptions such as physical self-perceptions change more easily than global self-perceptions (Fox, 2000).

The physical self-worth sub-domains of perceived physical strength adequacy, stamina, sports competence and body attractiveness discussed in Section 2.4.3 have been found to discriminate between active and non-active males and females (1989) and two recent studies have shown that participation in exercise programs can lead to improvements in these variables. A study of female college students participating in a 13 week program of aerobic dance showed that while global self-esteem did not change, small significant improvements were found in the physical self-worth variables of perceived stamina and body attractiveness by the end of the program (Riggs, 1997). In addition, exercisers with low initial self-esteem also improved on scores of self-
perceived strength adequacy. Another study by Crist (1995) examined changes in body esteem, which, as discussed in Section 2.4.3, is closely allied to perceived body attractiveness. In that study, 229 sixth-grade children were allocated to either vigorous aerobic exercise or free play four days a week over a period of 12 weeks. He found that not only did the exercisers improve on global self-concept where the play group did not, the exercisers’ improvement in body esteem was significantly greater than that of the free play group. It must be noted however, that both of these studies examined changes in physical self-perceptions using a form of aerobic exercise, and this is less comparable to yoga studies than a moderate exercise program. More research is needed to determine whether moderate exercise might also lead to the same results.

Thus, it has been argued that self-esteem is the psychological variable with the most potential for benefit from participation in physical activity. The trend in children’s studies suggests that physical exercise leads to substantial positive effects in this domain; however, the majority of research conducted so far has been with aerobic exercise. Some anecdotal evidence exists for the impact of strength training, an element which forms part of yoga asana work, on children’s self-esteem (Faigenbaum & Zaichkowsky, 1997). Research has indicated an association between physical self-perceptions and level of participation in physical activity. A small number of studies have reported changes in physical self-perception variables resulting from exercise programs. More research is needed to understand what if any benefits may be derived from non-aerobic activities both in terms of overall self-esteem and physical self-worth.

### 3.4.3 Relaxation and Mood

This section begins by introducing the debate arising from the relaxation literature about the extent to which physical and mental relaxation techniques correspond to physical and mental experiences of anxiety reduction. It then reviews the literature on relaxation training effects on mood in the general population and in children specifically. Firstly, limited but fairly consistent evidence of immediate and long-term mood change in adults is presented. Secondly, it is argued that compared to research conducted with clinical populations, research with non-clinical samples, particularly children, is scant. Thirdly, while non-clinical adult studies have examined
both long-term and momentary mood change, non-clinical child studies have tended to report immediate mood improvements.

Relaxation is associated with feelings of wellbeing and calm alertness. Benson (1976) proposed that all relaxation techniques produce the same general effect, characterised by parasympathetic dominance and a calm state of mind, although others have argued that subjective experiences of anxiety (e.g. worrying) require cognitive treatments and physiological aspects (e.g. increased heart rate and sweating) require somatic treatments (Davidson and Schwartz, 1976). Some authors have argued that relaxation is a somatic technique whereas meditation is a cognitive technique; however, others consider both relaxation and meditation to contain cognitive elements because a mental focus is involved in both (Lehrer & Woolfolk, 1993b). Because of this, and also the physiological similarities between meditation and relaxation (discussed in Section 3.3.2), relaxation and meditation studies have been reviewed together for the purposes of this study.

An extensive review of experimental studies by Delmonte (1985) into the effects of meditation on self-reported anxiety levels tentatively concluded that meditation practice is associated with anxiety reduction. Evidence for this has been found not only in clinical but also in non-clinical populations. Within the non-clinical population literature, a small amount of evidence has accumulated for both momentary and longer-term mood change in adults. Regarding immediate mood change, Berger, Friedmann and Eaton (1988) found that a group trained in Benson’s relaxation response technique showed significant improvements after each session in a variety of mood states. Similarly, Jin found that Tai Chi participants (both beginners and practitioners) reported less tension, depression, anger, fatigue, confusion and state anxiety after one hour of Tai Chi (Jin, 1989).

Other studies with adults have found long-lasting effects on mood as a result of relaxation and meditation. Smith, Compton and West (1995) added a simple meditation component to a 6-week happiness enhancement program, and found that the meditation group improved on scores of both state and trait anxiety, depression and happiness. These improvements were over and above the changes experienced by the happiness-
enhancement-only group. Despite the small sample size (N=36), the study produced evidence for long-term mood change. Further evidence of long-term reductions in anxiety were reported by Anderson, Levinson, Barker and Kiewra (1999), who used a pre-post-program control group design to examine the effects of a 5-week meditation training program on teacher stress and anxiety. Even though around 40% of participants only practised 2-5 times per week, significant differences were found for both state and trait anxiety, as well as for perception of stress. Winzelberg and Luskin (1999) conducted a four-week meditation program for teachers using a randomly allocated waiting list control study. There was no evidence of long-term reductions in anxiety but this may have been due to the inappropriate use of the anxiety measurement instrument.

As far as children are concerned, the majority of studies have focussed on the use of relaxation as a method of managing socio-emotional problems such as aggressive behaviour or test anxiety, or coping with long-term illnesses (Richter, 1984). Where anxiety has been a target variable, reductions in long-term anxiety have been the main focus. For instance, Chang and Hiebert (1989)’s review found that relaxation training procedures including meditation, autogenic training and quieting response training produced consistent positive effects on general anxiety and hyperactivity in public school students. On the other hand, King, Ollendick, Murphy and Molloy (1998) argued that school-based relaxation training programs for children with anxiety problems have yielded only modest improvements. They recommended either the generation of more modest treatment goals, or the development of more comprehensive treatment packages to address children’s symptoms.

Few systematic investigations into the effects of relaxation on non-clinical samples have been conducted with this age-group (Zaichkowsky et al., 1986; Lohaus et al., 2001). This is surprising given the apparent logic of equipping people with effective relaxation techniques from an early age. Unlike the adult studies, it seems that all the studies conducted so far with non-clinical child populations have found immediate mood changes rather than long-term changes resulting from relaxation techniques. For instance, in Sweden, a large project was undertaken examining both the physiological effects and the subjective experiences of 6 weeks’ relaxation training among almost 600
12-17 year-olds (Setterlind, 1983). Immediate mood changes and increased ability to relax were evident in the experimental group, particularly for older students and those with high anxiety levels. Students also felt they could continue to use the relaxation methods on their own. This is an important component of any program designed to teach people real life skills.

Evidence of immediate anxiety reduction was also found by Zaichkowsky and Zaichkowsky (1984), who conducted a six-week relaxation program for fourth-graders. The material included abdominal breathing exercises, progressive muscular relaxation exercises, and mental imagery techniques. Using a simple pre-post program design with a control group, Zaichkowsky and Zaichkowsky (1984) measured heart rate, skin temperatures, respiration rate, and state and trait anxieties. They found positive changes in the relaxation group compared to the control group on all indices except trait anxiety, and noted that change in trait anxiety was not to be expected given the brevity of the course. They subsequently extended and replicated the program study, using more training sessions, incorporating biofeedback training, and including children from grades 1 to 4 (Zaichkowsky et al., 1986). State anxiety was measured pre-post program and no differences were reported on this variable. The authors argue that perhaps the measure of state anxiety was not sensitive enough to pick up on changes flowing from the intervention.

Further evidence of immediate mood improvement was reported by Lohaus, Klein-Hessling, Vogele and Kuhn-Hennighausen (2001). Mood in this study consisted of perceived calmness, wellness and attentiveness. In their study, they compared the effects of imagery-based relaxation training, progressive muscle relaxation training, and neutral story reading on the psychophysiological responses of 64 children aged 9-13 years. Sessions were conducted individually for half an hour once a week for 5 weeks. The researchers focussed on a very short time frame, comparing measures of heart rate, skin conductance, skin temperature and subjective mood. Baseline measures were taken during the 5 minutes prior to the training, then continued during the 8 minutes of the treatment, and then at follow-up for a further 5 minutes. Significant improvements in subjective mood were found for both relaxation conditions.
As can be seen from this review, the literature provides some evidence for improvement in anxiety as a result of using relaxation and meditation methods. Less information exists regarding effects on other mood types such as depression. In non-clinical adult populations, researchers have found both momentary and longer-term mood improvement. Few studies have examined the use of these techniques with non-clinical child populations. Those that have done so present tentative evidence for immediate rather than long-term anxiety reduction.

3.4.4 Relaxation, Self-Esteem and Physical Self-Worth

This section focuses on studies of self-esteem improvement resulting from relaxation training. The small amount of research conducted to date has produced mixed results, though some evidence suggests that self-esteem change is more likely for participants with low initial self-esteem. Given the strong connection between global self-esteem and physical self-perceptions, and the fact that the body is the subject of relaxation training, a case is made for the inclusion of physical self-perception measurement in studies which involve relaxation training. In contrast to this, the dearth of actual studies in this area will be highlighted.

Given the significance of self-esteem as a major indicator of mental wellbeing, it is surprising that so few relaxation studies have examined self-esteem outcomes. Furthermore, little if any research has been conducted into the effect of relaxation on physical self-perceptions. Benson, Kornhaber, Kornhaber and LeChanu (1994) have provided a theoretical basis for arguing that practising a relaxation method can lead to self-esteem improvement. The relaxation response is associated with positive feelings of calmness and control, and a reduction in negative psychological symptoms (Benson, 1976). These changes are said to be linked to higher levels of self-esteem and internal locus of control (Benson et al., 1994). However, both adult and child studies have reported mixed results, and the strongest conclusion that can be drawn from the literature so far is that people with originally lower self-esteem scores are likely to demonstrate greater improvement than those with already high self-esteem.

Benson et al. (1994)’s study introduced a randomised crossover experimental design into a health curriculum subject for high school children. Students participated in
the health education subject and relaxation training. This lasted an entire semester, and during exposure to relaxation treatment, scores on the Piers-Harris Children’s Self Concept Scale improved, whereas no such trend was found after participation in the health curriculum. The use of the health curriculum subject as an attention control effectively discounted the proposition that self-concept change occurred merely as a result of receiving special attention. When participants were asked why the relaxation response had elicited such changes in them, they referred to greater feelings of self-control and empowerment, leading to positive changes in self-concept (Benson et al., 1994). In support of this contention, Benson et al. (1994) found a significant movement towards greater internal locus of control for one of their relaxation groups.

Further support for the positive association between relaxation and self-concept was reported in an adult study by Alfermann & Stoll (2000). These authors used a relaxation group as an attention control group for a 6-month exercise study, yet found that relaxation also considerably improved measures of self-concept and wellbeing. On the other hand, Ryan, Krall and Hodges (1976) allocated 72 test-anxious students to systematic desensitisation, progressive relaxation, and no-treatment control groups. Sessions were 45 minutes long, held twice a week for three weeks. At the end of this time they found that while both the desensitisation and the relaxation group reported reduction in test anxiety, only the desensitisation group improved in self-concept scores. The authors argued that this might occur because imagining overcoming stressful situations results in a greater sense of accomplishment than relaxing in a quiet room.

Younger children’s studies have failed to show self-esteem improvement after relaxation training. Campo (1993) set up a six-week program of relaxation for sixth graders, and failed to find significant differences in self-esteem, anxiety and depression compared to a control group, although adjusted means were in the predicted direction. It is possible that the schedule of five minutes of relaxation per day was not substantial enough to effect noticeable changes, just as five extra minutes of walking per day might not be sufficient to make an observable impact upon wellbeing. Similarly, a study of the effects of 18 lessons of relaxation training on children in elementary school did not reveal any significant changes in self-concept for the experimental group (Zaichkowsky
et al., 1986). It was argued that the length of time of the program might have been too short to induce changes in self-concept.

Some evidence suggests that relaxation training is more likely to induce self-esteem improvement in children who are already dealing with other kinds of mental or emotional difficulties. For instance, Loffredo, Omizo and Hammett (2001) employed a randomised controlled design to investigate the effects of a three-week group relaxation program on the self-concepts of hyperactive boys aged 5-7 years. The intervention consisted of yogic-type exercises including deep breathing practice. Pre-post program comparisons revealed significant positive improvements in the treatment group in social-self and intellectual-self domains. These refer to the children’s self-perception in helper-helpee relationships, and the perception of their tendency to succeed or fail in task-oriented pursuits respectively. No change was found in the personal-self domain – a measure of participants’ perceptions of their emotional state. The authors argued that the personal-self domain may be more stable and thus less likely to change under such a brief program. Reynolds and Coates (1987) compared the effects of cognitive-behavioural treatment and relaxation training to a waiting list control group of moderately depressed high school students. Training consisted of ten 50-minute sessions over five weeks. The researchers found that, compared to the waiting list control condition, both cognitive and relaxation methods significantly reduced scores on all measures of depression and anxiety as well as improving academic self-concept with no significant differences between cognitive and relaxation groups. On the other hand, Thompson (1981) conducted a study of 64 moderately anxious fourth-grade children, who were randomly assigned to a progressive relaxation training condition, a mental relaxation training condition, a contact control (reading adventure stories) and a no-treatment control. The program involved daily 20-minute sessions of the assigned treatment for two weeks. No significant differences were found as a function of treatment on the Piers-Harris Children’s Self-Concept Scale.

As discussed in Section 2.4.2, there is a close connection between global self-esteem and physical self-perceptions. Furthermore, the techniques of relaxation involve the distribution of a non-analytic form of attention to all the parts of the body (Jin,
1989), and the development of a practitioner’s sense of competency in bringing his or her own body and mind into a calmer state (McGuigan, 1993). Therefore, it is surprising to find a lack of research into the relationship between relaxation techniques and physical self-acceptance and physical self-worth. The only study that appears to have taken this concept into account was one by Cusumano and Robinson (1992). These authors measured physical self-efficacy and self-esteem change in university students following three sessions of progressive relaxation. Here the argument used was that mastery of the technique would result in higher physical self-efficacy and self-esteem. Surprisingly, they found that self-esteem improved but physical self-efficacy ratings dropped. It is possible that students may not have felt they mastered the technique after just three sessions, or that the treatment drew more attention to their physical selves, which might have lead to a decrease in confidence (Cusumano & Robinson, 1992).

The small number of reports on the effect of relaxation on self-esteem has produced mixed results. Furthermore, the impact upon physical self-perceptions has barely been investigated. Given that self-esteem and physical self-concept change might be expected theoretically, further study in this area is warranted. The literature produced so far raises questions about the kinds of relaxation training that might be most appropriate and the duration and intensity of sessions needed. The research also shows that children with lower initial self-esteem might be more likely to display improvement; however, even children with average initial self-esteem have increased their scores after participation in physical exercise programs (Fox, 2000). Therefore, ceiling effects are unlikely to account for the paucity of confirmatory research findings in this area.

### 3.4.5 Yoga and Mood

Western research into the effects of yoga on the body and mind soared in the 1960s with scores of articles reporting extraordinary feats of yogis who could hold their breath for several minutes, slow down their heart beats, and reduce respiration rates to something in the order of four to six breaths per minute (Greenberg, 1990). It has only been in the past two decades that general and specific benefits for the average person have begun to be explored. While the physiological effects of yoga are now well-
documented (see Section 3.3.3), less is known about the psychological outcomes of yoga practice. This section highlights the range of mood states which have been tested in relation to yoga practices. In addition, it shows that greater evidence has been found for immediate mood change than for long-term mood change in non-clinical populations. The qualification to this statement is that studies of immediate mood change have relied heavily on pre-formed groups, and no published work appears to have investigated these parameters in children.

Research with clinical samples has revealed that effects of yoga on depression and anxiety may depend on the kind of practice given. The National Institute of Mental Health and Neurosciences (NIMHANS) of India found that the Sudarshan Kriya Yoga, a particular form of yogic breathing practice resulted in significant improvements on standard clinical depression measures for a group of 15 dysthymic and 9 melancholic depression patients after one month (Art of Living International Research Committee, 1999). On the other hand, during a five-week treatment consisting of yoga and PR for depressed adolescent mothers, Field and Grizzle (1997) only found a decline in self-reported state anxiety after the first session, with no concurrent changes in observer ratings. The authors concluded that the self-reported anxiety change might have represented a placebo effect and perhaps there was too much “hard work” involved in the yoga, as reported anecdotally by some participants (Field & Grizzle, 1997). This would make sense in terms of depressed populations who sometimes find it very difficult to generate the energy to move around.

