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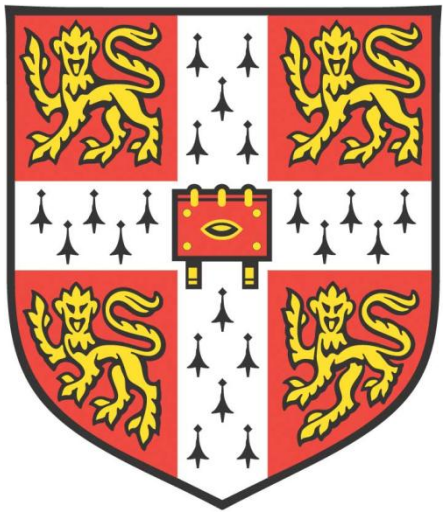
PROFILING EMOTION REGULATION: EXPLORING PATTERNS OF REGULATION IN CLASSROOM BEHAVIOUR



This dissertation is submitted for the degree of Doctor of Philosophy

Lysandra Sinclaire-Harding

Darwin College

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PROFILING EMOTION REGULATION: EXPLORING PATTERNS OF REGULATION IN CLASSROOM BEHAVIOUR

LYSANDRA SINCLAIRE-HARDING

SUMMARY

Emotion Regulation describes the ability to influence the experience and expression of affect. Adaptive emotion regulation contributes to healthy development, social competence and academic success (Kochanska, Murray & Harlan, 2000). This study investigated the behavioural strategies for emotion regulation, emotion expression, regulatory styles and classroom behaviour in middle childhood. One hundred and twenty-eight children were recruited from five UK public and private primary schools. From within their school setting, participant sensitivity to emotion-eliciting events was recorded using ambulatory skin conductance technology whilst age-group paired children performed two LEGO construction tasks. Observed behaviours were video-recorded and coded to establish frequencies of distinct regulatory behaviours. These were compared to self-reports of emotion regulation strategies and teacher-reports of classroom behaviour. Iterative partitioning cluster analysis methods were used to identify four regulatory profiles: 1) the 'Adaptive' cluster: employed high levels of positive problem solving and reappraisal strategies and frequently expressed both positive and negative emotions; 2) the 'Maladaptive' cluster: used more negative regulation (avoidant or obstructive strategies), expressed more negative emotion and had more social and behavioural problems in class; 3) the 'Reactive' cluster showed high levels of electrodermal activity, expressed little emotion and were reported as inattentive/hyperactive in class; and 4) the 'Distracted' cluster demonstrated high levels of behavioural and cognitive distraction. These results indicate four meaningful profiles that could support the identification of vulnerable individuals for positive school-based intervention and support.

This work is dedicated to my parents.

How I wish I could have been there in their childhood to protect them from the adversities they both endured. With all that I have learned, having now completed this work, I see just how remarkable their recovery has been and how resilient they are.

DECLARATION

This dissertation is the result of my own work and includes nothing, which is the outcome of work done in collaboration except where specifically indicated in the text. It has not been previously submitted, in part or whole, to any university of institution for any degree, diploma, or other qualification.

In accordance with the Faculty of Education guidelines, this thesis does not exceed 80,000 words, and it contains less than 150 figures.

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Lysandra Sinclaire-Harding, MPhil, PGCE, BA

_____

Date

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List of Abbreviations and Acronyms

AMP	Amplitude
ANS	Autonomic nervous system
AUC	Area under the curve
EDA	Electrodermal activity
ER	Emotion regulation
ERICA	Emotion Regulation Checklist for Children and Adolescents
FSM	Free school meals
NsSFs	Non specific skin conductance fluctuations
PPM	Peaks per minute
SCL	Skin conductance level
SDQ	Strength and Difficulties Questionnaire
SEN	Special educational need
SNS	Sympathetic nervous system