In terms of non-clinical populations, long-term mood has been reported as unchanging except following a program which lasted over a year. Berger and Owen (1988) measured a range of mood states on three separate occasions for swimmers, body conditioners, fencers and yoga practitioners. They failed to find mood improvement over the course of a semester for any of their groups; however it must be noted that they used “right now” measures of mood. While long-term mood can arguably be regarded as merely a series of short-term moods, more accurate information might have been gleaned using long-term mood measures. A study by the Defence Institute of Physiology and Allied Sciences in India (Ray et al., 2001) suggests that
long-term effects might not become evident until after almost a year of frequent and regular practice. In that study, 54 engineering students were randomly assigned to a yoga group and a control group. Both groups continued their regular physical activity regimen and attended similar classes during the year. While the control group did not engage in any supplementary activities, the yoga group attended hour-long yoga classes 3 times per week over 5 months. Both groups were tested on physiological and psychological parameters at the start (Phase 1), and then at 5 months (Phase 2), after which both groups took part in yoga classes for a further 5 months (Phase 3). Because Indian scales were used in the study, it is difficult to ascertain the exact nature of the mood parameters they were measuring. However, the results indicated that anxiety in males declined significantly when comparing Phase 1 with Phases 2 and 3 in the yoga group, and Phase 2 with Phase 3 in the control group. Meanwhile, both male and female depression scores were reduced in the yoga group by the time they reached Phase 3, but no significant change in depression was observed in the control group, even when it transferred to yoga activities. Thus, while there was some evidence of long-term depression reduction, more consistent evidence was found for anxiety reduction in this study.

Baldwin (1999) found both immediate and long-term mood change in volunteers who took part in a yoga program as short as 8 weeks in duration. This project took place in a YMCA centre where participants either included the yoga classes into their regular exercise program (n=6) or formed the waiting list control group, continuing their regular exercise activities at the centre (n=7). Despite the small sample, Baldwin found that yoga participants’ total mood scores on the POMS improved over eight weeks as compared to the control group, and found that pre-post session scores (using the Incredibly Short version of POMS) reflected more positive affect change than those taking part in cardiovascular or resistance training exercise.

The majority of evidence for mood change resulting from yoga practice originates from short-term studies, that is, those which evaluate the outcomes of individual yoga sessions. Such studies have reported differences in a range of mood states. Schell, Allolio and Schonecke (1994) found that after a two-hour period the yoga
group indicated lower levels of irritability and higher spirits than the control group (reading in a comfortable position). Few conclusions can be drawn as to the effectiveness of the yoga session itself in terms of mood however, because this was measured only post-session, and participants were allocated to groups according to level of experience in yoga. Harvey (1983) also examined mood change in 20 participants before and after their third class in either yoga breathing techniques, philosophy of meditation, or abnormal psychology lectures (pre-formed). Using the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1992), Harvey found that the yoga group had significantly increased vigour-activity and decreased total mood disturbance scores relative to the philosophy of meditation class, and greater reductions in fatigue and depression scores compared to the lecture class.

Berger and Owen (1992) examined pre- and post-session mood change in swimmers and yoga students on three separate occasions during semester and found that both groups reported significant immediate mood benefits as measured by the POMS. This consisted of reduced anger, confusion, tension and depression. In a separate study, these authors also compared pre- and post-session swimming, fencing, body conditioning and yoga on several occasions (Berger & Owen, 1988). They found yoga participants to be consistently less tense, depressed, angry, fatigued and confused after class than before on all three testing occasions. Swimmers had unusually positive initial moods and reported less confusion and tension after the first day of swimming only. Body conditioning students reported only more fatigue after class, while fencers reported only increase in vigour. In addition, only the yoga students reported significant reductions in anxiety as measured by the STAI-S.

These studies present positive findings in relation to the impact of yoga on immediate mood. However, there is no clear pattern from the findings so far of particular types of mood being more strongly affected than others. Depression, anger and tension and so on all seem to feature in the results. Whether or not this is an indication of yoga’s influence on overall mood, or of a lack of specificity in research design so far, remains to be determined. Furthermore, no material has been found to
date reporting mood changes in children as a result of taking part in yoga. Further research is needed to address this gap in the literature.

3.4.6 Yoga, Self-Esteem and Physical Self-Worth

Regarding the literature on Hatha Yoga and self-esteem, the dominant theme that emerges is the lack of appropriate control groups in the majority of studies (Cusumano & Robinson, 1992; Sahajpal & Ralte, 2000; Williams, 1992b; Rudolph, 1981; Engelman, Clance, & Imes, 1982). No study to the researcher’s knowledge has yet been conducted concerning the effects of yoga on global self-esteem in children. Only three studies, including one with children, have examined the impact of yoga on some form of physical self-perception and these have yielded conflicting results. These issues are addressed below.

The majority of findings published so far have been weakened by a lack of appropriate control groups. Williams (1992) for instance used self-selected groups of volunteer students to examine change in self-esteem following training in yoga, martial arts, or no exercise. No significant changes on the Rosenberg Self-Esteem Scale were reported for any of the groups before and after 11 weeks. Initially, it had been hoped to sample only people who did not participate in other regular physical activity. However, the small numbers satisfying this criteria necessitated the use of participants who were already regular exercisers, possibly clouding results (Williams, 1992). Rudolph (1981) also used self-selected groups in a comparison of self-concepts in female volunteers before and after 12 weeks of Hatha Yoga, interpersonal relationship development classes, and algebra classes, and found a significant change in the yoga group only. Students felt that the yoga had helped them to become more self-aware, to feel better about themselves, and to solve personal and/or physical problems.

Sahajpal and Ralte (2000) used a case study design to study changes in self-concept, sleep patterns and stress level in 12 females who had reported feeling stressed after recently moving to a new city. After one month of daily Induced Yogic Relaxation Training (IYRT), they noted increases in scores on the Tennessee Self Concept Scale. The subsequent conclusion that IYRT had caused this however, cannot be substantiated because while 4 people demonstrated large improvements in self-concept, 3 people
showed changes in the reverse direction, and the rest indicated score increases of no more than 6 out of a possible 500. Furthermore, the lack of control group means that there was no way to account for the natural increase in self-concept likely to occur over time as a person adjusts to their new surroundings.

As discussed in Section 2.4.2, self-concept consists of multiple domains, and as argued in Section 3.4.3, physical self-perceptions are a particularly relevant topic in any study involving physical movement. Despite this, only three studies appear to have investigated these parameters in the context of yoga. Two of these used adult populations, and the third represents the only article found to date which used a child sample. Engelman, Clance and Imes (1982) compared changes in self- and body-cathexis for a yoga group and a therapy group over a ten-week period. Self- and body-cathexis are defined as the extent to which individuals feel satisfied or dissatisfied with themselves, and with various parts or processes of their body respectively (Secord & Jourard, 1953). Both groups changed significantly in terms of self-cathexis compared to controls, but only the yoga group showed significant change in body-cathexis compared to the controls. This is interesting in the sense that the two interventions seem to achieve similar end-results in terms of self-esteem, but via different pathways. In the same vein, Clance, Mitchell and Engelman (1980) selected twelve third-grade children on the basis of poor performance in sports classes, and assigned six of them to body awareness and yoga classes (three sessions per week for four weeks), while the control group remained in regular physical education classes. They found a significant change in the yoga group and not in the control group; however, the results need to be treated with caution due to not only the small number of participants, but also the lack of comparability between control and condition groups. The experimental group was rewarded at each session with a nutritional snack, and it was separated for special attention, whereas the control group had neither of these conditions.

Of the physical self-perception literature, the study by Cusumano & Robinson (1992) is the only one to have employed a randomised group design. They compared changes in self-esteem after three 80-minute classes of Progressive Relaxation versus Hatha Yoga classes. Both conditions were found to effectively increase self-esteem (as
measured by the Rosenberg Self-Esteem Scale) in 95 Japanese undergraduates. Cusumano & Robinson (1992) suggest that this improvement may have been due to the focussing of attention on bodily feelings during stretching and breathing acting as a distraction from stressful thoughts. However, scores on physical self-efficacy, a mastery component thought to contribute to exercise-assisted change in self-esteem, actually decreased over the same period of time. This may have been caused by the students’ focussing more seriously on their physical capabilities, leading to a decline in confidence, possibly accompanied by the feeling that three sessions had not been long enough to master the techniques presented (Cusumano & Robinson, 1992).

Thus, very little controlled research has been undertaken so far into the effects of yoga on self-esteem, and no studies have been found examining global self-esteem change in children. Two adult studies which examined physical self-worth and physical self-efficacy appear to present conflicting explanations as to how yoga influences global self-esteem. The only child study which appears to have investigated the impact of yoga on children’s satisfaction with their bodies reported a positive change, but these results must be viewed tentatively because of certain methodological limitations. Given that, as Fox (2000) has argued, physical self-perceptions change more easily than global self-perceptions, it would seem logical to examine more closely the effect of yoga on physical self-worth alongside global self-esteem.

3.5 Methodological Issues

Although the literature reviewed in this chapter presents a number of findings which demonstrate associations between wellbeing and different kinds of physical activity and relaxation, care must be taken not to overemphasize these benefits. As Alfermann and Stoll (2000) pointed out with regard to physical exercise research, significant results are more likely to be published than non-confirmatory ones, thus increasing the risk of possible overestimation of the positive effects of exercise. Other issues which limit the conclusions that can be drawn from exercise studies are shared by the relaxation and yoga fields and are discussed below.

Morgan (1997) has argued that investigations into the psychological effects of physical activity need to incorporate a control condition for the purposes of comparison.
Ideally, the control condition should involve more than being on a “waiting-list” because of the confounding influence of the Hawthorne effect (Morgan, 1997). The Hawthorne effect refers to cases where groups receiving any kind of intervention improve on psychological parameters simply because they are receiving “special attention” (Morgan, 1997). Thus, in order to gauge more accurately the effectiveness of the physical activity under study, a placebo paradigm is considered more desirable than a waiting list control design (Morgan, 1997). This problem emerges consistently within the exercise research literature, as demonstrated by Alfermann and Stoll (2000). They randomly allocated volunteers to one of four groups: an exercise group (jogging or fitness) or a placebo group (relaxation or back training). They found that the placebo groups improved as much as the experimental groups. This is not surprising given the rise in physical self-efficacy which may occur from mastering the techniques in any of the four conditions. The result raises questions about those studies which have only used waiting list controls to investigate the efficacy of physical activity programs, as so often happens in the current literature. Indeed, the authors report a meta-review conducted by Craft and Landers (1998) into the effects of exercise on depression. Waiting list control group studies had a large mean effect size (0.77) whereas the mean effect size in experiments with a placebo design was close to zero (0.06).

The same issue appears in the relaxation and yoga literature. Some studies, such as those of Sahajpal & Ralte (2000) and Jin (1989), did not use a control group at all. This meant that for instance in Jin (1989)’s study of Tai Chi practitioners, the relieving effect of completing an assessed task which may have induced performance anxiety, could not be discounted. Other studies have used a waiting list control (Zaichkowsky & Zaichkowsky, 1984; Zaichkowsky et al., 1986; Campo, 1993), but, as applies to exercise research, these cannot counteract the Hawthorne effect, that is the possible psychological improvement resulting from being given special attention.

Thus, the ideal design employs an “inert” placebo, in other words, one which quantifies the effects of “special attention” alone (Morgan, 1997). As evidenced from the literature, this is in practice very difficult, partly because individuals’ involvement in studies is voluntary and any activity purposefully engaged in is likely to have its own
psychological influence (Morgan, 1997). This problem of selecting an appropriate alternative activity seems to plague the relaxation and yoga fields as much as it does the physical exercise field. Activities employed as control tasks such as reading in an easy chair (Bahrke & Morgan, 1978), quiet rest (Raglin & Morgan, 1987), and eating lunch (Wilson, Berger, & Bird, 1981) have been found to be stress-reducing, pointing to the capacity of simple distraction, relaxation and gratification to reduce negative affect. Harte, Eifert and Smith (1995) used sport as a comparison and found that positive affect increased and negative affect decreased after one hour of both running and meditation where matched trained practitioners were used. In yoga studies, games (Telles et al., 1997), other sporting exercise (Smith, 1984) gardening (Telles & Srinivas, 1998) and quiet reading (Schell, Allolio, & Schonecke, 1994) have all been used as comparative alternatives.

Even when outcome measures of an alternative activity have been taken, one of the most significant limitations of the studies reviewed to date is the fact that most of them have been quasi-experimental in nature (Alfermann & Stoll 2000; Steptoe et al., 1993). This is apparent not only in the exercise literature but also in the yoga field. The majority of studies on yoga have used pre-formed groups rather than random allocation of participants. The potential influence of this was demonstrated by Schell et al. (1994) who measured personality differences between the yoga group and the reading group and found that they differed significantly on scores of excitability, aggressiveness and emotional lability, showing some significant differences in ways of coping with stress, with yoga practitioners tending to downplay stressful situations, and being less likely to resort to aggressive and self-pitying reactions. Whether this is a reflection of the kinds of people attracted to this form of relaxation, or whether it is a long-term effect of practising yoga cannot be deduced from the study.

The benefits of social interaction resulting from participation in an exercise, relaxation or yoga program is another variable which needs to be addressed. In one of the few relaxation experiments in which subjects were randomly assigned to treatments, Berger, Friedmann and Eata (1988) compared mood change over three months in a group of joggers, a group trained in Benson’s relaxation response technique, a
discussion group, and a lecture group. The discussion and lecture groups served as controls, providing information about the impact of repeated testing and demand characteristics (the cues which communicate to the participant what the experimental hypotheses are), and also about the mood-altering effects of social interaction alone. Jogging, relaxation, and discussion all resulted in improvements in short-term mood as measured by the POMS and this demonstrates the significance of social interaction in moderating the affective component of stress, as has been noted by others (McCann & Holmes, 1984). However, over and above that effect, Berger et al. (1988) noted that jogging and practising the relaxation response lead to significantly greater POMS scores than group discussion, reflecting favourably on the idea that it is more than merely the comfort of social interaction which is responsible for mood change with these techniques.

Thus, it can be seen that conclusions drawn from the literature in the general exercise, relaxation and yoga fields are limited to the extent that research designs have either failed to use a control group, have only made use of waiting list control groups, or, where alternative placebo activities have been included for comparative purposes, have based these on pre-formed groups. Few studies have used random allocation of participants to alternative programs.

### 3.6 Summary

This chapter has presented past research into the effects of yoga under two broad sections: physical health and mental health. In terms of physical health, the discussion focussed on two physiological parameters, heart rate and breath rate. For mental health, the variables of mood, self-esteem and physical self-worth were discussed. Because of the lack of research undertaken thus far into the effects of yoga on a number of these variables, it was necessary to gather further information from two related fields, those of general physical exercise and relaxation. In Section 3.2, the nature of Hatha Yoga as it is practised in the West was described, and its relationship to the exercise and relaxation fields was elaborated upon. It was noted in the discussion of physical exercise and physical wellbeing that in terms of the physiological indices, voluntary heart and breath rate reduction, the general physical exercise literature is less relevant to
yoga than relaxation studies (see Section 3.3.1). From the relaxation literature presented in Section 3.3.2, it was found that while adult studies investigated relaxation states following single sessions, studies with children tended to examine the development of the ability to relax, rather than relaxation or recovery states. Little controlled research was available as to the effectiveness of relaxation programs with children not suffering from any particular physical or mental ailments; nonetheless, the literature seemed to indicate that children could develop significant control over their heart and breathing rates in as little as six weeks. This conclusion is important because it could shed some light on the evidence of Section 3.3.3, which summarized the findings of the effects of yoga on breathing and heart rates. From these studies, it was clear that not enough research had been conducted yet to develop any firm conclusions. The strongest theme to emerge so far was that children with higher initial levels of arousal might be more likely to display changes.

Studies of the effects of general exercise, relaxation and Hatha Yoga on mental health were reviewed under Section 3.4. In Section 3.4.1, the strength of the evidence for general physical exercise to impact upon short-term mood in non-clinical populations was highlighted. Yoga, as a particular kind of exercise which fitted into Berger and Owen (1988)’s taxonomy of mood-enhancing activities, was therefore thought to follow the same pattern; however, most of the research published was correlational or quasi-experimental in nature, rendering causality impossible to establish. The exercise literature also indicated that self-esteem was amenable to change (see Section 3.4.2), with a recent review showing an increase in 61% of children’s studies with an average effect size of .47; however, the applicability of this to yoga research was limited by the fact that the greatest effects on self-esteem found so far in children were with fitness and aerobic activities (Gruber, 1986). Nonetheless, some anecdotal evidence was found for the impact of strength training activities on children’s self-esteem, an element which forms part of yoga asana work (Faigenbaum & Zaichkowsky, 1997). A small number of recent studies also demonstrated the capacity for exercise regimes to improve physical self-perception variables, although once again, these have been limited to investigations of aerobic exercise. Section 3.4.3 summarized
the effects of relaxation on mood. The most consistent evidence for mood improvement was found with anxiety, although there was also some evidence of depression reduction. It was found that the few studies which have examined the use of these techniques with non-clinical child populations presented tentative evidence for immediate rather than long-term anxiety reduction. Mixed results were found for the effects of relaxation on self-esteem (Section 3.4.4). Furthermore, only one study was found which examined the impact of relaxation upon physical self-perceptions (Cusumano & Robinson, 1992). Given that self-esteem and physical self-concept change might be expected theoretically, it was concluded that further study in this area was warranted. The studies outlined in Section 3.4.5 reported positive findings in relation to the impact of yoga on immediate mood; although the lack of randomly controlled studies limited any firm conclusions. No studies were found reporting investigations of mood change in children as a result of taking part in yoga. Further research was recommended to address this gap in the literature. Very little controlled research was found to have been undertaken into the effects of yoga on self-esteem, and no studies were found examining global self-esteem change in children. The argument raised in the relaxation studies for the importance of studying physical self-perceptions was also applied to yoga; yet, once again, only a small number of research papers were found to investigate these parameters. The two adult studies presented yielded conflicting results. The only study which appeared to have assessed the impact of yoga on children’s satisfaction with their bodies reported a positive change, but these results were viewed tentatively because of methodological limitations (see Section 3.4.6). Finally, as discussed in Section 3.5, the difficulty of selecting appropriate placebo activities and the lack of randomly controlled studies were found to be common themes occurring throughout the exercise, relaxation and yoga literatures.
Chapter 4
The Present Study

4.1 Overview of Chapter

This chapter identifies the main elements from the literature review of Chapter 3 in order to formulate a series of hypotheses for the present study. The construction and delivery of the program and the measurements taken are also outlined in this chapter. Specifically, Section 4.2 summarizes the past research and identifies gaps in the present literature. Section 4.3 provides the rationale and general aims of the current study. Section 4.4 explains the design of the study for the purposes of investigating the hypotheses which are presented in Section 4.5. Section 4.6 outlines the methodology of the study. The sample used for this research is described in Section 4.6.1 and the program setting is explained in Section 4.6.2. The research design is outlined in Section 4.6.3, and the materials used for each of the variables measured are presented under Section 4.6.4. Finally, Section 4.6.5 outlines the measurement procedures for the study.