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SUMMARY

Emotion Regulation describes the ability to influence the experience and expression of affect. Adaptive emotion regulation contributes to healthy development, social competence and academic success (Kochanska, Murray & Harlan, 2000). This study investigated the behavioural strategies for emotion regulation, emotion expression, regulatory styles and classroom behaviour in middle childhood. One hundred and twenty-eight children were recruited from five UK public and private primary schools. From within their school setting, participant sensitivity to emotion-eliciting events was recorded using ambulatory skin conductance technology whilst age-group paired children performed two LEGO construction tasks. Observed behaviours were video-recorded and coded to establish frequencies of distinct regulatory behaviours. These were compared to self-reports of emotion regulation strategies and teacher-reports of classroom behaviour. Iterative partitioning cluster analysis methods were used to identify four regulatory profiles: 1) the 'Adaptive' cluster: employed high levels of positive problem solving and reappraisal strategies and frequently expressed both positive and negative emotions; 2) the 'Maladaptive' cluster: used more negative regulation (avoidant or obstructive strategies), expressed more negative emotion and had more social and behavioural problems in class; 3) the 'Reactive' cluster showed high levels of electrodermal activity, expressed little emotion and were reported as inattentive/hyperactive in class; and 4) the 'Distracted' cluster demonstrated high levels of behavioural and cognitive distraction. These results indicate four meaningful profiles that could support the identification of vulnerable individuals for positive school-based intervention and support.

1 INTRODUCTION

According to epidemiological studies, between 8 and 15% of school children exhibit moderate to clinically significant emotional and behavioural problems (Campbell, 1995; Meltzer, Gatward, Goodman, & Ford, 2003). The longitudinal Millennium Cohort Study found 8% of 7 year-olds have serious behavioural problems, with a further 6% at the borderline (Brown & Schoon, 2010). In school, such problems: interfere with the ability to engage in classroom learning activities, undermine development of social relationships with peers, and predict future social and academic difficulties (M. Richards et al., 2009). Where problems are assessed and identified as clinically significant children may receive one-to-one intervention from supporting educational or clinical services. However, such assessment or intervention is unlikely to be offered to individuals with difficulties that do not meet clinical thresholds of severity. Nevertheless emotional, behavioural or conduct problems for these children can have an enormously detrimental impact on their attention and learning over time, as well as that of their peers (Osher, Bear, Sprague, & Doyle, 2010), and a lack of diagnosis of incipient problems has been identified as a risk factor for emotional disorders in adulthood (McCrory, De Brito, & Viding, 2010).

Whilst psychology and education researchers increasingly seek to better understand the impact of emotions on student development and achievement, teaching practice seems at some distance from acknowledging the reasonably

well-established laboratory findings that emotions considerably influence aspects of cognition heavily relied upon in education (Immordino-Yang & Damasio, 2007). Traditionally the role of the educator is to re-enforce student behaviour conducive to achieving curricular targets. Teachers are unlikely to be trained to consider the emotions that encourage or discourage such behaviours and may be less concerned with acknowledging or supporting the presence of emotional antecedents that negatively or positively influence learning. Problem behaviours and their associated emotions are often not well understood or optimally managed in schools and in some cases punitive disciplinary procedures can exacerbate rather than alleviate emotion and behavioural problems (Osher et al., 2010).

The proposed study is justified by the personal experience of its author. During thirteen years of teaching practice and classroom observations I have seen children delightfully curious about a learning challenge whilst conversely observing disruption to a child's motivation, perseverance and conduct after a negative emotional experience. These affective catalysts have substantial consequences on individual learning and whole-class teaching. From my own classroom practice, and as a trainer to other teachers and support staff, I have noticed that educators have little awareness of the knowledge reasonably well established in psychological research: that individuals regularly displaying challenging behaviour and conduct problems in class are at risk of developing adolescent and adult mental health difficulties, anti-social or criminal behaviour (Sainsbury Centre for Mental Health, 2009). In schools, many misconceptions exist regarding the possible causes of such problems or what they might suggest for potential outcomes in later life. Often, parents are unwilling or unable to support the school and little background detail is available to class teachers that might explain potential causes of worrying behaviour. Strategies to support these children and initiate positive changes to disruptive behaviour are it seems, often only discovered through trial and error.

In such family situations, parents may be unaware of the impact of stress factors on the well-being of a child, or they may be sensitive to associated social stigma (McCrory et al., 2010), which may mean that problems are not acknowledged or

addressed. In more severe circumstances of emotional, physical or sexual maltreatment, parents may actively avoid seeking intervention or support (Glaser, 2000). Outcome predictors are uncertain and depend upon a multiplicity of factors including internal genetic predispositions and external environmental factors such as socio-economic status, parental support and education environment.

Conceived against this background, this project seeks to provide greater understanding of the hidden factors that influence the emotional and behavioural responses typically on display in the classroom. Combining a physiological measure of skin conductance, together with observational, self report and teacher report questionnaires of emotion regulation and behaviour, it is hoped that the results will provide valuable information for the identification and support of children whose early experiences may have led to struggles in adapting to the demands of the school setting. It is hoped that this research will be valuable not only to practitioners who witness and respond to complex behaviours in school each day but also will build upon existing research that seeks to better understand the individual differences in physiological factors at play in vulnerable children whose future emotional well-being would likely benefit from early support and intervention (Viding, McCrory, Blakemore, & Frederickson, 2011).

Psychological studies show that emotionally neglected children are socially withdrawn, inattentive and cognitively underachieving in their elementary school years (Egeland, 2009). Whilst emotions and their regulation have become a primary focus for researchers in cognitive and neuro-psychology, education research has been slower to engage in this domain. This historical neglect may be reflected in the prevailing attitudes within many classroom cultures that consider emotions as detached from cognitive capacities and reinforced by guidelines that encourage separate timetabling of social and emotional aspects of learning from traditional curricular subjects.

In the UK, there has been some acknowledgement of the importance of developing positive emotion regulation from policy makers, with the introduction of curricular targets that require teachers to support students to “recognise,

name and deal with their feelings in a positive way" (Department for Education and Department for Education and Employment, 1999). However, many mainstream classroom practitioners detach the teaching and timetabling of socio-emotional aspects of learning from the cognitive thinking skills taught in formal topics such as Mathematics and Science. The pressure and priorities for schools are for academic achievement, which may be compromised by antisocial, disruptive or aggressive behaviours. Improved understanding of the external and internal influences on affected individuals, and the interplay between both, should provide insight and justification for more effective interventions.

Thus far, there has been little progress towards placing the young 'maladapted regulator' into the context of life-long experience and predicted expectations. Yet socio-emotional problems in childhood cast a long shadow. In the fourth and previous edition of the Diagnostic and Statistical Manual of Mental Disorders, maladaptive emotion regulation was linked to psychological problems implicated in over half of the Axis I and all of the Axis II disorders (American Psychiatric Association, 2000). Now, in recognition of its central role in mental health, emotion regulation (or dysregulation) has been recognised as part of the very definition of a mental disorder (American Psychiatric Association, 2013). For example, conduct disorder affects about 6% of all those aged between 5 and 16 (M. Richards et al., 2009). Early onset (under age 10) is particularly likely to result in persistent difficulties. In addition to those with a clinical diagnosis, much larger numbers display early conduct problems, which whilst below the threshold for a clinical diagnosis, still increase the likelihood of adverse outcomes in later life, including offending.

Teachers are well placed to identify problems and schools can provide the possibility for relatively low-cost interventions (such as Social Emotional Learning Programmes, e.g. Osher et al., 2010; Wyman et al., 2010) via the creation of secure classroom environments in which children with emotion regulation difficulties can be identified and targeted (National Institute for Health and Clinical Excellence, 2006).

Emotion regulation competencies are taught in classroom curricula (Greenberg, Kusche, Cook, & Quamma, 1995) such as Circle Time in the UK (Kelly, 1999) and

various interventions have been tested (e.g. Rochester Resilience Project in the USA: Wyman et al., 2010). These include anger control skills (Lochman, Coie, Underwood, & Terry, 1993), strategies to reduce 'downward emotional spirals' taught in interventions for depression (Asarnow, Scott, & Mintz, 2002) and increasing tolerance of distress to reduce children's self-harming (Katz, Cox, Gunasekara, & Miller, 2004). Such interventions have proved effective in the alleviation of problems of depression and disruptive behaviour. However, the impact of social emotional education interventions varies and few have demonstrated long-term generalised benefits (Wyman et al., 2010).

The proposed project may therefore be of interest to researchers and practitioners seeking to develop effective interventions. From a comprehensive review of published research into emotion regulation, this is believed to be the first study of its nature to be carried out within the classroom setting. Using multiple methods of data collection, this research will record physiological reactivity to elicited emotion during a collaborative problem solving task. These internal indicators of emotion sensitivity will be compared with in-situ observations of outward displays of emotion regulatory behaviours and combined with participant and teacher reports of emotion regulation competency. Combined analysis of this data will provide in-depth assessment, at the level of the individual, of emotion reactions and their corresponding behaviours within the school context.