4.2 Summary of the Literature

As argued in Section 1.1, public health promotion has become a financially justifiable and important priority in government policy. The benefits of general physical exercise and relaxation are being promoted by health specialists and educators, but empirical research to support this is still in its developmental stages, and research into newer popular forms of exercise and relaxation such as yoga lags even further behind. Children are considered a priority group for health promotion campaigns because of the belief that attitudes and behaviours established in childhood lay the foundations for later adulthood (Commonwealth Department of Health and Family Services, 1998). Despite this, research with this population is scant compared to the adult literature.

The literature on the effects of yoga on health has located yoga as it is practised in the West within the frameworks of both exercise and relaxation. As outlined by Berger and Owen (1988), yoga asanas constitute a form of exercise which facilitates abdominal breathing, is regular, (arguably) enjoyable and non-competitive. In addition, these asanas are performed with an emphasis on relaxation, and other yogic techniques
such as breathing regulation and Yoga Nidra (relaxing individual parts of the body) provide the grounds for considering yoga as a form of relaxation training. Because of the lack of research available on yoga specifically, it has been useful to draw upon research in general exercise and relaxation for the purposes of deriving the hypotheses for the present study.

Concerning effects on the physiological indicators of heart and breath rate, yoga techniques share more commonalities with relaxation training than with general physical exercise in that the function of yoga is not primarily to increase cardiorespiratory fitness, but rather to enhance cardiorespiratory self-control. To that end, measures such as resting heart rate levels, or heart rate reduction while relaxing during several minutes could be used. The way of assessing heart rate is likely to depend on the research design. Where yoga programs are running at a high frequency over an extended period of time, such as that conducted by Telles et al. (1997), it would be reasonable to measure resting heart rate. However, with programs running for shorter periods of time such as once a week over ten weeks, it would be more logical to borrow from the kinds of methodology employed by Gilbert and Orlick (1996) who measured reduction in heart rate rather than resting heart rate. This measures the participant’s ability to relax at will over a short period of time, and conceptualises relaxation as a skill rather than a state.

While adult studies have indicated that voluntary heart rate reduction can be taught using yogic techniques, (Telles & Vani, 2002; Cusumano & Robinson, 1992), studies with children have been less clear (Telles et al., 1997; Telles & Srinivas, 1998). The relaxation literature, on the other hand, provides more consistent evidence of children learning some degree of autonomic control according to indicators such as heart and breathing rate (Zaichkowsky & Zaichkowsky, 1984; Zaichkowsky et al., 1986; Gilbert & Orlick, 1996; Richardson et al., 1982).

No material has been found so far investigating mood changes in children as a result of taking part in yoga. Adult studies seem to suggest that yoga impacts positively on immediate mood; however each of these used pre-formed groups rather than random allocation of participants. It is also not clear from the literature at this stage whether or
not there is there is a clear pattern of particular types of mood being more strongly
affected than others. Using the physical exercise literature to shed light on this issue,
 improvement in anxious and depressed mood in non-clinical populations is indicated
even for non-aerobic moderate exercise. The limitation to this however is that most of
the research published so far has been correlational or quasi-experimental in nature. The
mood which is most consistently reported to improve according to the scant relaxation
literature available is anxious mood (Delmonte, 1985; Anderson et al., 1999). This also
seems to be the case in children, although further research is needed to clarify the role
of relaxation in other mood changes (Zaichkowsky & Zaichkowsky, 1984;
Zaichkowsky et al., 1986; Lohaus, Klein-Hessling, Vogele, & Kuhn-Hennighausen,
2001).

No research has yet been undertaken into the impact of yoga on children’s self-
estee m. Adult research has yielded mixed results and has been hampered by the lack of
randomisation of treatment groups. Physical activity reviews indicate that overall self-
estee m can improve in children, but parallels with yoga are more difficult to draw here
as most studies investigated aerobic activity. The small number of reports on the effect
of relaxation on self-esteem has produced mixed results, with the clearest trend revealed
so far being that children with lower initial self-esteem might be more likely to display
improvement.

Given that physical self-perceptions are said to change more easily than global
self-perceptions, and children’s self-perceptions are especially body-oriented (Fox,
2000), it is important to examine more carefully the effect of yoga on physical self-
worth alongside global self-esteem. One adult study found a positive change in physical
acceptance following yoga (Engelman, Clance, & Imes, 1982), while another found a
reduction in physical self-efficacy after yoga, contrary to expectations (Cusumano &
Robinson, 1992). Only one methodologically limited study has attempted to examine
the effects of yoga on children’s physical acceptance (Clance et al., 1980). These
researchers reported improvements in children’s physical acceptance scores. From this
small number of investigations, it is clear that little conceptual work has been developed
in terms of physical self-perceptions in yoga and relaxation. By contrast, the physical
exercise literature offers a developed theoretical model regarding the various components of physical self-worth and self-esteem (Sonstroem, Harlow, & Josephs, 1994). As noted in Section 2.4.3, physical self-perceptions are said to be divided into two dimensions: physical self-acceptance and physical competency. According to Sonstroem and Morgan (1989)’s Exercise and Self-Esteem Model (EXSEM), physical self-worth is an aspect of physical competency which is thought to mediate changes in self-esteem resulting from participation in physical exercise. It consists of four subdomains. These are self-perceptions of: physical strength adequacy, physical condition or stamina, sports competence and body attractiveness or appearance. In Section 2.4.3 it was noted that body attractiveness is very similar to the domain of physical self-acceptance, and therefore might be used as an indicator of such (Sonstroem et al., 1994).

4.3 Rationale and Aims of the Present Study

The small knowledge base on the effect of yoga and similar body practices on physiological and psychological indices is limited by the lack of randomised controlled studies and its reliance on adult samples. The aim of the current project then was to investigate the effects of yoga on children using a randomised controlled design. It was decided to run a brief and intensive yoga program for children after school and investigate its effects on physiological and psychological parameters of health. In terms of physiological measures, Zaichkowsky and Zaichkowsky (1984; 1986) used a method and format which examine pre-post program parameters following a short intervention. Following this model, the current study examined heart rate and respiration rates. Unlike the Zaichkowsky and Zaichkowsky (1984; 1986) studies however, heart rate was measured as heart rate change, following the methodology of Gilbert et al. (Gilbert & Orlick, 1996).

The time period considered for the current project meant that long-term mood change was unlikely; however, short-term mood change represented a meaningful variable as yet untested in the field of yoga and children. Therefore, the study aimed to investigate the impact of yoga sessions on short-term mood change. In order to clarify
specific mood effects, anxious and depressed mood were chosen as separate indicators of (poor) psychological health.

Finally, given the absence of research into the effects of yoga on children’s self-esteem, the project aimed to discover whether participation in the yoga classes might contribute to positive changes in global self-esteem as well as the more malleable construct of physical self-worth. Because of the lack of research into physical self-perceptions in the yoga and relaxation literature, the variables of physical self-worth (perceived strength adequacy, stamina, sports competence and body attractiveness) derived from the general physical exercise literature, were applied to the current project. Thus, both general self-esteem and physical self-worth variables were treated as indices of psychological wellbeing.

4.4 Design of the Present Study

The design of the study was based on the coordination of a number of factors. Because of the desire to test program outcomes and not only session outcomes, it was considered important to deliver a program of a certain intensity to bring about sustained effects. Based on the researcher’s own experience of yoga, one session per week was considered too infrequent an intervention for effects to accumulate over a limited period. At the same time, the length of the program was restricted according to the need to keep a placebo-control group running concurrently without experiencing dropouts, and the substantial costs of running yoga and alternative activity classes. A small but more intense program design of two sessions per week over three weeks was chosen to balance these criteria.

To address the question of what kind of activity might constitute an appropriate comparative alternative for physical exercise studies, Morgan (1997) suggested the use of traditional psychotherapy, biofeedback, and hypnotherapy. Yet his discussion was situated within the context of treatments for stress reduction using clinical populations, which were not relevant to the current study. Plante and Rodin (1990) conducted a review of studies on physical exercise and psychological health in non-clinical populations, and suggested that participation in non-exercise hobby activities might result in the same psychological improvements as participation in regular exercise.
Given the lack of research into this issue, Plante and Rodin (1990) recommended that future studies include non-exercise hobby activities, such as reading, music, art and board games, as control groups (Plante & Rodin, 1990).

Following the recommendations of Morgan (1997) and Plante and Rodin (1990), the current study used a placebo-type design, offering an alternative program of recreation for the control group. This activity was also chosen as a practical balance between the need to offer something attractive to children so that they would want to stay involved, and yet which mitigated other specific psychological effects. Based on the sorts of activities children might be presented with in an after-school care program, the recreation group was considered a realistic reflection of the kinds of behaviour that children might normally engage in after school.

For all the best intentions of creating an “inert” placebo activity, it was considered quite likely that children would feel good participating in the recreation activities. Therefore, other psychological effects resulting from participation in the recreation group could not be altogether discounted. Inherent in the nature of recreation is the idea that the doing of it is its own reward (Hull, 1991). There is clear evidence to suggest that play is an intrinsically rewarding activity, and therefore often positively impacts on mood (Hull, 1991; Wankel & Berger, 1991). Hull (1991) reports that participation in leisure activities tends to be associated with positive mood. Similarly, level of reported fun has been observed to be consistently related to positive affect (Wankel & Sefton, 1989). It was expected that the nature of the games and craft activities would provide the conditions for enjoyment and hence for some mood improvement. Therefore, it was decided to include an adjunct measurement of children’s ratings of enjoyment of both the yoga and recreation activities in order to assess the influence of this factor.

In order to satisfy ethical requirements of delivering a yoga program to all those who registered for it, and at the same time to submit the hypotheses to a replication experiment, the yoga program was subsequently repeated with the recreation group. The idea of using a full cross-over design where the first yoga group also received recreation
was rejected on the basis that the original yoga group might still retain some of the skills learnt in the yoga sessions and this would confound results.

Thus, children who volunteered for the yoga program were randomly assigned to either the yoga group or the recreation groups. Both programs involved six sessions, conducted twice weekly over three weeks. Physiological variables and self-esteem and physical self-worth variables were assessed pre- and post-program. Anxious and depressed mood was assessed pre- and post-session. The same measures were repeated for the replication study where the recreation group took part in the same yoga program as the original yoga group.

4.5 Hypotheses

The main aims derived from the research literature were intended to explore any possible effects of yoga on psychological and physiological parameters in children. Changes were not expected to occur in physiological parameters for the placebo group because their play experience does not develop greater sensitivity to internal physical states – a key component in the conscious regulation of the autonomic system and hence in the ability to relax at will. Changes in self-esteem were expected to occur in the yoga group as a result of the mastery of new physical techniques, and this would be reflected in reports of increased perceptions of physical self-worth. Such changes were not expected in the recreation group, because it did not involve learning new physical skills. Despite the possible positive effects of recreation on mood, it was expected that the yoga would have a greater impact on mood. Evidence suggests that personal accomplishment and improving one’s skills are important contributors to mood (Wankel & Berger, 1991) and the control group was not trained in any new physical skills. Secondly, the children would be subjected to the further physiological effects of moderate exercise combined with physical relaxation which previous researchers report have the potential to improve mood (Plante & Rodin, 1990).

Thus, the research aims were developed into three general hypotheses as a means of assessing the yoga and recreation programs which had been devised. They were as follows:
Hypothesis 1: That over the course of the program, global self-esteem and the variables of physical self-worth (perceived strength adequacy, stamina, sports competence and body attractiveness) will improve more for the yoga group than for the recreation group.

Hypothesis 2: That over the course of the program, yoga participants will have learnt to relax more effectively at will than recreation participants (as measured by respiration rate and reduction in heart rate).

Hypothesis 3: That yoga sessions will contribute to significantly greater mood changes (in anxiety and depression) than recreation sessions.

4.6 Methodology

4.6.1 Research Sample
Participants consisted of 22 schoolgirls aged 8-10 years who attended a private school, situated in a South-Eastern suburb of Melbourne. They were recruited through an advertisement offering a free after-school program. Although there was a great deal of interest among the students in the school to take part, the need to attend two sessions within the same week prevented some children from becoming involved. Among those who volunteered, three participants in the yoga group and two participants in the recreation group were only able to attend Wednesday sessions because of tennis classes on Fridays. It was decided that they should be allowed to remain in the project given the already small numbers and their strong desire to take part in the program.

4.6.2 Setting
Both the yoga and the recreation sessions were conducted at the participating school. Yoga classes were held in a large classroom with little furniture in it. The recreation group met in the junior school art room. Because classes began at 4pm on Wednesdays (half an hour after school ends), the school provided free after-school care for the participants until the start of class.

4.6.3 Research Design
The study consisted of a mixed within and between subjects design. Within subjects factors were pre-post program comparisons of global self-esteem, physical self-
worth variables (perceived strength adequacy, stamina, sports competence and body attractiveness), heart rate change and respiration rate, and pre-post session comparisons of anxious and depressed mood. Group (yoga or recreation) was the between subjects factor. Figure 1 displays the design of the whole study.

<table>
<thead>
<tr>
<th>PRE-PROGRAM</th>
<th>PROGRAM (anxious and depressed mood measured pre-post 6 sessions)</th>
<th>POST-PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga group</td>
<td>1 2 3 4 5 6</td>
<td>Global self-esteem</td>
</tr>
<tr>
<td>Physical self-worth</td>
<td></td>
<td>Physical self-worth</td>
</tr>
<tr>
<td>Heart rate change</td>
<td></td>
<td>Heart rate change</td>
</tr>
<tr>
<td>Recreation group</td>
<td></td>
<td>Respiration rate</td>
</tr>
</tbody>
</table>

Figure 1. 2 (Group) x 2 (Pre-post Program) x 6 (Session) Design of the Study.

4.6.4 Materials

4.6.4.1 Heart Rate Change and Respiration Rate

Heart rate change and respiration rate are physiological measures designed to assess the extent to which the children have learnt to relax “at will” over the course of the program. Each child was asked to lie down while the measures were taken. To measure change in heart rate, an optical fingertip monitor was attached to the child’s finger and a baseline reading of heart rate was taken. Then following the protocol used by Gilbert and Orlick (1996) and Richardson, Beall and Jessup (1982), the researcher said “I’d like you to relax as much as possible for a minute or so while I take your heart beat and put this cardboard on your belly”. After one minute, heart rate was recorded again while the child was still attempting to relax. Thus, a heart rate change figure was calculated by subtracting heart rate after one minute from baseline heart rate.
Adopting the procedure used by Zaichkowsky and Zaichkowsky (1984), breathing rate was taken by placing a rectangular piece of card on the abdomen of the participants and counting the number of complete respirations in one minute. This number was used as a breathing rate score. As argued by Zaichkowsky and Zaichkowsky (1984), while this method of measurement may lack the precision of a laboratory instrument, it provides the efficacy required for mass testing.

### 4.6.4.2 Global Self-Esteem

To measure global self-esteem, the global self-worth subscale of Harter’s Self Perception Profile for Children (SPPC) (1985) was used. The SPPC was based on Harter’s view of self-concept as a multi-dimensional construct which contains both a global sense of self and domain-specific self-evaluations. The scale is considered a well-established and psychometrically sound instrument (Byrne, 1996). Its strength lies in the method of item construction which was grounded in interviews and open-ended questionnaires with the target age-group (Fox & Corbin, 1989b).