Middle childhood (6 to 10 years old) is believed to be a sensitive window for the maturation of emotion regulation (Shonkoff, Boyce, & McEwen, 2009), during which period the child increases contact with adults and peers outside of the home. At school, these relationships provide contextually appropriate opportunities for observing a child's range of diverse regulatory strategies. Children in middle childhood report that talking to a peer about their emotions is comparably effective to seeking support from an adult, indicating the increasing salience of peer relationships in children's social-emotional lives (Waters & Thompson, 2016). Furthermore, since the development of emotion regulation competence is integrally related to environmental factors, identification and intervention in these middle years offers great hope for the child's future. By

adolescence, patterns of emotion regulation may be entrenched and difficult to modify (Calkins, 2009). For instance, in older children, *over-control*, inhibition or suppression of negative emotion is associated with greater internalising problems, such as anxiety (Suveg & Zeman, 2004), whereas *under-controlled* negative emotion has been linked to greater externalising problems such as conduct disorder (Eisenberg et al., 2005). Greater understanding of the individual differences in emotion regulation in the middle years is required in order to develop positive interventions at this age where they may be more effective (and cost effective) in preventing the health and economic burden linked to adult mental-health than in later stages when developmental trajectories have already been established.

Relative to early childhood and adolescent age groups, middle childhood has been relatively neglected in emotion regulation research. In their 2013 meta-analysis of children's emotion expression, only 28 of the 164 studies reviewed involved children between the ages of six to 12 years (Chaplin & Aldao, 2013). Many questions remain with regards to how social contexts can facilitate effective development of emotion regulation in children. Efforts to design effective interventions are hindered by an incomplete knowledge-base regarding the range of subjective differences in internal physiological responding and how these relate to corresponding emotion regulatory strategies that unfold across childhood and adolescence (Cole, Martin, & Dennis, 2004). Studies of emotion regulation in applied settings are often reliant upon self-report questionnaires (J. Zeman, Klimes-Dougan, Cassano, & Adrian, 2007) and interviews (e.g. McDowell, O'Neil, & Parke, 2000). Such 'off-line' methods provide assessments either *before* or *after* a task and rely heavily on the individual's self-awareness of feelings and behaviour. This may be especially challenging for young children who are still developing vocabulary and self-awareness. In studies investigating metacognitive processing, very little correspondence is found between off-line behaviour reports and those taken on-line, or *during* the actual task, even when the former are administered retrospectively (Veenman & Hout-Wolters, 2003). To reduce the impact of such a confound, multi-method designs are recommended (Veenman, Van Hout-Wolters, & Afflerbach, 2006) that lessen reliance on self-

awareness and support the analysis of behavioural responses that take place during the task itself.

In accordance with such advice, a central goal for this study is to incorporate both online and off-line measures of emotion reactivity and regulation in order to understand the optimal and non-optimal strategies that children adopt in order to regulate their emotions in class. Among the methods included, a physiological measure of skin conductance is used to facilitate the identification of individual variability in emotional reactivity to classroom-based problem solving tasks. This data will be compared with the regulatory behaviours and emotions observed in-situ and then considered in relation to general behaviours and tendencies reported by both participant and their teacher.

This thesis is structured into five chapters, beginning with this Introduction. Chapter Two summarises the theory and evidence from the research literature on emotion, emotion regulation and its relevance for understanding the psychological disorders most often observed in school. From this critical evidence, this chapter justifies the relevance of this study and raises the central questions of concern to this thesis. Chapter Three summarises the data-collection methodologies most typically utilised in a project of this nature, as well as providing necessary justification of the screening questionnaires, behavioural tasks and physiological measures selected for the present project. This chapter provides an explanation of the decisions related to the study's design as well as the approach taken for data analysis. Chapter Four reports the findings of this study and is separated into four sections, which address each of the four research questions in turn. The chapter begins with reporting the result of the analysis at the whole-group level, before considering patterns from within the identified groups. Finally, Chapter Five presents the final discussion. This chapter summarises the main findings of the study in respect to the existing body of literature, acknowledges the study's limitations and discusses its contributions and implications for future research and practice.

2 REVIEW OF PRIOR LITERATURE

2.1 Introduction

Great efforts are underway to understand emotion regulation from a range of research traditions and perspectives that include child development, cognitive psychology, neurobiology, sociology, temperament and personality, metacognition and self-regulation. Debate and discussion continue over the many theoretical and empirical questions that remain unanswered in respect of emotion and its regulation. For instance, researchers have yet to agree a single definition of emotion regulation, theoretical conceptualisations differ and gold-standard measures have yet to be agreed. As such, attempts to test a theory in applied research with still so many questions to be resolved, may seem premature. Nevertheless, as far as understanding emotion and behavioural concerns that impact children and their teachers throughout classrooms across the world, there are obvious limitations for what can be gleaned from laboratory studies that experimentally manipulate the elicitation of emotion and prescribe instructions for corresponding regulatory responses. One area of accord between authors in the field is that applied research is a priority for providing real-world understanding of emotion regulation in context (Aldao, 2013).

The focus of this chapter is thus to review the existing research in respect of emotion regulation. It begins with a description of the functional nature of

emotion and leads on to describing the development of early regulatory behaviours. Whilst acknowledging alternative perspectives on the topic, James Gross's (1998b) theoretical framework of emotion regulation is presented with a view to raising the central research questions for the current enquiry. In respect of these questions, relevant literature on individual differences in physiological reactivity, emotion and behavioural problems, and gender is also included. Where available, the focus of the contributing literature is drawn from studies conducted with children and considered in respect of the education context.

2.2 How important is emotion regulation?

Since the work of Harry Harlow (Harlow, 1971; Harlow, Harlow, & Suomi, 1971) psychologists have known that positive social and emotional communication plays a vital role in child development and that adaptive emotion regulation is critical for mental and social well-being (Ochsner, Bunge, Gross, & Gabrieli, 2002; Thompson & Calkins, 1996). Social and emotional development in early childhood is directly linked to a child's later ability to adapt to new social settings such as school, to form emotionally supportive relationships and to sustain attention and motivation for new learning to occur. A child that has learned to adaptively regulate their emotions is able to calm himself when anger is roused, soothe himself when upset and in such circumstances, redirect his attention to aspects of interest and happiness. Such emotion regulation capabilities develop early in infancy and depend largely upon positive environmental experiences that are reflected in the infants increasing functional maturity. Caregiving routines that stimulate a child's curiosity, that provide support and structure for activities and sensitively respond to and manage a child's emotions provide the optimal environment for promoting early cognitive, socio-emotional and neurobiological growth required to successfully and adaptively manage emotions in adulthood (Thompson, 2001).

2.3 The nature of emotion

In advance of considering how emotion is regulated, this section will clarify the nature and function of emotion. The development of regulatory abilities across

infancy and childhood is considered in this section, followed by a discussion of the role of emotion in supporting, or at times, impeding the development of social competencies required for success in the school context.

The current thesis broadly adopts a functionalist view of emotion. From this perspective, emotion serves an adaptive function that supports our ability to understand and navigate our physical and social environment. This view submits that to some degree, emotions have a biological basis. A brief overview of some of the key classical and contemporary literature supporting this view is provided in the paragraphs that follow.

For many decades psychologists viewed emotions as being in conflict with reason or rational behaviour (Leeper, 1948). In the mid-1880's James-Lang theory controversially proposed that emotions are no more than the experience of bodily changes (muscular tension, elevated heart-rate, perspiration and dryness of mouth) that occur in response to arousing stimuli (Ellsworth, 1994). This theory remained influential and is supported by evolutionary theorists (e.g. Izard, 1977; Plutchik, 1984) who view emotions as a facility to help the human organism adapt to the demands of its environment and thereby maximise the chances of survival.

This view was challenged by scientists conducting investigations of brain lesions in animals. Buried deep within the sub-structures of the brain is the so-called *limbic system*. Its anatomical parts were first identified in the nineteenth century and include the amygdala and the hippocampus; structures that are known to be involved with emotion (LeDoux, 1998). In surgical experiments, (Cannon, 1929) and (Bard, 1928) removed the cortex from the brain of cats. They found that freeing the limbic circuit from cortical control allowed uncontrollable emotion, such as rage, to be displayed. This early evidence suggested that cognitive function cannot be isolated from emotional influence.

These findings from laboratory animals were first supported in humans by the work of behavioural psychologist Richard Lazarus (Richard S Lazarus, Coyne, & Folkman, 1984). In what he likened to a marriage between thought and emotion, he suggested that prior to an emotion occurring, people make a cognitive assessment of an event and its significance to them or those they care about.

Lazarus updated his original theory in 1991, suggesting that the initial cognitive appraisal of an event could be overridden by a subsequent review of the decisions derived from the initial assessment (Carlson, Buskist, & Martin, 2000; Richard S Lazarus, 1991). From a neurobiological perspective, it is suggested that whilst limbic structures, such as the amygdala, are primarily involved in the initial learning required for a response to emotionally significant events (LeDoux, 1998), the orbitofrontal cortex is involved in reappraising the emotional significance of a stimulus (Rolls, 1999, 2004)

The functionalist perspective of emotions as guiding, enabling and organising behaviour adaptively in response to the environment (Campos, Campos, & Barrett, 1989; Frijda, 1986b; Richard S Lazarus, 1991) is one that can only really be understood in relation to a given situation or context. In the present thesis, the selected context is that of the middle years of primary school education.