For this study, only the global self-worth sub-scale was employed, because Harter’s athletics sub-scale is essentially replicated in a physical self-worth scale (discussed in Section 4.6.4.3 below) and the other subscales of scholastic competence, social acceptance and behavioural conduct were less relevant to the yoga program. The global self-worth subscale contains six items, providing a quickly-administered yet highly reliable rating of global self-worth (S. Harter, personal communication, July 20, 2001). Harter (1985) reports internal reliabilities ranging from .78 to .84 for this scale. Marsh and Gouvernet (1989) found strong concurrent validity for an earlier version of this scale and the Self-Description Questionnaire I (Marsh, 1992), as well as strong concurrent and discriminant validity.

It has been noted that the response format of the SPPC has the potential to confuse children (R. Galligan, personal communication, August 9, 2001). Harter designed the questions in a particular way to attempt to redress any tendency towards socially desirable responses. Thus, in the original form, a child needs to first choose the one of two sentences which is more like them (eg. Some kids often forget what they learn vs. other kids can remember things easily), and then indicate whether their choice
represents something which is really true for them or sort of true for them. Following advice from a colleague with considerable experience with the SPPC (R. Galligan, personal communication, August 9, 2001), a simpler response format was used in this study. Half of the questions were positively worded; the other half were negatively worded. Respondents were then given four options from which to choose: a) Very true for me b) Sort of true for me c) Not really true for me d) Definitely not true for me. This scale was labelled What I’m Like, and is attached in Appendix F.

4.6.4.3 Physical Self-Worth

To measure physical self-worth, a slightly adapted version of the Children’s Physical Self-Perception Profile (C-PSPP) by Whitehead (1995) was used. Most scales of physical self-perceptions have been generated by eating disorder specialists, and tend to focus purely on the notion of physical appearance (Ryckman, Robbins, Thornton, & Cantrell, 1982). This scale, on the other hand, is based on physical exercise research, which recognizes the potential of changes in perceived physical competencies to influence overall self-esteem (see for instance Fox, 2000). As such, it measures four aspects of physical self-worth, which explicate part of the link between exercise and self-esteem. These are self-perceptions of: strength adequacy (e.g. how confident a person feels about doing activities which require muscular strength), stamina (e.g. how much a person feels they can do vigorous exercise without fatiguing), sports competence (e.g. how competent a person feels trying different kinds of sports) and body attractiveness (e.g. how much a person likes the way they look). These self-perceptions are measured using four individual subscales. It is noted that the subscales are kept separate and are not summed to a value for overall physical self-worth.

The C-PSPP is based on an adult version, the Physical Self-Perception Profile (PSPP) (Fox & Corbin, 1989b), whose psychometric properties have been well-established (Fox & Corbin, 1989; Sonstroem et al., 1992). A study of over 500 7th and 8th grade students indicated support for the four factor structure in the child version, with reliabilities for each sub-scale ranging from .89 to .92 (Whitehead, 1995). There was also evidence of strong construct and convergent validity as compared with physical education teacher ratings and physical fitness scores (Whitehead, 1995). A
study in Britain with 12-15 year olds did not obtain such a clear factor-structure, but found adequate internal reliability and evidence of external validity (Biddle et al., 1993).

The C-PSPP appears to be the only scale which focusses specifically on perceptions of physical competence in children; however, Whitehead’s (1995) scale has so far only been used with children as young as 12 and the current study employed 8-10 year olds. Practical considerations disallowed a prior examination of the psychometric properties of the scale in relation to a younger age group. However, a small pilot study with five 7-10 year olds resulted in the simplification of some vocabulary for the purposes of comprehensibility. For example, the word “stamina” was replaced with “energy”, and “lack” was replaced with “don’t have much”. The C-PSPP uses the same response format as Harter’s global self-esteem scale. For the same reasons indicated in the discussion of Harter’s scale (Section 4.6.4.2), that this format has the potential to confuse children, response wording was altered in the same way as the global self-esteem scale, using response options of a) Very true for me b) Sort of true for me c) Not really true for me d) Definitely not true for me. The final scale, labelled “Some Kids”, is reproduced in Appendix F.

4.6.4.4 Current Mood

Because this measure would be used frequently over the course of the study, it was considered important to select a scale which was short and easy to administer. As discussed in Section 2.4.1, the majority of mood scales for children are either long, expensive, or focus predominantly on clinical extremes of mood disorders.

In a recent evaluation of a counselling intervention with 7-11 year-olds, Sherr and Sterne (1999) successfully employed a visual analogue scale consisting of a picture of a cartoon character, which could be drawn at various points along a ladder to indicate mood. Because it was short and user-friendly, it made an ideal model on which to base a scale for the current study. Using vocabulary which was generated by a group of five 7-10 year olds from a local primary school, a visual analogue scale was constructed with three items for anxious mood (worried, scared, nervous), and three items for depressed mood (grumpy, terrible, sad). The scale has obvious face validity and allows a
calculation of internal reliability to be made. The scale, labelled “This is Sandy”, is contained in Appendix F.

4.6.4.5 Qualitative Questions

In addition to the quantitative scales, an enjoyment question and some qualitative questions were included in the post-program questionnaire (refer to Appendix F). The purpose of the enjoyment question was to assess whether the two programs were comparable in terms of enjoyment (see Section 4.4). The qualitative questions were designed to ascertain what elements of the two programs the children liked best and least, and to determine whether or not the children described a pattern of overall changes in how they felt after sessions which might not have been accounted for by the immediate mood questionnaire.

4.6.5 Procedures

Participating children whose parents had consented were sent letters with details of the group to which they had been randomly allocated, their personal ID number, and the room in which they were to meet. Both programs consisted of six one-hour sessions, conducted at 4:00 pm on Wednesdays and at 3:30 pm on Fridays.

Before the first session, all children completed the global self-esteem scale (What I’m Like, refer to Appendix F) and the physical self-worth scale (Some Kids, refer to Appendix F). As a check to see whether past experience of yoga affected the results, the participants were asked whether or not they had ever done yoga before, and if so, whether that was a little or a lot (i.e. taking part in a regular class). In addition, children were given a list of counselling services for themselves and for their parents to refer to in case a child became upset as a result of answering the self-esteem and physical self-worth questionnaires. These are reproduced in Appendix G. While children were completing their questionnaires, two at a time were taken to one side to lie down and have their heart rate and breathing rate measured.

At the start of every session, participants completed the mood scale (called “This is Sandy”). After this, they proceeded with the activities of the yoga or recreation programs.
The yoga classes were taught by a yoga teacher certified with the Australian Yoga Teachers’ Network, and trained in Hatha Yoga at Mangala Yoga Studios in Carlton. An assistant, trained in yoga, was also present to inspire the children by demonstration, and to help individuals with the correct postures. Posture work was taught in a dynamic and playful way, combining strong shapes with balances and times of relaxed stillness. All classes were presented with the philosophy that children should simply do the best they can, without being worried about being able to get the postures “right” and certainly without pushing or straining. Three of the six sessions started with the children seated cross-legged in a circle around a candle flame as a form of focussing. Next they moved into postures in the circle, and then standing in lines, and sometimes walking through the room or using the walls of the room. The other three classes began with very active work, having children run, roll and do cartwheels, skip through a big rope, or walk their feet up the walls. They then slowed down into the more focussed postures standing in a line, and then in a circle. In every class, active poses were interspersed with moments of rest in more relaxing poses such as the Child pose or the Swastika pose (Refer to Appendix D), and during the last few minutes of each session, children were asked to rest lying down on their backs or their bellies with their eyes closed. A form of Yoga Nidra (relaxing individual parts of the body), slow breathing or relaxing creative visualisation was employed during this time. Every class ended with the children gathering around the candle flame and blowing it out together. In the background, a selection of slow music was played throughout each class, providing an atmosphere of calm focussing which is integral to every yoga class. A comprehensive list of the asanas is included in Appendix D and the session formats are outlined in Appendix B. The music repertoire is provided in Appendix E.

The recreation group took part in a different activity each session. The program was conducted in a relaxed atmosphere by two coordinators with experience in childcare and after-school care. Following is a list of the activities which were offered to the recreation group: making lanterns, playing games, making masks, decorating jewellery boxes, necklace-making and making paper flowers. More detailed procedures for these are presented in Appendix C. Every class started with a general discussion.
about the activity of the day. Where craft-making was involved, this included some time to handle and explore the materials provided and to view examples of completed craft for the children to generate ideas for their own work. The children sat around tables and the coordinators moved around the room helping them where required and talking about their ideas. Towards the end of each session, participants were asked to complete their activities (with the option of taking some additional materials home if they needed more time to finish them), and to help pack up the materials. Children were allowed to take home all creative projects they completed during the sessions.

After every session, participants completed the mood scale once again. At the conclusion of the sixth session, children completed the global self-esteem scale and the physical self-worth scale for the second time, and had their heart and breath rates measured again. The data collection procedures for the study are outlined in greater detail in Appendix A.

At the conclusion of the two programs, the recreation group returned to take part in six sessions of yoga. Measurement procedures for this second yoga program were repeated as above. There was a small variation between the original yoga program and the program which was later delivered to the former recreation group. Children were taught all the same postures, but because the yoga teacher found the second group to be more excitable than the first group, she omitted the partner work for the second group (see Appendix B). Furthermore, the Balloon Breath (refer to Appendix D) was incorporated more regularly into the program, as was the instruction: “Show me what your body looks like when it’s completely relaxed” to encourage children to become aware of what a relaxed body feels like.
Chapter 5
Results

5.1 Overview of Chapter

The results in this chapter are broadly presented in two parts. The first part deals with the first six sessions where two groups were running concurrently (the yoga and the recreation group). The second part presents results from the second set of six yoga sessions, which was in effect a replication study of the yoga program by the former recreation group. For the first part, Section 5.2 provides a description of the nature of the whole sample and an equivalence check for the two randomly formed groups. Then the dependent variables are divided into two categories. Pre-post program variables (heart rate change and breath rate, global self-esteem, and perceptions of body attractiveness, strength adequacy, stamina, sports competence,) are reported in Section 5.3. Pre-post session variables (anxious and depressed mood) are addressed in Section 5.4. In Section 5.5, qualitative data gathered from the two groups are compared thematically. Section 5.6 introduces the second part of the analysis, which was the replication of the yoga program with the former recreation group. Pre-post program variable outcomes are presented in this section. Section 5.7 covers pre-post session data, and Section 5.8 presents the themes which appeared in the replication group’s qualitative responses to the yoga program.

5.2 Preliminary Analyses

The purpose of this section is to detail the nature of the sample with reference to other samples, and to check the comparability of the two randomly formed groups prior to the program.

5.2.1 Sample Determination and Characteristics

In order for a student to be said to have learned a basic number of yoga skills and postures and to have successfully completed the program, a minimum of 4 out of 6 sessions was set as the number attended in order to be included in the final sample. This resulted in 5 out of 22 cases being omitted from the analysis (2 from the yoga group,
and 3 from the recreation group). The final sample of 17 contained 8 members in the yoga group and 9 members in the recreation group, with compliance rates being about even across both conditions. Two children who were going to be away for the 6th session of their respective program were given post-program questionnaires at the conclusion of the 5th session. It was found that most of the children had never tried yoga before. Five out of twenty-two had done “a little bit” of yoga. This consisted of trying out a few postures with a practising parent on one or two occasions. Therefore, it was possible to conclude that the members of this group were beginners in yoga.

Average breath rate at the start of the program was 17 breath cycles (one inhalation plus one exhalation) per minute ($N = 17, SD = 3.00$). This is somewhat slower than the respiration rate reported by Zaichkowsky and Zaichkowsky (1984b) for 24 4th grade students under similar conditions ($M = 22.50, SD = 5.73$). Average heart rate for the current sample prior to relaxing was 82.35 b.p.m. ($SD = 14.03$). This is also lower than that of students in Zaichkowsky and Zaichkowsky (1984)’s sample ($M = 96.20, SD = 5.73$) and lower than the average heart rate norms reported for children 8-10 years of age (95-100 b.p.m., Rathe & Klioze, 2001).

Table 1 displays the initial means of the sample on the psychological variables from the standard psychological scales of global self-esteem and physical self-worth. Note that the sample’s self-esteem mean of 3.33 is slightly higher than that reported by Harter in the SPP-C manual (Harter, 1985). In the manual, two samples of lower middle to upper middle class 4th grade girls from Colorado both produced a mean of 3.13 ($N = 25, SD = .73; N = 36, SD = .56$). Regarding the physical self-worth variables, comparable data for the same age group was not available; however, a sample of 60 girls from south-west England of 12.2 years’ average age ($SD = .30$) reported similar scores on all domains (Attractiveness: $M = 2.49, SD = 0.62$; Strength adequacy: $M = 2.47, SD = 0.62$; Stamina: $M = 2.81, SD = 0.62$; Sports competence: $M = 2.72, SD = 0.57$) (Biddle et al., 1993).

Table 1 also displays the alpha coefficients for the reliabilities of the psychological scales. All scales showed moderate to high internal reliability, although the self-esteem measure was not always consistent. It seems that the second item,
“Some kids are not happy with the way they do a lot of things” reduced alpha somewhat at the pre-program testing stage.

Table 1

*Alpha Reliabilities of Scales and Sample Means and Standard Deviations Prior to the Program.*

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Alpha reliabilities</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-esteem</td>
<td>.59-.83</td>
<td>3.33</td>
<td>0.38</td>
</tr>
<tr>
<td>Attractiveness</td>
<td>.82-.76</td>
<td>2.67</td>
<td>0.72</td>
</tr>
<tr>
<td>Strength adequacy</td>
<td>.72-.76</td>
<td>2.48</td>
<td>0.61</td>
</tr>
<tr>
<td>Stamina</td>
<td>.87-.92</td>
<td>3.03</td>
<td>0.65</td>
</tr>
<tr>
<td>Sports competence</td>
<td>.81-.72</td>
<td>2.70</td>
<td>0.62</td>
</tr>
</tbody>
</table>

*Note. N=17*

5.2.2 *Initial Group Equivalence Check*

In order to make certain that the two groups were equivalent at the start, t-tests for independent samples were conducted, treating initial values of the pre-program values as dependent variables. As summarized in Table 2, there were no significant differences between the two groups on any of the variables.
Table 2

Comparison of Initial Means on Pre-program Variables for Yoga and Recreation Groups

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Treatment Groups M (SD)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yoga (n=8)</td>
<td>Recreation (n=9)</td>
<td>(df=15)</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>3.44 (0.42)</td>
<td>3.21 (0.29)</td>
<td>1.35</td>
</tr>
<tr>
<td>Attractiveness</td>
<td>2.71 (0.85)</td>
<td>2.60 (0.60)</td>
<td>0.30</td>
</tr>
<tr>
<td>Strength adequacy</td>
<td>2.50 (0.55)</td>
<td>2.46 (0.70)</td>
<td>0.14</td>
</tr>
<tr>
<td>Stamina</td>
<td>3.17 (0.70)</td>
<td>2.87 (0.60)</td>
<td>0.94</td>
</tr>
<tr>
<td>Sports competence</td>
<td>2.86 (0.70)</td>
<td>2.51 (0.51)</td>
<td>1.16</td>
</tr>
<tr>
<td>Breath rate</td>
<td>17.28 (3.43)</td>
<td>16.63 (2.77)</td>
<td>1.04</td>
</tr>
<tr>
<td>Heart rate change</td>
<td>+2.22 (6.46)</td>
<td>-0.75 (5.16)</td>
<td>0.43</td>
</tr>
</tbody>
</table>

5.3 Pre-Post Program Effects of Yoga and Recreation Groups

The purpose of the next set of analyses was to explore the pre-post program variables for any evidence of improvement in the yoga group over the recreation group. The small size of the sample meant that most of the assumptions for parametric techniques were unlikely to be met. On the other hand, non-parametric statistics tend to be less sensitive (Pallant, 2001). The aim was to make the analysis as sensitive as possible, given the small sample, to detect any program effects which might indicate suitable outcome parameters for future research. For this reason, parametric tests were used first, followed by non-parametric statistics for those variables which seemed to discriminate between groups. Because of the small data set, separate mixed between/within subjects ANOVAs were conducted on each of the seven pre-post program variables. Although multiple analyses of this nature would often warrant the use of a more stringent alpha level (such as at p<.01), alpha was maintained at the commonly used level of p<.05, again to assure sensitivity to the small data set. As a result of this, all findings from these analyses would need to be interpreted with caution.
The next variable which was analysed was heart rate change, that is, the degree of change in heart rate recorded over one minute during supine relaxation. The reader is reminded that this was calculated by subtracting the second reading (after relaxing for one minute) from the first (baseline). Thus, a heart rate change value of 0 would indicate that heart rate remained constant during the one-minute period. Table 3 displays the means and standard deviations for heart rate change. Although the means were in the predicted direction, a mixed between/within subjects ANOVA indicated no significant main effects for group, $F(1,15) = 0.03, p = .87$, and pre-post program, $F(1,15) = 1.04, p = .32$, and a non-significant interaction effect, $F(1,15) = 1.61, p = .22$.

Table 3

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>+2.22 (6.46)</td>
<td>-2.33 (4.27)</td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>-0.75 (5.18)</td>
<td>-0.25 (10.26)</td>
</tr>
</tbody>
</table>

As illustrated in Table 4, a mixed between/within subjects ANOVA on breath rate revealed no significant main effect for group, $F(1,15) = 0.30, p = .59$, or pre-post program, $F(1,15) = .06, p = .81$. The interaction effect was also not significant, $F(1,15) = .04, p = .85$.

Table 4

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>17.28 (3.43)</td>
<td>17.83 (5.27)</td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>16.63 (2.77)</td>
<td>16.69 (4.99)</td>
</tr>
</tbody>
</table>

A mixed between/within subject ANOVA on pre- and post-program global self-esteem revealed no significant main effect for group, $F(1,15) = 0.61, p = .45$, or pre-
post program, $F(1,15) = 0.00, p = .97$. The interaction effect was also non-significant, $F(1,15) = .56, p = .47$. The means and standard deviations are presented in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Group</th>
<th>M (SD)</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>3.44 (0.42)</td>
<td>3.35 (0.57)</td>
<td></td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>3.21 (0.29)</td>
<td>3.29 (0.49)</td>
<td></td>
</tr>
</tbody>
</table>

A mixed between/within subject ANOVA was conducted on pre- and post-program body attractiveness scores. There were no significant main effects for group, $F(1,15) = .02, p = .90$, or pre-post-program, $F(1,15)=.06, p=.80$, and the interaction effect was also non-significant, $F(1,15) = .69, p = .42$. The means and standard deviations are summarized in Table 6.

Table 6

<table>
<thead>
<tr>
<th>Group</th>
<th>M (SD)</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>2.71 (0.85)</td>
<td>2.67 (0.77)</td>
<td></td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>2.60 (0.60)</td>
<td>2.69 (0.64)</td>
<td></td>
</tr>
</tbody>
</table>

A mixed between/within subjects ANOVA was then conducted to determine the effects of the yoga and recreation programs on strength adequacy scores. The means of these are presented in Table 7. There was no significant group effect, $F(1,15) = .11, p = .75$, or interaction effect, $F(1,15) = 2.02, p = .18$. The pre-post program comparison for both groups combined was significant, $F(1,15) = 6.40, p = .02$. Sample means of 2.48 ($SD = 0.61$) before the program, and 2.76 ($SD = 0.70$) after the program, indicated that both groups showed a slight improvement in perceived strength adequacy after the program.
Table 7

Means and Standard Deviations on Strength Adequacy Scores Pre- and Post-program

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>2.50 (0.55)</td>
<td>2.61 (0.50)</td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>2.46 (0.70)</td>
<td>2.85 (0.89)</td>
</tr>
</tbody>
</table>

A mixed between/within subjects ANOVA on stamina scores revealed no significant main effect for group $F(1,15) = .79, p = .39$ or pre-post-program $F(1,15) = .42, p = .53$. The interaction effect also did not reach significance $F(1,15) = .00, p = .96$. The relevant means and standard deviations are reported in Table 8.

Table 8

Means and Standard Deviations on Stamina Scores Pre- and Post-program

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>3.17 (0.70)</td>
<td>3.24 (0.76)</td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>2.87 (0.60)</td>
<td>2.96 (0.79)</td>
</tr>
</tbody>
</table>

Finally, sports competence scores were analysed using a mixed between/within subjects ANOVA. The means and standard deviations are presented in Table 9. Both the main effect for group $F(1,15) = 2.12, p = .17$, and pre-post program, $F(1,15) = 1.27, p = .28$, were not significant. There was no significant interaction effect, $F(1,15) = .72, p = .41$. 

Table 9

Means and Standard Deviations on Sports Competence Scores Pre- and Post-program

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-program</th>
<th>Post-program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga (n=8)</td>
<td>2.86 (0.69)</td>
<td>3.03 (0.66)</td>
</tr>
<tr>
<td>Recreation (n=9)</td>
<td>2.52 (0.51)</td>
<td>2.54 (0.57)</td>
</tr>
</tbody>
</table>

In sum, the majority of the ANOVAs produced no significant results. The exception was a main effect for pre-post program on the strength adequacy variable, which showed a statistically significant improvement over time. However, the difference between the two means (a score change of 0.25) was so small as to be of little practical significance and may have been due to Type I error. Because there were no interaction effects, which would indicate changes resulting from the programs per se, non-parametric tests were not pursued.

5.4 Pre-Post Session Effects for Yoga and Recreation Groups

The purpose of the first set of analyses in this section was to determine whether the items on the What I’m Feeling questionnaire could be grouped together as measures of anxious and depressed mood. Thus, reliabilities were calculated for each time of assessment (before and after six sessions) on the three items purported to indicate levels of anxiety (“worried”, “scared”, and “nervous”) and the three items reflecting depressed mood (“grumpy”, “terrible”, “sad”). Alpha values for the anxious mood items ranged from .72 to .96, and those for the depressed mood items ranged from .70 to .97 indicating strong internal consistency. On the basis of this, single anxiety and depression scores were calculated using the average of each respective set of three items.

The aim of the next set of analyses was to determine whether or not individual yoga sessions influenced anxious and depressed mood differently from the recreation sessions, and to describe the pattern of influence over the course of the programs. As in the analyses for the pre-post program variables (Section 5.3), the intent was to keep the
analysis as sensitive as possible, so both parametric and non-parametric techniques were utilised where appropriate. To compare groups on pre- and post-session mood scores it is sometimes argued that pre- and post- scores should be kept separate so that data can be inspected using ANOVA (J. Pallant, personal communication, July 1, 2002); however in light of the small sample size it was considered more parsimonious to examine the data by applying t-tests to mood change scores. Therefore, for each session, mood change scores were calculated by subtracting post-session anxious mood from pre-session anxious mood, and post-session depressed mood from pre-session depressed mood. This produced 6 anxious mood change scores and 6 depressed mood change scores.

Once again, at the risk of elevating Type I error, the .05 level of significance was kept in order to maintain sensitivity to possible effects given the small sample size. As illustrated in Table 10, average anxious mood change declined steadily for the yoga group over the six sessions, whereas recreation group scores remained steady with little change pre-post session. T-tests showed significant differences between the two groups from the second session onwards, with the yoga group consistently showing greater pre-post session reductions in anxiety than the recreation group. With regards to depressed mood, there was little consistent change in scores for either group, and t-tests revealed no significant differences between groups.
Table 10

*Means, Standard Deviations and T-tests for Mood Change Scores in Yoga and Recreation Groups*

<table>
<thead>
<tr>
<th>Session number</th>
<th>Treatment groups M (SD)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yoga</td>
<td>Recreation</td>
<td>t (df)</td>
<td>p</td>
</tr>
<tr>
<td>Anxious mood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-0.26 (0.36)</td>
<td>-0.04 (0.45)</td>
<td>-1.10 (15)</td>
<td>.289</td>
</tr>
<tr>
<td>2</td>
<td>-0.67 (0.56)</td>
<td>0.10 (0.71)</td>
<td>-2.31 (13)</td>
<td>.038</td>
</tr>
<tr>
<td>3</td>
<td>-0.70 (0.79)</td>
<td>0.08 (0.46)</td>
<td>-2.46 (15)</td>
<td>.026</td>
</tr>
<tr>
<td>4</td>
<td>-0.71 (0.60)</td>
<td>-0.04 (0.28)</td>
<td>-2.84 (14)</td>
<td>.013</td>
</tr>
<tr>
<td>5</td>
<td>-0.78 (0.87)</td>
<td>0.04 (0.28)</td>
<td>-2.69 (9.81)</td>
<td>.023</td>
</tr>
<tr>
<td>6</td>
<td>-0.80 (0.64)</td>
<td>0.14 (0.26)</td>
<td>-3.78 (9.53)</td>
<td>.004</td>
</tr>
<tr>
<td>Depressed mood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-0.30 (0.84)</td>
<td>0.29 (0.74)</td>
<td>-1.52 (15)</td>
<td>.150</td>
</tr>
<tr>
<td>2</td>
<td>0.13 (0.71)</td>
<td>-0.05 (0.30)</td>
<td>0.63 (9.67)</td>
<td>.546</td>
</tr>
<tr>
<td>3</td>
<td>-0.26 (0.72)</td>
<td>0.42 (1.51)</td>
<td>-1.20 (15)</td>
<td>.248</td>
</tr>
<tr>
<td>4</td>
<td>0.04 (0.55)</td>
<td>0.04 (0.52)</td>
<td>0.00 (14)</td>
<td>1.00</td>
</tr>
<tr>
<td>5</td>
<td>-0.19 (0.78)</td>
<td>-0.08 (1.15)</td>
<td>-0.22 (15)</td>
<td>.832</td>
</tr>
<tr>
<td>6</td>
<td>-0.04 (0.21)</td>
<td>0.62 (1.06)</td>
<td>-1.62 (6.43)</td>
<td>.153</td>
</tr>
</tbody>
</table>

Because the t-tests revealed significant differences in anxious mood, scores were then analysed using the less sensitive but more statistically appropriate Mann-Whitney U Test. As summarized in Table 11, there was still a significant difference between groups on anxious mood from Session 2 onwards, whereas no significant differences were found on depressed mood.
Table 11

*Mann-Whitney U Test on Mood Change Scores*

<table>
<thead>
<tr>
<th>Session number</th>
<th>N</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious mood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>17</td>
<td>-1.41</td>
<td>.24</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>-2.30</td>
<td>.03</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>-2.00</td>
<td>.05</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>-2.71</td>
<td>.01</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>-2.41</td>
<td>.03</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>-2.81</td>
<td>.01</td>
</tr>
<tr>
<td>Depressed mood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>17</td>
<td>-1.29</td>
<td>.24</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>-0.24</td>
<td>.87</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>-0.89</td>
<td>.42</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>-0.81</td>
<td>.51</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>-0.69</td>
<td>.54</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>-1.45</td>
<td>.23</td>
</tr>
</tbody>
</table>

In order to determine the practical significance of these differences, the effect size was calculated using partial eta squared. According to Cohen (1988), an eta squared value of .01 indicates a small effect, .06 indicates a moderate effect, and .14 shows a large effect. As can be seen from Table 12, depressed mood remained largely unaffected by group, but there was a very strong association between group and anxious mood, which also increased over time.
Table 12

Partial Eta Squared Values for Anxious and Depressed Mood

<table>
<thead>
<tr>
<th>Session</th>
<th>N</th>
<th>Anxious mood</th>
<th>Depressed mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>17</td>
<td>.07</td>
<td>.13</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>.29</td>
<td>.03</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>.29</td>
<td>.09</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>.37</td>
<td>.00</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>.30</td>
<td>.00</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>.50</td>
<td>.19</td>
</tr>
</tbody>
</table>

In order to check whether or not mood change was simply a reflection of one activity being more enjoyable than another, a 2-tailed t-test for independent samples was conducted on participants’ enjoyment ratings (rating 1-4) at the conclusion of each program. A rating of 1 indicated “I didn’t enjoy it at all” and a rating of 4 indicated “I enjoyed it a lot”. There was no significant difference between the yoga group (M = 3.89, SD = .33) and the recreation group (M = 3.75, SD = .71).

5.5 Comparing Yoga and Recreation Experiences Thematically

In order to develop a more comprehensive picture of the groups’ general feelings after each class, information from qualitative questions issued at the conclusion of the programs was collated and analysed for recurrent themes. The themes revealed changes in mood which were similar to those reflected in answers to the mood questionnaire. In particular, the yoga group made greater use of the terms “relaxed” versus “hyper”, whereas the recreation group wrote mainly in terms of “happiness”. When asked “How did you usually feel at the end of each class compared to at the start?” yoga respondents wrote, “I feel a lot calmer as though I can put up with everything”, “I felt tired and relaxed”, “Calm, not sad, good”, “I felt tired and worn out at the start, relaxed and happy at the end”, “I felt more relaxed more calm and less
‘hyper’”, “Great”. Those recreation students who responded wrote, “Depended on what we did”, “Happy”, “Much happier”, “As happy as I came in”, “Happy, hungry”.

To understand the differences between the two groups’ subjective experiences, responses to two questions pertaining to what the children liked best and least about their respective programs were collected and analysed for recurrent themes, and these are presented in Table 13.
Table 13  
*Most-liked and Least-liked Aspects of Yoga and Recreation Programs*

<table>
<thead>
<tr>
<th>Yoga group</th>
<th>Least-liked</th>
</tr>
</thead>
<tbody>
<tr>
<td>I liked them all the same</td>
<td>Nothing</td>
</tr>
<tr>
<td>I liked doing the different yoga postures and learning how you can relax your body in different ways</td>
<td>I loved doing the yoga positions and I think I improved my flexibility</td>
</tr>
<tr>
<td>I liked the postures</td>
<td>I liked everything</td>
</tr>
<tr>
<td>The yoga positions</td>
<td>I didn’t like the rabbit because I hurt my arms a little</td>
</tr>
<tr>
<td>I liked how it relaxed me and helped my strength at the same time</td>
<td>I guess it’s just me an impatient person, but I thought it was a bit slow in some places</td>
</tr>
<tr>
<td>I liked the postures and the relaxation</td>
<td></td>
</tr>
<tr>
<td>I like the balancing bits a lot because I like balancing. I found out I could do a few more things than usual</td>
<td>My mask because it looked awful</td>
</tr>
<tr>
<td>I liked the sparrow and the frog and everything</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreation group</th>
<th>Least-liked</th>
</tr>
</thead>
<tbody>
<tr>
<td>The things we did the art</td>
<td>Sandy</td>
</tr>
<tr>
<td>Everything we do is groovy</td>
<td>I hate the group, Sandy</td>
</tr>
<tr>
<td>I like H and the vase and flower day</td>
<td>Nothing</td>
</tr>
<tr>
<td>The vases and necklaces cause I like beading and painting</td>
<td>My mask because it looked awful</td>
</tr>
<tr>
<td>I liked it all because it was fun!</td>
<td>Beading because it’s boring</td>
</tr>
<tr>
<td>I love art and I really want to try yoga</td>
<td>Sandy because she is dumb</td>
</tr>
<tr>
<td>Working with H, N and A</td>
<td>I hate Sandy</td>
</tr>
</tbody>
</table>

*Note.* Initials refer to researcher and research assistants. Sandy refers to imaginary character in the What I’m Feeling questionnaire.

As can be seen from Table 13, both groups focussed on favourite postures or activities when listing their likes. The recreation group also reflected some enjoyment of the social interaction which accompanied it. As for dislikes, one person in the yoga
group commented on a particular posture that she found difficult, and another about the slowness of the class overall. No other negative comments were made. In the recreation group, the main theme to emerge was a dislike of the mood questionnaire (using the imaginary character of Sandy), which was administered before and after each session.

In passing, it was noted that several unsolicited comments were made by parents and their children at the conclusion of the program. It seemed that many of them wanted to continue yoga and were interested in having yoga classes offered as part of the regular activities offered by the school.

5.6 Pre-Post Program Effects for the Second Yoga Group

At the conclusion of the initial yoga and recreation programs, members of the recreation group became the second yoga group and undertook 6 sessions of yoga in the same manner as the first group. Post-recreation program data became pre-yoga program data for the second group, and another set of responses collected at the conclusion of the second yoga group program became the post-program data for the purposes of these analyses. The aim of the analyses was to determine to what extent the results from the first yoga program might be replicable in the second yoga group. To this end, the data was once again split into pre-post program and pre-post session data.

Addressing the pre-post program data first, the aim of identifying any possible effects in this small sample led to the use of the more sensitive parametric tests first, followed by the more statistically relevant non-parametric tests where significant results were obtained. As argued in the analyses for the main study (Section 5.3), a p-value of .05 was maintained despite the multiple analyses because of the small sample size.

Table 14 provides the means, standard deviations and t-test results for the pre-post program variables. Any changes pre to post program were small, and the only significant effect produced was for the sports competence score, where participants indicated improvement in the sports competence variable by the end of the course. Means for heart rate change over one minute were in the predicted direction and approached, but did not reach, significance.
Table 14  
Means, Standard Deviations and T-tests on Pre-post Program Variables

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Pre-program</th>
<th>Post-program</th>
<th>t (df)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global self-esteem</td>
<td>3.29 (0.49)</td>
<td>3.48 (0.37)</td>
<td>-0.45</td>
<td>.67</td>
</tr>
<tr>
<td>Body attractiveness</td>
<td>2.69 (0.64)</td>
<td>2.82 (0.54)</td>
<td>-0.68</td>
<td>.52</td>
</tr>
<tr>
<td>Strength adequacy</td>
<td>2.85 (0.89)</td>
<td>2.82 (0.98)</td>
<td>0.46</td>
<td>.66</td>
</tr>
<tr>
<td>Stamina</td>
<td>2.96 (2.96)</td>
<td>2.83 (0.79)</td>
<td>1.71</td>
<td>.14</td>
</tr>
<tr>
<td>Sports competence</td>
<td>2.54 (0.57)</td>
<td>2.79 (0.61)</td>
<td>-3.33</td>
<td>.02</td>
</tr>
<tr>
<td>Breath rate</td>
<td>16.81 (4.96)</td>
<td>16.57 (7.25)</td>
<td>0.10</td>
<td>.92</td>
</tr>
<tr>
<td>Heart rate change</td>
<td>-0.25 (10.26)</td>
<td>-10.00 (9.99)</td>
<td>2.21</td>
<td>.07</td>
</tr>
</tbody>
</table>

Note. df = 6

This result was further tested using the Wilcoxon Signed Rank Test. As summarised by Table 15, with a p-value maintained at .05, scores improved significantly for the sports competence variable only.