2.3.1 Emotion in school context

The historic view that emotion is a state of activation and arousal (Duffy, 1934) driven by subjective experience and undeserving of a place in scientific psychology (M. Meyer, 1933) is one that is perhaps echoed by those of us in the field of education who often consider that the high-level cognitive skills taught in schools are rational, distinct systems somehow detached from emotion and body. For many years, teaching practice has been at some distance from acknowledging the now well-established empirical findings that emotions considerably influence the aspects of cognition heavily relied upon in education and that emotions are indeed critical contributors to the acquisition of skills and knowledge required in the classroom (Immordino-Yang & Damasio, 2007). This is perhaps due to the traditional neglect of emotion by educational researchers who, until the 1990's largely ignored the progress made by neighbouring fields of psychology and neuroscience and focused on cognitive outcomes of schooling. In the last two decades however, there has been an increasing interest in the role of emotion and its regulation in academic contexts (Do & Schallert, 2004) and emotions have emerged as one of the most salient topics in current educational research (Pekrun & Linnenbrink-Garcia, 2014).

Emotion should be of interest to educators as emotional memories have long-lasting influence on thoughts, decisions and reactions (LeDoux, 1998). Active areas of research enquiry into specific emotions of particular relevance to classroom learning include interest and enjoyment (Ainley & Hidi, 2014), curiosity (Markey & Loewenstein, 2014), pride and shame (Oades-Sese, Matthews, & Lewis, 2014), anxiety (Zeidner, 2014), confusion (D'Mello, Lehman, Pekrun, & Graesser, 2014) and boredom (Goetz et al., 2014). The contribution of emotions to learning in specific academic subjects is also of interest to education researchers in the domains of mathematics (G. A. Goldin, 2014), science (Sinatra, Heddy, & Lombardi, 2015), reading and writing (Bohn-Gettler & Rapp, 2014). This work is underpinned by a growing literature on the effective measurement of emotions in academic settings (Kreibig, Gendolla, & Scherer, 2010; Pekrun & Bühner, 2014; Reisenzein, Junge, Studtmann, & Huber, 2014).

The logical extension of this work on *emotions* in education is towards the development of research enquiry into understanding its *regulation* in classroom context. Whilst studies with such an applied focus have a secure footing in clinical research relating to psychopathology, the application of emotion regulation research to education, with few exceptions, remains theoretical and experimental. It is to this body of prior research and its relevance to the present thesis that we now turn.

2.4 Early development of emotion regulation

When a particular event or situation has high personal significance and deserves our attention, the role of emotion is to interrupt our on-going activity to prepare us for action (Frijda, 1986a). Yet we cannot afford to be constantly interrupted and therefore, emotions need to be appropriately managed according to the particular context in which they arise (Johnstone & Walter, 2014). This is particularly true of classroom contexts where emotion regulation is required to minimise emotional reactivity that may disrupt learning.

Early signs of emotion-regulation can be seen in the first weeks of life. New-borns are able to reduce levels of stimulation by turning away from the source, closing their eyes and engaging in self-soothing activities such as thumb-sucking (Kopp,

1989). Early parental relationships are strongly associated with the development of emotion regulation. The new infant requires a stimulating environment that changes in response to the infant's moods and interests. An important aspect of the nurturing relationship is that new stimuli are presented in a way that is gradual, nurturing, predictable, repetitive, and attuned to the child's development stage (B. Perry & Pollard, 1998). This includes sensitive handling by the caregiver, responsive eye-gaze and talking to the infant. Since young infants have not yet developed the capacity to regulate their own arousal and impulses, they require help from a sensitive caregiver to co-regulate emotional reactivity and behavioural response to distress; to help deal with frustration; to direct and focus attention; and to restore a calm emotional state, free of anxiety (Glaser, 2000). In this way, the securely attached infant-mother relationship can be described as a bio-behavioural system that acts as a protector or buffer to the body's emotional response system (Gunnar, 1998) and from these early social experiences, emerges the adult ability to develop adaptive regulatory strategies to cope with negatively challenging events (Sroufe, 1996).