Table 15
Wilcoxon Signed Rank Test on Pre-post Program Scores

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Z</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global self-esteem</td>
<td>-0.37</td>
<td>.72</td>
</tr>
<tr>
<td>Body attractiveness</td>
<td>-0.54</td>
<td>.59</td>
</tr>
<tr>
<td>Strength adequacy</td>
<td>-0.21</td>
<td>.83</td>
</tr>
<tr>
<td>Stamina</td>
<td>-1.51</td>
<td>.13</td>
</tr>
<tr>
<td>Sports competence</td>
<td>-2.06</td>
<td>.04</td>
</tr>
<tr>
<td>Breath rate</td>
<td>-0.68</td>
<td>.50</td>
</tr>
<tr>
<td>Heart rate change</td>
<td>-1.70</td>
<td>.09</td>
</tr>
</tbody>
</table>

N=7

To determine the effect size for the sports competence scores, partial eta squared was calculated, revealing a large program effect of .65.
5.7 Pre-Post Session Effects for the Second Yoga Group

The purpose of this set of analyses was to determine whether or not the pattern of changes in mood for the first yoga group would be replicated in the second group. As argued in the analyses of the main study (Section 5.4), the exploratory nature of the study and the small sample size warranted a maximization of sensitivity of the analyses. Thus, multiple t-tests were conducted on mood change scores while maintaining a .05 level of significance.

Table 16

Means and Standard Deviations of Mood Change for the Second Yoga Group

<table>
<thead>
<tr>
<th>Session Number</th>
<th>Pre-session M (SD)</th>
<th>Post-session M (SD)</th>
<th>t (df)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anxious mood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.38 (0.74)</td>
<td>1.08 (0.24)</td>
<td>1.00 (7)</td>
<td>.35</td>
</tr>
<tr>
<td>2</td>
<td>1.52 (0.69)</td>
<td>1.14 (0.38)</td>
<td>1.49 (6)</td>
<td>.19</td>
</tr>
<tr>
<td>3</td>
<td>1.67 (1.39)</td>
<td>1.25 (0.71)</td>
<td>1.62 (7)</td>
<td>.15</td>
</tr>
<tr>
<td>4</td>
<td>1.14 (0.38)</td>
<td>1.00 (0.00)</td>
<td>1.00 (6)</td>
<td>.36</td>
</tr>
<tr>
<td>5</td>
<td>1.71 (1.39)</td>
<td>1.38 (1.06)</td>
<td>2.00 (7)</td>
<td>.09</td>
</tr>
<tr>
<td>6</td>
<td>1.10 (0.25)</td>
<td>1.00 (0.00)</td>
<td>1.00 (6)</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td>Depressed mood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.33 (0.64)</td>
<td>1.21 (0.40)</td>
<td>1.00 (7)</td>
<td>.35</td>
</tr>
<tr>
<td>2</td>
<td>1.43 (0.79)</td>
<td>1.19 (0.38)</td>
<td>0.80 (6)</td>
<td>.45</td>
</tr>
<tr>
<td>3</td>
<td>1.54 (1.18)</td>
<td>1.38 (0.70)</td>
<td>0.71 (7)</td>
<td>.50</td>
</tr>
<tr>
<td>4</td>
<td>1.33 (0.64)</td>
<td>1.19 (0.50)</td>
<td>0.53 (6)</td>
<td>.62</td>
</tr>
<tr>
<td>5</td>
<td>1.79 (1.40)</td>
<td>1.46 (1.30)</td>
<td>1.76 (7)</td>
<td>.12</td>
</tr>
<tr>
<td>6</td>
<td>1.14 (0.38)</td>
<td>1.00 (0.00)</td>
<td>1.00 (6)</td>
<td>.36</td>
</tr>
</tbody>
</table>

From Table 16 it can be seen that both anxious and depressed mood levels were at very low levels prior to each session. T-tests revealed no significant changes pre- to post-session for either anxious or depressed mood on any occasion.
5.8 Analysing Themes of the Second Yoga Group Experience

Despite the lack of difference in responses on the What I’m Feeling questionnaire, when students were asked at the conclusion of the yoga program how they usually felt after class, responses were as follows: “I’d feel very relaxed at the end unlike the start”, “Relaxed”, “A bit better depends what we do”, “Better”, “I felt much more relaxed”, “We are all hyper before it and the yoga calms us down”. Where the same participants had responded in terms of happiness at the conclusion of the recreation program, the answers shown here tended to reflect themes of relaxation versus hyperactivity.

In order to develop a greater insight into the nature of the second yoga group’s subjective experience, answers to the two post-program questions, “What did you like best about the yoga activities you have been doing?” and “What did you like least about the yoga activities you have been doing?” were analysed (see Table 17).

Table 17
Most-liked and Least-liked Aspects of the Second Yoga Program

<table>
<thead>
<tr>
<th>Most-liked</th>
<th>Least-liked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postures and making up our own stuff</td>
<td>I like talking</td>
</tr>
<tr>
<td>They’re very comfortable</td>
<td>Sandy!</td>
</tr>
<tr>
<td>Last session cause did our favourite postures</td>
<td>All the hard postures cause I couldn’t do them</td>
</tr>
<tr>
<td>Upside down stuff</td>
<td>Didn’t like some postures like the crow and the frog because I couldn’t do them</td>
</tr>
<tr>
<td>Giraffe race, creative time, some of the postures cause they were fun</td>
<td>Sandy questionnaire</td>
</tr>
</tbody>
</table>

Note. Sandy refers to the imaginary character in the What I’m Feeling Questionnaire.

Table 17 indicates that, as with the first yoga group, likes focussed on particular favourite postures. Dislikes, on the other hand, focussed on those postures which children found difficult to do. The format of the mood questionnaire (Sandy) was also a negative issue, and one which this same group had raised previously at the conclusion of the recreation program (Refer to Table 13).
Chapter 6
Discussion

6.1 Overview of Chapter

In this chapter, the results of the current study are summarized and interpreted in the context of the surrounding literature. Where direct comparisons to other yoga studies are precluded, evidence is gathered from the associated literatures of exercise and relaxation. Section 6.2 summarizes the results from Chapter 5. Section 6.3 discusses the findings on the pre-post program variables of heart rate change, breath rate, global self-esteem and physical self-worth variables. Section 6.4 discusses the pre-post session variables of anxious and depressed mood. Section 6.5 further examines all of these variables in relation to the replication study, that is, where the recreation group transferred to the yoga program. Section 6.6 addresses measurement issues, critically reviewing each of the measures used in the study in the light of the results and the literature. The main methodological issues which emerged from the findings are discussed in Section 6.7. The conclusions drawn from the methodological issues gave rise to recommendations for future research, which are presented in Section 6.8. Section 6.9 returns to the main theme of positive health promotion, which was introduced at the start of this thesis, and discusses the broader implications of this study in relation to wellbeing. Finally, Section 6.10 provides a summary of the findings and the conclusion of the thesis overall.

6.2 Summary of Results

The first part of the results reported the comparison of the yoga and the recreation program on a number of variables. Participants were randomly allocated to the two programs and preliminary analyses suggested that they were equivalent on relevant parameters. Generous criteria for significance were used throughout the analyses for the purposes of maintaining sensitivity to possible effects with a small sample. No significant differences were found in either group in terms of pre-post program variables, apart from a slight but statistically significant improvement in both groups on the strength adequacy variable. Multiple t-tests and non-parametric tests
indicated that, at the end of each session, the yoga group’s anxious mood scores were significantly reduced compared to those of the recreation group. In addition, partial eta squared values indicated a strong effect size for the yoga program on anxious mood. No pattern of change was observed for depressed mood in either group.

Students’ qualitative responses reflected differences between the two groups, with themes of relaxation versus hyperactivity predominating in the yoga group, and themes of happiness dominating in the recreation group. Thematic analyses of participants’ most and least-liked aspects of their program suggested that the yoga group focussed on their favourite activities or postures when writing about what they liked best, and the recreation group enjoyed the activities and the social interaction. When thinking about the negative aspects of the program, the main theme to emerge was the format of the mood questionnaire, which was not liked by girls in the recreation group.

The second part of the results examined pre- and post- differences for the replication study with a single yoga group (the former recreation group). Using similar criteria of significance as were used in the first part, no significant changes were found on pre-post program variables except for a small but significant improvement over time for the sports competence variable. A partial eta squared revealed a large program effect for this variable. Participants rated themselves as low in anxious and depressed mood prior to beginning each session, and, unlike in the first yoga group, no significant changes in mood were recorded at any time; nonetheless qualitative answers to questions at the conclusion of the program displayed themes of relaxation. Thematic analyses of most and least-liked aspects of the program indicated children’s focus on favourite activities or postures when describing their most-preferred aspect. Doing difficult postures emerged as a negative theme. The format of the mood questionnaire was another negative topic, which had previously been raised by the same group at the conclusion of the recreation program.
6.3 Pre-Post Program Effects of Yoga and Recreation

6.3.1 Heart Rate Change and Respiration Rate

Regarding the physiological variables of the current study, the results do not support the hypothesis that, compared to the recreation program, children who had taken part in the yoga program would have developed a significant ability to relax at will as indicated by greater heart rate reduction. Although the yoga group mean change score was in the predicted direction, and the recreation group pre-post means were fairly similar, no significant differences were found between groups before and after the programs. This contrasts with the general understanding developed in the adult literature that heart rate reduction can occur as a result of practising yoga (Telles et al., 1997; Morse et al., 1984; Cusumano & Robinson, 1992; Telles & Vani, 2002). In this study, as discussed in the defining chapter on physiological indices (Section 2.3.1), the ability to relax at will was conceived of as a skill which contributes to positive health, and which can therefore be measured by examining voluntary reduction in heart rate. This followed the reasoning and protocol used by Gilbert and Orlick (1996). After an initial heart rate reading, the researchers told participants to relax as much as possible. After one minute, the researchers took another reading and used these two figures to calculate heart rate change over one minute. The current results contradict the findings of Gilbert and Orlick (1996), where children did display a significantly greater drop in heart rate compared to at the start of the program; however, this was probably due to differences in program length and content, issues which are discussed in greater detail in the paragraph on relaxation studies below. Alternatively, a recent study has revealed that it may take participants up to five minutes to reduce their pulse rate (Telles & Vani, 2002). Therefore, it is possible that the one-minute time interval was not long enough to allow participants to fully relax.

Studies which have examined the effects of yoga on heart rate have tended to use a slightly different methodology, by measuring pulse rather than pulse reduction while children were relaxing quietly at the start and end of a yoga program. The outcome of the current study confirms the results of Smith (1984) and Telles and
Srinivas (1998) who reported that heart rate was not significantly slower at the end of a children’s yoga program compared to before. These two investigations used a daily program over three weeks (Telles & Srinivas, 1998) and a weekly program over ten weeks (Smith, 1984). The current study used twice weekly sessions over three weeks. By contrast, the present results differ from those of Telles et al. (1997), who reported a significant drop in heart rate for a yoga group following a six-month program. Given that the only children’s yoga study which did report a significant change used a program lasting six months, it is possible that children require longer exposure to relaxation techniques before being able to relax themselves at will. This is perhaps not surprising given that a certain amount of concentration is needed to bring about a state of relaxation (Benson, 1976) and children’s attention spans tend to be shorter than those of adults. It must be noted however that in the Telles et al. (1997) study, the heart rate of children in the games control group also dropped significantly, suggesting that games were just as effective as yoga in decreasing heart rate.

Studies from the children’s relaxation literature point to another factor which may be more important than the length of time of the program. Lohaus et al. (2001), Setterlind (1983), Gilbert and Orlick (1996), Richardson, Beall and Jessup (1982) and Zaichkowsky and Zaichkowsky (1984; 1986) all reported lowered heart rates in children following their relaxation programs. One of the main differences between these programs and the yoga programs could be that the relaxation skills taught in the relaxation programs were more overt than those taught in the yoga programs. For example, both Gilbert and Orlick (1996) and Zaichkowsky and Zaichkowsky (1984) included theoretical material about what stress is and how to recognise it as well as specific exercises to practise at home. The relaxation skills were taught in a much more deliberate manner than those in the current study, where relaxation was simply included as part of the yoga class experience. Relaxation arose from the stretching poses and the resting poses in-between invigorating poses, as well as the breathing techniques and guided relaxations at the conclusion of classes. The most important consequence of the differences in teaching method could be that children acquire relaxation skills to differing degrees. That is, children participating in yoga programs might have
experienced relaxation but still only with guidance. It is argued that the ability to relax oneself without external guidance, such as that seen in the majority of the relaxation studies, reflects a higher level of skill acquisition. Therefore, it is possible that the indirectness in the teaching of the relaxation skills contributed to why the children did not display the ability to control heart rate at the end of the program.

Neither the recreation nor the yoga programs had any influence on children’s capacity to slow their breathing. The current results do not support the hypothesis that children who had participated in the yoga program would exhibit slower respiration rates than their recreation counterparts. This conflicts with the findings of two Indian studies by Telles et al. (1997) and Telles and Srinivas (1998), which found that yoga participants showed a significant decrease in breath rate where controls did not. It is possible that the difference between the current study and these two studies lies in the nature of the samples. Firstly, the Indian studies consisted of mainly teenage children (12-16 years and 11-17 years respectively) whereas the children in the current study were 8-10 years old. Perhaps older children learn such techniques more easily than younger ones; however, the Zaichkowsky and Zaichkowsky (1984; 1986) relaxation studies using children of a similar age to this sample found a significant slowing of breath rate, effectively discounting this line of reasoning. Secondly, the children in the Indian studies came from disadvantaged families (Telles et al., 1997) and were visually impaired (Telles & Srinivas, 1998), and were assessed as having significantly higher initial values of physiological arousal including breath rate than “normal” children of similar age. The sample in the current study consisted of children from a private school and their initial respiration rates and heart rates were already considerably lower than those in the Indian studies. They were also lower than those of the children assessed in a Zaichkowsky and Zaichkowsky (1984) relaxation study, and lower than the heart rate norms for this age-group published by Rathe and Klioze (2001). Therefore, there is evidence to suggest that the participants in the current study were already quite relaxed at the beginning of the program. This may have impacted upon their responsiveness to relaxation training within the yoga program, suggesting the existence of a floor effect on the breathing parameter.
6.3.2 Global Self-Esteem

Contrary to the hypothesis, global self-esteem was found not to change as a result of participation in the yoga group. Yoga was just as ineffective as recreation in altering self-esteem. No other study appears to have examined the effects of yoga on children’s global self-esteem. It is also difficult to compare this outcome with those of adult studies because of the large differences in design; however, the current results appear to conflict with the findings of Cusumano and Robinson (1992), Engelman et al. (1982) and Rudolph (1981), who all reported improvements in global self-esteem following a yoga program. For Cusumano and Robinson (1992), the only randomised controlled adult study, this occurred after as little as three sessions. The Engelman et al. (1982) and Rudolph (1981) programs lasted 10 and 12 weeks respectively.

The current results could suggest that a yoga program can lead to self-esteem improvement in adults but not in children, but rather than drawing this as a conclusion, some other factors must also be taken into account. For example, in the only adult study found to date to have produced no significant self-esteem change, Williams (1992) alluded to the impact of participation in other physical activity on the demonstrable effectiveness of the yoga program. It is possible that people who are already engaged in regular physical activity would be less likely to benefit from a yoga course than people who are relatively sedentary during the rest of the week. Given that children tend to be more physically active than adults, in that they at least engage in compulsory physical education every week, the lack of self-esteem change in children could be explained by the fact that they already participate in sufficient physical activity to enjoy positive psychological benefits (Dunn & Blair, 1997).

The global self-esteem results can be interpreted to some degree with reference to general exercise and relaxation studies conducted with children. The current result contradicts reviews of general physical exercise research, which have concluded that exercise positively impacts upon children’s global self-esteem; although the majority of the evidence for this has come from aerobic exercise studies. The fact that yoga, as a form of non-aerobic exercise, did not produce changes may lend support to the notion that non-aerobic exercise is less likely to improve self-esteem in children. On the other
hand, scores indicated that the children’s initial self-esteem scores were already moderately high, and both general exercise and relaxation research have revealed that individuals with physical disabilities or low initial self-esteem are more likely to demonstrate self-esteem improvement than those with higher initial self-esteem (Fox, 2000; Loffredo, Omizo, & Hammett, 2001; Reynolds & Coats, 1987).

The result confirms the findings from the two controlled relaxation studies conducted with children of a similar age. Both Campo (1993) and Zaichkowsky and Zaichkowsky (1986) failed to find significant changes in self-esteem scores following six-week relaxation programs. Zaichkowsky and Zaichkowsky (1986) argued that six weeks might not be long enough to effect changes in self-esteem. The present results appear to confirm Zaichkowsky and Zaichkowsky (1986)’s point of view.

6.3.3 Physical Self-Worth

Authors have noted that whereas global self-esteem is relatively stable, physical self-perceptions, which are closely linked to self-esteem, are thought to be more malleable (Fox, 2000; Alfermann & Stoll, 2000). Therefore, even if self-esteem did not change, some improvement could still be expected among the physical self-worth variables. Of these variables, self-perceived stamina might have been the least likely to change because of the non-aerobic nature of the yoga activities, but strength adequacy was expected to rise because of the strength developed during asana work, and body attractiveness also had the potential to improve because of the non-competitive framework within which attention was directed to bodily sensations. In addition, sports competence, a variable that reflects the degree of confidence with which a person tries novel exercise activities, was expected to improve because of the mastery of certain postures and techniques which the children had never tried before. Despite this theoretical reasoning, no such changes were found for any of the components of physical self-worth in the yoga group, and there were no differences between the yoga and recreation groups before and after the programs on these variables. Only a pre-post increase in both the yoga and recreation groups for self-reported strength was found, but this improvement of 0.28 was so small as to be of little practical significance.
The result cannot be directly compared to other yoga studies because none have examined the same physical self-worth variables. However, it does conflict with the findings of a most recent study by Li, Harmer, Chaumeton, Duncan and Duncan (2002), who used a randomised controlled design to examine changes in the same physical self-worth variables following a program of Tai Chi. They found that perceptions of attractive body, strength adequacy and stamina all improved following participation in Tai Chi. However, the program in the Li et al. (2002) study was much longer than the one in the current study (6 months), suggesting that a longer time period may be required to effect changes. The current conceptualisation of physical self-worth was adopted from the physical exercise literature, where physical self-worth has been found to mediate exercise-related self-esteem improvement. The current results conflict with the findings from two exercise studies, which reported improvements in perceived body attractiveness, stamina (Riggs, 1997) and body esteem (Crift, 1995) following participation in exercise programs. It was noted that these studies used an aerobic form of exercise, therefore it is possible that aerobic exercise is more likely to influence these variables than moderate exercise such as yoga. As noted in the results (Section 5.2.1), the initial scores of the present sample were similar to those reported by Biddle (1993) for a group of 12 year-old English girls. This reduces the plausibility of the argument that the lack of change in physical self-worth variables was due to ceiling effects.

The only other study which appears to have explored yoga’s effect on children’s physical self-perceptions was that by Clance, Mitchell and Engelman (1980). They used the Children’s Body Satisfaction Test, which was a modified version of Secord and Jouard (1953)’s Body Cathexis Test. This is a body esteem scale, closely akin to the attractive body variable used in the current study. In contrast to the non-significant results attained on the attractive body variable, Clance et al. (1980) reported an increase in scores for their yoga group and not for their control group after a program of three sessions per week for four weeks. The difference in outcomes might be explained by the different nature of the samples in the two studies. The participants in the Clance et al. (1980) study were selected because they were performing poorly in physical education classes, which they did not enjoy. Therefore, it was considered quite likely that their
initial physical acceptance values would have been lower than average. As mentioned above, the current sample showed average initial values on physical self-worth scores, and from casual interaction with the children, it was clear that the majority of them enjoyed all kinds of physical activity. The present study contained more methodological controls than the Clance et al (1980) study, in that it used a placebo-control group whereas Clance et al. (1980) had an inactive control group. Neither group in the current study was offered any sort of reward for participation whereas the Clance et al. (1980) yoga group was provided with a snack after each session. In addition, they would likely have been affected by the special attention they received as a result of participating in the program, something which, the authors report, was considered a special privilege. The results of the current study therefore bring uncertainty to the conclusions drawn by Clance et al. (1980) that yoga can improve children’s perceptions of the attractiveness of their body.

The current findings also conflict with those reported in a quasi-experimental adult study by Engelman et al. (1982). That particular study examined body cathexis, also a measure of physical self-acceptance which is most closely related to the attractive body variable. After ten weeks the yoga group improved on body cathexis scores whereas the therapy group did not. The same arguments that were used in the discussion on global self-esteem could apply here, in that it is likely that the children were already more physically active than the adults enrolling in the yoga program. The current findings also contrast with those of the only other study found to date on this topic, by Cusumano and Robinson (1992). After three sessions of yoga, they found that physical self-efficacy in Japanese female university students actually decreased. Physical self-efficacy in that instance was measured by a scale containing a range of items some of which tap into the domains of physical self-worth. It is difficult to understand the current results in the light of the drop in the Cusumano and Robinson (1992) study; however the authors suggest that three sessions of yoga may have caused participants to reflect more seriously on their physical selves which might have led to a decrease in confidence, and three sessions were probably not enough for students to develop a sense of familiarity with the postures. Perhaps in all such programs an initial drop in physical
self-confidence might be expected as one is introduced to new movements, and this might eventually rise again with time as students begin to master the new techniques. Certainly the lack of consistent findings in this area provides grounds for further research into the effects of yoga on physical self-worth variables.

6.4 Pre-Post Session Effects of Yoga and Recreation

The hypothesis comparing mood change as a result of participating in yoga or recreation was partially supported. The results of the administration of the mood questionnaire before and after each session showed that anxious mood declined for the yoga group but not for the recreation group. This pattern was significant and increased in strength from the second session onwards. It was also reflected in the strong effect size for the yoga program on this variable, which explained as much as half of the variance between groups on the final session. No change trends were found in either group for depressed mood, which was already initially low. The demonstrated pattern of mood scores was reflected in the thematic content of the written answers to qualitative questions. When describing how they usually felt at the end of a session compared to at the start, yoga participants wrote for example, “I feel a lot calmer as though I can put up with everything”, “I felt tired and worn out at the start, relaxed and happy at the end”, and “I felt more relaxed more calm and less ‘hyper’”. Here, adjectives relating to anxiety rather than depression reduction were evident. These qualities are very different from those mentioned by the recreation group in response to the same question, where happiness was the main theme. Some examples of responses included, “As happy as when I came in”, “Happy”, and “Depended on what we did”.

Because the program incorporated a recreation control group, as proposed by Plante and Rodin (1990), it can be said with confidence that the drop in anxiety experienced by the yoga group was not merely the result of being given special attention (the Hawthorne effect), or of having successfully completed a novel task (potentially invoking pre-session performance anxiety). There is clear evidence to suggest that participation in leisure activities is associated with positive mood (Hull, 1991). Similarly, level of reported fun has been observed to be consistently related to positive affect (Wankel & Sefton, 1989). Mood has also been found to be positively
affected by social interaction (Berger et al., 1988). In this way, the recreation condition provided a strong comparative alternative to the yoga group, because not only did it account for the Hawthorne effect, it also controlled for social interaction and enjoyment. Children were asked to rate their enjoyment levels for the two programs. Both were rated equally (highly), indicating that enjoyment of the task was not sufficient to explain the mood differences between the two groups. This suggests that, over and above offering an enjoyable social experience, there was something else about the yoga which might have been responsible for the changes. It is possible that the sequence of alternately stretching, strengthening and relaxing the major muscles of the body, contributed to the reduction in anxiety observed for the yoga group.

In the absence of other research in this area, the results of the yoga group suggest that anxious but not depressed mood may improve in children as a result of taking part in yoga activities. This is interesting because, although adult studies confirm the view that yoga can lead to some kind of mood improvement, there has been no particular indication of certain kinds of mood being affected more than others. Baldwin (1999) reported only improvement in total mood score. Berger and Owen (1992; 1988) reported improvement in a range of mood states including reduced anger, tension, confusion and depression and anxiety. Harvey (1983) reported increased vigour-activity and decreased fatigue, depression, and total mood disturbance.

The demonstrated pattern of mood change also supports the trend in adult and child relaxation research, in which, of all the mood variables, improvements in anxious mood have been most consistently reported. As far as children are concerned, relaxation training has been found to alleviate anxiety in those who are already experiencing higher than average levels of anxiety (Chang & Hiebert, 1989). Even children with “normal” initial anxiety levels have reported reduced anxiety levels immediately post-relaxation exercises and also following a six-week relaxation program (Lohaus et al., 2001; Zaichkowsky & Zaichkowsky, 1984).

This result also confirms the view which is developing in the general physical exercise literature that it is possible to demonstrate immediate mood gains in non-clinical populations (Morgan, 1987). According to Morgan (1987), anxiety reduction
lasting up to two hours in normotensive subjects is the main benefit to be derived from acute exercise, while the evidence for short-term reductions in depressed mood is less solid (Martinsen & Morgan, 1997). The present result appears to support that contention. It also confirms the view that exercise need not be aerobic in order for participants to derive mood benefits (Berger & Owen, 1992). In terms of children’s exercise-mood studies, it supports the findings of Williamson et al. (2001) who observed that a 15-minute session of physical exercise lead to greater “positive mood” and reduced “negative mood” in nine to ten year old children. In that instance, two kinds of physical activity were used, both of which were considered aerobic: a fun run and playing with large rubber balls. The current results suggest that the parameters might be extended to include the notion that non-aerobic activity can also be mood-enhancing for children, as has been found among adults (Berger & Owen, 1992).

Despite the significant trends in mood produced in the first yoga group, these results need to be treated with caution. The sample was extremely small and generous significance criteria were used for the identification of differences. Further, the pattern of mood improvement was not replicated in the second yoga group, that is, the former recreation group. This issue, along with the further results of the second yoga group, are addressed in the next section.

6.5 Results of Replication Study

Contrary to expectations but in line with the findings from the main study, no significant changes were found in breath rate, global self-esteem, perceived strength adequacy, body attractiveness or stamina when the yoga program was delivered to the second yoga group. The group mean for change in heart rate did move in the predicted direction, but was not significant. The same arguments raised in relation to the main study (see Section 6.3), such as the indirectness of relaxation teaching methods, the brevity of the program and possible ceiling effects, could apply here to explain why the results did not confirm the hypotheses.

The only significant finding among the pre-post yoga program variables was an average improvement in perceived sports competence. This variable assesses the degree to which children feel comfortable about sports in general, and about trying new
physical activities. Given the generous significance criteria used, and the small difference in means found, this result can only be interpreted with caution; nonetheless a large effect size was reported. It suggests that the experience of practising the asanas, which could be regarded as novel and at times unusual postures, contributed to the children’s sense of confidence in their ability to take part in a variety of sports. From interaction with the girls it was clear that they enjoyed practising the postures outside the classes, and had been demonstrating them to friends and family. The enhancement of perceived sports competence found with this second yoga group was not produced with the initial yoga group.

The disparity between these two sets of results might be explained by differences in the nature of the two groups, something noted from casual observation and supported by the answers given to the qualitative questions. Although the initial check for group equivalence on pre-program measures (Table 2, Section 5.2.2) did not reveal any statistically significant differences between the two groups on sports competence, observers of both groups noted that the second yoga group was in general less physically agile and more distractible than the first group. They seemed to have greater difficulty managing the stronger asanas, and this was reflected in their list of dislikes for the program: doing difficult postures. This was barely mentioned by the first yoga group. Therefore, it is possible that the second group’s engagement with exercises which were at times difficult led to eventual feelings of mastery in certain aspects of physical activity.

As mentioned at the conclusion of the discussion of mood score changes in the main study (Section 6.4), no significant changes were found for the second yoga group in terms of anxious and depressed mood. Once again, observers noted that the second group was generally more distractible than the first yoga group. This could mean that they were less able to focus on what their current mood was. This point will be expanded upon in the discussion of measurement issues (Section 6.5). Furthermore, as noted in Tables 13 and 17 of the Results, several of the participants in the recreation group developed a dislike for the mood questionnaire. This could have influenced how seriously they took the mood measurement process. This argument is strengthened by
the fact that the group’s answers to the qualitative question, “How did you usually feel at the end of the yoga sessions compared to at the start”, did nonetheless show themes of relaxation and anxiety reduction. For instance, children responded, “We are all hyper before it and the yoga calms us down”, and “I felt much more relaxed”, and “I’d feel relaxed at the end unlike at the start”. Therefore, it is possible that the second yoga group did experience some anxiety reduction, but it was not reflected in their responses to the mood questionnaire.

6.6 Measurement Issues

It was noted in the review of mood measures (Section 2.4.1) that no standardized scales for measuring immediate mood in children appeared available (except for the PANAS-C which measures general positive and negative affect, rather than anxious and depressed mood). Both Williamson et al. (2001) and Sherr and Sterne (1999) thus developed their own mood scales for children in this age group. The current study followed the format used by Sherr and Sterne (1999) of Sandy the imaginary character who walks along a path to indicate his or her current mood. The adjectives for this study were derived from a pilot group of 7-11 year old children who produced their own words for anxiety and depression. Thus, there was reason to believe that the adjectives used in the scale were appropriate and meaningful for this particular age group. Reliability calculations indicated that the anxious mood and depressed mood items contained strong internal consistency and could be used to develop two scores, for anxious and depressed mood. As noted in the qualitative analyses (refer to Sections 5.5 and 5.8), several children in the recreation group, commented that they did not like Sandy, and they thought she was silly. The concept of Sandy had been used to make the questionnaire appear more user-friendly, and Sherr and Sterne (1999) did not report any such problems; however, if this scale were used again in the future, the Sandy concept would be omitted because the children were capable of understanding the instructions without it, and if anything it distracted them from the purpose of the questionnaire.

Another issue which arose from the use of the mood scale was the degree to which children are capable of articulating how they are feeling at any point in time. This matter was alluded to by Williamson et al. (2001) who said that they chose nine and ten
year old children for their exercise and mood study because they believed this was the youngest age group which would be capable of completing self-report mood questionnaires accurately. Just as an over-tired child can continue to be very active due to a lack of awareness of his or her own fatigue, it is likely that children who are very distracted are less able to focus on their own internal sensations and develop a reliable impression of their own mood state. Certainly, the group which did not report mood changes in the study was also the more distracted group according to external observers. Yoga theory posits that this phenomenon can occur not only in children but in adults as well (Iyengar, 2001). Because yoga draws attention to the body, which is the site of the physical sensations and physiological fluctuations associated with emotion, yoga is thought to make the practitioner more aware of his or her feeling states (Sivananda Yoga Vedanta Centre, 1996). If it is the case that children are less able to access their feeling states before a yoga class than after a yoga class, then self-report measures may be a less accurate form of assessment than external observation. The experience of observers of the yoga program was that both groups displayed calmer and more focussed behaviour by the end of the sessions; however, the problem with making formal use of external observation for measurement is the difficulty of categorising types of behaviour, of observing multiple children simultaneously, and of keeping external observers blind to the treatment condition.

The scale used to measure global self-esteem was the global self-esteem subscale of the Self-Perception Profile for Children (SPP-C) developed by Harter (Harter, 1985). The alpha coefficient indicated moderate to high reliability for the six questions used with this sample. Following the recommendation of a colleague, the response format was simplified to a simple four-point Likert type scale (R. Galligan, personal communication, August 9, 2001). This appeared to be successful as the children responded to all the questions and displayed an understanding of the instructions. It was concluded that because this scale was brief and easy to administer, it could be recommended with this format for use with future studies in the same area.

Most published scales of physical self-perceptions focus on physical appearance or body image and not on physical competence. The physical self-worth variables
investigated in this study were based on the multi-dimensional model developed by Sonstroem and Morgan (1989). The advantage of this model is that it includes the concept of physical competence, and thus provides a theoretical link between participation in physical exercise and global self-esteem. This study employed a slightly modified version of Whitehead (1995)’s Children’s Physical Self-Perception Profile (C-PSPP). The strength of this measure is that it is based on Fox and Corbin (1989b)’s Physical Self-Perception Profile (PSPP) for adults, a scale which was developed using open-ended data collection of large samples and has been positively reviewed as an exceptionally psychometrically sound assessment scale (Byrne, 1996).

Despite the theoretical and psychometric strength of the original scale, there were at least two weaknesses in the use of the C-PSPP for this study. The first was that the youngest age group tested to date with this scale was 10-12 year olds (Fox & Corbin, 1989). It would have been desirable, but was not within the scope of this study, to test the validity of the scale using open-ended questionnaires with the 8-10 year-old age group prior to the commencement of the program (Fox & Corbin, 1989). In the absence of this, a small pilot study determined the 8-10 year olds’ comprehension of the language and this led to some wording changes. The second weakness was the fact that there might have been specific physical self-efficacies developed through yoga which were not reflected in the domains of this scale. The C-PSPP measures perceptions of attractive body, sports ability, strength and stamina. Because yoga does not build cardiorespiratory fitness, the stamina variable for instance would have been less relevant to program outcomes. At the same time, the C-PSPP does not measure children’s perceived ability to relax, competency in balancing, or flexibility, three significant components of any yoga program. To this end, a scale specifically designed to measure perceived competency changes resulting from yoga could be developed. Alternatively, it might be possible to modify another scale such as the Physical Self-Description Questionnaire by Marsh and Redmayne (1994). This scale also measures physical self-competencies and has undergone rigorous psychometric testing (Marsh, Richards, Johnson, Roche, & Tremayne, 1994). It includes two subscales which might be of greater relevance to yoga practice: flexibility and coordination. Its disadvantages
are that it has not been tested on children younger than 12 years, and it is long, containing 70 items, which is more than twice the number of items in the C-PSPP.