The emotions experienced when children interact with their environment can activate physiological arousal (Levenson, 2003). A key system associated with emotional arousal is the Autonomic Nervous System (ANS). The ANS may be regarded as the system of periphery neurons that lie outside of the central nervous system (Kuntz, 1936). This system retains a synaptic relationship to the brain stem and spinal chord axons of the central nervous system but is an outlying regulatory system that as suggested by its name, acts relatively unconsciously. The ANS is subdivided into an excitatory sympathetic nervous system and an inhibitory parasympathetic nervous system (Gazzaniga, Ivry, & Mangun, 2009). Both originate in the brainstem and influence the regulation of organs such as the heart, lungs and kidneys as well as blood vessels and sweat glands. The ease with which individuals are able to transition between high and low states of arousal relies on the flexibility of the ANS to regulate these two systems according to situational demands. Emotion regulation is critically dependant on the individual's ability to adjust these physiological systems (Gross, 1998b).

2.4.1 Impact of stress on development of emotion regulation

When the individual is threatened, the stress response of the ANS triggers the release of several so called 'fight or flight' hormones such as adrenaline and cortisol, which are important for meeting the energy demands associated with a threatening event and include vigilance to stress and preparation to deploy defensive responses (Cannon, 1929). Short-term cortisol release in response to threat serves an adaptive function, but chronically elevated cortisol levels are found to have a negative effect on health, as well as social outcomes (Tarullo & Gunnar, 2006). In threatening environments laden with distress and conflict, children learn to maintain vigilance to threat and as a result are constantly exposed to high levels of emotional arousal. Sustained exposure to on-going, potent sources of distress such as deprivation, neglect or parental conflict, may result in the development of prolonged alertness or hyper-vigilance to emotion-eliciting events, altering the biological stress response and eventually producing deficits in a child's ability to effectively regulate their emotions (Gunnar & Quevedo, 2007). While the early years present considerable opportunities for rapid growth and development, they are also the periods of greatest vulnerability to stress.

Healthy development of the systems controlling emotional reactivity and regulatory systems is hampered by factors of socio-emotional deprivation. Numerous studies show that adversity, neglect or maltreatment in the early years leads to psychological problems later in life (for review, see Kim & Cicchetti, 2010). Potential threats or sustained exposure to negative environmental influences of distress (such as marital conflict, domestic violence, economic uncertainty, premature birth, maternal depression or parental unavailability) appear to alter the stress response system and lead to deficits in the child's capacity to autonomously regulate their emotions (Gunnar & Quevedo, 2007). Whilst early established patterns of emotion regulation may be adaptive within the family or parental relationship (e.g. avoiding rejection, or gaining attention from an unavailable caregiver) they can become maladaptive in normative environments (i.e. when the child is at school), increasing vulnerability for negative behavioural, emotional and social consequences (Cassidy, 1994). The

resulting behavioural tendencies that arise from early experience and manifest themselves in the classroom are of central concern to the present study and as such, deficits in emotion regulation and their association with specific emotion and behavioural difficulties will be discussed in more depth, later in this chapter.

2.5 Theoretical foundations of emotion regulation

The theoretical basis for emotion regulation that has emerged from research in this area and is described in the following section, accommodates in its explanation both the outward behavioural expressions as well as the underlying physiological responses associated with emotion reactivity and its regulation.

The term emotion regulation emerged from the psychoanalytic terminology: 'stress and coping' (Gross, 1999). There is some overlap in definitions between *emotion regulation* and *coping* although coping includes wider, non-emotional actions and goals (Scheier, Weintraub, & Carver, 1986) in contrast to the emotion regulatory actions that are specifically taken to achieve those goals with emotional consequences.

One of the long-standing debates in the ER literature relates to the question of whether emotion regulation is a one or two-factor process. In the single factor model, emotion and emotion regulation occurs simultaneously, i.e. emotions regulate behaviour as emotions are regulated (Campos, Frankel, & Camras, 2004). This model also proposes that emotion cannot be identified independently of behavioural regulation. In the alternative two-factor model, the generation and regulation of emotions are separate but related processes (Cole et al., 2004; Gross, 1998b). For example, a nervous student at the beginning of a test might count to ten in a regulatory attempt to calm his anxious feelings. The current study adopts the two-factor approach, advocating that emotions have a distinct effect on behaviour, depending on how they are regulated.