For the present study, heart rate change was measured using optical pulse oximeters with finger probes. This apparatus proved practical because it was non-invasive and provided a reading quickly, with less disturbance, and more accurately than a traditional pulse count. In addition, children were interested in the finger probes and enjoyed using them. As discussed in Section 6.3.1, the current study followed the Gilbert and Orlick (1996) protocol where heart rate change was recorded over one minute. Because Telles and Vani (2002) have since reported that it may take up to five minutes for people to reduce their heart rates, it would be useful to extend the period over which heart rate change is measured. The only drawback of this proposal is that it dramatically increases the length of time that an experimenter spends with each child. The logistical issues of the number of children, number of machines, and total amount of time available for testing would need to be taken into account.

The results of the present study and the literature review revealed a great disparity in how heart rate in particular was measured. Greater clarity is needed to define heart rate. Certain fitness studies and long-term relaxation/yoga studies (lasting several months) focus on resting heart rate, a measure taken immediately upon waking, and said to reflect baseline levels of heart rate. On the other hand, short-term relaxation/yoga studies are unlikely to show differences in baseline levels of heart rate. Therefore, it is more practical to look at heart rate as a skill (the ability to reduce heart rate over a specified period of time) or as a state (reduced heart rate at a particular point in time). If relaxation techniques are being offered in a less overt way, as part of the program experience, then it would be possible to measure heart rate immediately pre- and post-session, as a measure of physiological state. Cusumano and Robinson (1992) used a version of this method, taking a heart rate reading before Session 1 for a baseline measure, and then using the average of each of the three post-session readings to obtain a difference measure. This does offer a measure of change in heart rate pre- to post-session, but it would have been better to take a pre-session measure before every session, rather than just prior to the very first session, because the unfamiliarity with the
program would probably have led to an unusually high heart rate prior to Session A, therefore inflating the difference results. Alternatively, if relaxation is being deliberately taught as a skill where children can eventually guide themselves through their own relaxation, then the method used by Gilbert and Orlick (1996) and Telles and Vani (2002) measuring heart rate change over a set number of minutes would be an appropriate pre-post program comparison. Simply measuring pulse before and after a relatively short-term program, as was conducted by Smith (1984), Telles and Srinivas (1998) and Zaichkowsky and Zaichkowsky (1984; 1986) arguably does not provide enough information as to whether this heart rate is simply a reflection of preceding activity levels or is a self-generated state. Thus, it is argued that methods for measuring heart rate need to be employed in a more regulated fashion, so that greater clarity can be created regarding the nature of the outcome variables. The interpretation of the current results in the light of the literature suggest that, due to the brevity of the study and indirectness in the teaching of relaxation skills, measurement could be improved by noting heart rate as a state immediately pre- and post each session.

The breathing rate protocol followed that of Zaichkowsky and Zaichkowsky (1984; 1986). This was easy to administer and could be used in conjunction with the heart rate measurements. Therefore it is recommended for future studies which require a simple assessment of respiration rate.

### 6.7 Methodological Issues

One of the strengths of this particular study was that, unlike the majority of studies in this area, it employed a placebo control group and randomly allocated participants to the two groups. The majority of adult yoga studies have used pre-formed groups (Engelman et al., 1982; Berger & Owen, 1988; Berger et al., 1988; Williams, 1992; Rudolph, 1981; Sahajpal & Ralte, 2000). Past research has demonstrated the power of special attention, quiet resting, and simple distraction to lead to reported improvements particularly on psychological variables (Morgan, 1997). Other children’s yoga studies have used games (Telles et al., 1997), other sporting exercise (Smith, 1984) and gardening (Telles & Srinivas, 1998), or a “waiting list” control (Clance et al., 1980). Of course, the truly “inert” placebo in exercise research is an ideal rather than a
reality. If one is interested in evaluating the whole yoga experience rather than unpacking the particular elements which make up yoga, then one must find a comparative activity which is neither a form of relaxation nor a form of exercise. Following the recommendation by Plante and Rodin (1990), a program of recreation activities was created. The recreation group was considered a better form of control group than watching a video or story reading because as well as countering the Hawthorne effect, it also mitigated the effects of social interaction and participation in an enjoyable creative activity. Berger et al. (1988) have noted the power of social interaction to enhance mood, and a study by Williamson et al. (2001) which used video-watching as a control activity, found that watching a video could actually increase negative mood in children. This study could have been strengthened, however, with the use of a third waiting list group that did not receive any activity at all. Alternatively, O’Halloran, Murphy and Webster (2002) recently proposed a substitute to the placebo approach. Acknowledging the difficulties associated with the use of placebo groups in exercise studies, they developed a scale to measure participants’ beliefs about mood improvement following exercise. If administered prior to the program under investigation, this would provide a useful measure of participants’ expectancies of program outcome.

One of the central methodological problems of this study was the small number of sessions administered to participants. This decreased the chances of changes occurring in pre-post program variables. Lack of resources and the need to limit the percentage of dropouts over time led to the delivery of a relatively short program. Even though some studies have found positive change following very short programs (Cusumano & Robinson, 1992; Clance et al., 1980), this study produces evidence confirming Zaichkowsky and Zaichkowsky (1986)’s view that a greater length of time might be needed to effect changes in relatively stable psychological variables such as global self-esteem, and to train children to a point where they are capable of bringing themselves to a state of relaxation.

The interpretation of the results was also limited by the small sample size. Conclusions drawn from the data can only be speculative and would need replication
with a larger sample in order to confirm any trends. Although several of the Indian studies have used intensive daily programs (Telles et al., 1997; Telles & Srinivas, 1998; Telles & Vani, 2002; Sahajpal & Ralte, 2000), it seems that such a regimen would be difficult to employ in a Western context. The program schedule of two classes per week already prevented certain interested children from taking part.

A fourth issue was the nature of the sample used in the study. Girls in this project attended a private school, which meant it was very likely that they came from families with a high socio-economic status and had the self-confidence which is often associated with that status (National Health Strategy, 1992). Within this group, the process of volunteering to take part in the program probably also resulted in the selection of children who already take an active interest in exploring new activities, a concomitant of high self-esteem (Byrne, 1996). This was reflected in their average to high ratings on all psychological variables prior to the commencement of the program. Another aspect of this sample, which was noted in the discussion of self-esteem results (Section 6.3.2), was that it was clear from interaction with the girls that they were already very physically active outside of the yoga class. The consequence of all of this is that, as has been found in the physical exercise and relaxation literature, they would be less likely to exhibit improvements than a group of children from lower socio-economic backgrounds who had fewer resources or opportunities to take part in other physical activity (National Health Strategy, 1992).

Finally, a number of limitations of the delivery of the yoga program itself also need to be taken into account. Class formats for the program are outlined in Appendix C and the manner in which the yoga classes were taught were detailed in the procedures (Section 4.6.5). Factors which limit the replicability of the program include the personality of the yoga teacher and the nature of the sample (Cusumano and Robinson, 1992). To counteract the effect of instructor’s personality, the study could have used a larger sample, split into multiple yoga classes and run by multiple yoga teachers. This would have required greater resources which were not available for the present study; however, the effect of the nature of the group was somewhat counteracted by the replication study (where the recreation placebo group became the second yoga group).
As was noted in the procedures (Section 4.6.5) the second yoga group was more excitable than the first, and this necessitated a slightly different teaching style which omitted partner work and incorporated more instructions during relaxation. It is possible that the prior experience of participation in the recreation placebo group led to a greater socialization of the participants, which made them more excitable. Whatever the causes of the differences between the two groups, the fact that the mood trend found in the first group was not reproduced in the second group, could point to factors arising from the particular instructor-group interaction.

### 6.8 Recommendations for Future Research

A number of issues raised in the literature reviewed in Chapters 1 and 2 and in the discussion of current results form the basis for recommendations for future research. It is clear that research into the effects of Western yoga programs is still far behind that of general exercise and relaxation programs. Systematic examinations of the effects of yoga on child populations are scarcer still. This study only focussed on a small number of indicators of positive health, although there is a great deal of scope to investigate a wide range of outcomes ranging from disease management to subjective wellbeing. The following recommendations flow more specifically from the outcomes on the indicators used in the current study.

The exercise literature has been quick to integrate physical self-worth and global self-esteem as well as the notion of physical self-efficacy into its models and measures. The case was made in Section 3.4.2 for the need to incorporate such indicators in yoga and relaxation research. To date, self-esteem has only been examined occasionally, and as far as physical self-perceptions are concerned, only some variations of physical self-acceptance have been included (except for the most recent Tai Chi study conducted by Li et al., 2002). Yet the tentative results of the follow-up study suggest that yoga might enhance confidence in physical activities in children who are less physically agile. Theoretical work needs to be undertaken in the field of yoga to understand more about what kinds of changes in physical self-perceptions might take place. This might include exploring changes in self-perceived flexibility, balance and relaxation as contributors to physical self-worth (see Section 6.6). Future research could
focus on the development of a scale to measure specific self-efficacies which might develop through the practice of yoga.

The current study focussed on two main mood variables, anxious and depressed mood, which form part of the emotional component of wellbeing; however, cognitive aspects also need to be addressed. One important aspect that is pertinent to yoga studies is concentration or attention (Hopkins & Hopkins, 1979). Given the high percentage of school children said to suffer from Attention Deficit Disorder, yoga has the potential to offer children training in the development of concentration capacity, and some research has already begun to this end at a Sydney Hospital (R. Manosha, personal communication, February 28, 2002).

There is also potential for the physiological substrates of wellbeing to be investigated in more depth. Regarding the physiological variables examined in the current study for example, it is possible to examine respiration in greater detail, such as not only recording breathing rate but also breathing regularity and breathing type as an indicator of relaxation (e.g. primarily in the chest or in the abdomen; (Morse et al., 1984).

A new and developing area of physiological research is the monitoring of circulating hormone levels in conjunction with exercise and relaxation (Kirschbaum & Hellhammer, 1994). A few investigators have started to explore the effect of yoga on certain stress hormones such as adrenalin and cortisol in adults, obtaining significant results where trained practitioners were used (Schell, Allolio, & Schonecke, 1994; Kimura, Ohno, Kumano, & Kimura, 2000). No studies have been found to date examining the effects of yoga on children’s hormone parameters.

From the review of the methodological issues discussed in Section 6.7, it seems that it would be better to use longer programs for the examination of relatively stable variables. Given the practical difficulty of introducing programs which involve a commitment of more than one session a week, it is recommended that future research in this area concentrate on weekly sessions for a minimum of 10 weeks, to counteract the lack of frequency of the sessions. Previous familiarity with yoga needs to be controlled for. More importantly perhaps, as was discovered during the course of this research, the
level of physical activity engaged in besides the yoga class needs to be taken into account. Finally, where possible, replication of yoga programs is required with larger numbers of students in order to draw any firm conclusions as to the specific effects of yoga on children.

6.9 Implications for Health Research

In the introduction to this thesis, it was pointed out that primary prevention is a cost-effective strategy for the enhancement of wellbeing in the population (National Health Strategy, 1993). Cowen (1994), a well-known writer in the field of the promotion of psychological wellbeing has argued that primary prevention involves not just risk reduction but also the active enhancement of positive health. This means, at its broadest level, that health promotion is proactive, is available to the whole population, includes a focus on children because of the habits and skills which can be acquired with ease at this age, and it is also ongoing. One of the implications of the literature reviewed and the results of this study is that positive health cannot be achieved through finite prescriptions of isolated interventions. Positive health appears to be a dynamic and ongoing process. Berger and Owen (1992; 1988) and others (Martinsen & Morgan, 1997) in their studies of yoga and other forms of exercise with normotensive subjects found that the positive mood effects of such activities are significant yet transitory rather than cumulative. This means that physical activities such as these need to be practised regularly in order to continue to enjoy their benefits. A positive effect of yoga on mood was observed immediately post-session for the main yoga group in this project, supporting the notion of momentary mood improvement. The steady increase in mood gains found over the course of the program can be explained by the growing impact of the yoga practice as the children became more familiar with the postures and processes.

On the basis of their findings within the physical exercise literature, Berger and Owen (1992) elaborated a taxonomy of mental health-enhancing forms of exercise. The list included activities which were pleasing and enjoyable, aerobic or facilitated abdominal breathing, non-competitive, temporally and spatially certain, and repetitive or rhythmical, and of moderate intensity. This list is useful because it generates
discussion as to the parameters of physical activities which might promote mental wellbeing. The reduction in anxious mood found in the first yoga group, albeit qualified by the non-replication in the second yoga group, supports the view that yoga fits into this taxonomy. Further work needs to be undertaken to determine whether the same taxonomy applies to children or whether different elements might be more important with this population. Certainly, as reported in the mood score analyses (see Section 5.4), the element of enjoyability was present in the current program. Enjoyment has been found to be a critical factor in motivating people to take part in physical exercise (Wankel & Berger, 1989). Less has been written about this factor in relation to adherence to relaxation programs. Nonetheless, it is reasonable to suggest that this element is particularly important with regards to children’s participation in various health-promoting activities. The fact that many of the children who took part in the free after-school program requested that yoga be offered on an on-going basis at the school is a reminder of the motivating power of enjoyment (see Section 5.5).

The active enhancement of positive health also implies the generation of skills or competencies for successful adaptation to changing life circumstances. As argued by Gilbert and Orlick (1996), Zaichkowsky and Zaichkowsky (1984), Setterlind (1983) and Prilleltensky and Nelson (2000), this needs to include equipping children with stress control, self-management and coping skills. Following this view, the assessment of physiological indices of self-relaxation formed part of the current study. By the end of the six-session program, children did not indicate significant learning in this area. It is quite likely that a longer training period would be needed for the development of the skill of self-relaxation. This highlights the importance of longitudinal studies especially in the field of positive health. Rather than determining the presence or absence of a sickness, positive health implies acquiring skills and changing habits in everyday living. Such changes tend to be incremental and take time to become evident.

Finally, although yoga itself has and continues to be used as a form of therapy to manage and help treat symptoms of disease and disorder (Jain et al., 1993; Nagarathna & Nagendra, 1985; Patel, 1993), it was originally designed to be practised by average healthy people to move them further along the positive health continuum (K.
Desikachar, personal communication, October 26, 2002). As such, it fits well with the philosophy of health-promotion strategists. Perhaps the biggest challenge facing yoga researchers is the diversity of yoga practices and the deeply intra-personal nature of their topic. As noted in the discussion of Western yoga practices (refer to Section 3.2), a great variety of styles of yoga have evolved over the years, and the nature of classes can vary substantially from teacher to teacher. Therefore, it is difficult to make any broad generalisations about the effectiveness or otherwise of “yoga”. Greater specificity may be required when researchers report the methodologies of their investigations. Furthermore, yoga’s migration to Western shores has necessitated its translation into a medicalized framework which values externally observable and replicable phenomena over subjective individual ones. This has been reflected in the current thesis which sought to locate Western yoga practices within the fields of physical exercise and relaxation outcome studies and thus runs the risk of reductionism. If, as Patanjali’s Yoga Sutras say, the heart of yoga is the stilling of the whirrings of consciousness (Feuerstein, 1990), then perhaps the meeting between Western empiricism and yogic tradition will strike a balance in a health research methodology which includes not only quantitative data collection but also more qualitative, phenomenological approaches.

6.10 Summary and Conclusions

In sum, this study did not find significant changes in the yoga group compared to the recreation group by the end of the programs on the pre-post program variables of heart rate change, breathing rate, global self-esteem and the physical self-worth variables; however, significant reductions in anxious mood were found for the yoga group from the second session onwards, where no changes were recorded for the recreation group. Neither program had any effect on self-reported depressed mood. In the replication study, heart rate change, breathing rate, and global self-esteem also did not change significantly. Only one physical self-worth variable, self-perceived sports competence, improved slightly by the end of the program. In addition, the pattern of mood changes reported in the main study was not repeated in the second yoga group. No changes were reported for pre- and post- session anxious and depressed mood.
Given the major limitations of the very small sample size and the brevity of the study, these findings were interpreted as tentative and exploratory.

This research represents an inquiry into a much under-studied field of practice. Within the limitations of a brief program on a small yet randomised sample, it was possible to demonstrate that yoga is less likely to affect children’s self-esteem or evaluation of their physical selves, particularly if they already have high self-confidence and play other sports. On the basis of the results, it is suggested that yoga might need to be taught over a longer period of time and with greater emphasis on overt relaxation skills if children are to learn how to relax themselves voluntarily. Although yoga was not found to alter depression, it seems to have the potential to play a role in reducing short-term anxiety as was found in reduction of children’s anxiety scores in the first yoga group and answers to the qualitative questions of both yoga groups. These findings signify a stepping-stone in the exploration and clarification of health parameters that relate best to the study of yoga in children, and offers direction for future more in-depth investigations.
References


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