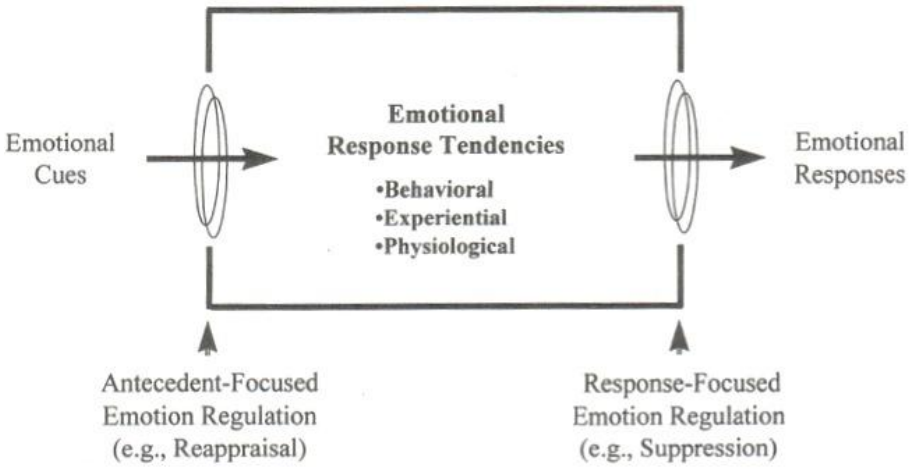

Figure 2.1: A model of emotion regulation, highlighting two classes of emotion regulation (Gross, 1998a)

The schematic presented in Figure 2.1 provides an illustration of the multiple processes involved in the regulation of emotion. According to Eisenberg and colleagues (1996) individuals regulate their cognitive, affective and behavioural responses on an ongoing basis, at times automatically and unconsciously, at others consciously and with control. A positive or negative emotional cue – whether presented in the laboratory or the classroom - results in the appraisal of the cue to assess its level of threat, reward potential and/or its relevance to personal goals. Once appraisal occurs, an emotional response tendency is activated. These tendencies include components of behaviour (outward expressions of emotion), experience (internal experience of emotion) and physiology (e.g. increased blood pressure, heart rate, electrodermal activity). These can be manipulated in order to alter, obstruct or suppress the generation, activation and expression of emotions (Mikulincer & Shaver, 2009). Emotional response tendencies are unique to the individual, they may not always be conscious and intentional and they are limited to the types of regulatory responses the individual is able to enact.

2.6 Classifying emotion regulation strategies

This section provides examples and descriptions of regulatory response tendencies together with a brief outline of the empirical and theoretical steps

that have thus far been taken in order to categorise regulatory response tendencies.

In the context of an emotionally distressing situation, a re-framing or re-direction of some circumstantial aspect of the event should lead to a decrease in the experiential, physiological and expressive signs of the emotion being regulated (Gross, 1998a). Whilst some researchers focus on the temporal features of emotion regulation (Laible, Carlo, Panfile, Eye, & Parker, 2010) and others on the dysregulation of emotion (Shields & Cicchetti, 2001), the present study is interested in the various cognitive and behavioural strategies that young people employ to manage their emotional experience in relation to their classroom behavioural tendencies.

Within the functionalist view, the experience of an emotion prompts a tendency to act in predictable ways (Frijda, 2004) and emotion regulation strategies refer to the particular approach an individual chooses in order to manage their emotional experiences. Although the notion of "strategies" implies conscious consideration of a decision, in the present study this term refers to the underlying process which may or may not be made consciously (Koole, 2009).

The potential range of possible emotion regulation strategies is enormous and finding a way of classifying strategies represents a formidable scientific challenge. Researchers have used different approaches including factor analyses (Thayer, Newman, & McClain, 1994) and rational sorting (Parkinson & Totterdell, 1999). Problems with both of these methods in respect of replication and convergence have been reported (Koole, 2009); Mauss, Bunge, and Gross (2007) distinguished between automatic versus controlled emotion-regulation processes, this is a useful distinction as it cuts across the complete range of ER strategies. However, in their analysis, (Moors & De Houwer, 2006) demonstrated diverse concepts associated with automaticity that vary more or less independently and given the desirability for a homogenous criteria for classifying strategies (Skinner, Edge, Altman, & Sherwood, 2003), automaticity versus control does not seem an entirely suitable approach.

R.S. Lazarus and Folkman (1984) classified specific coping strategies as either emotion-focused (regulating the distressing emotions), or problem-focused

(taking specific steps to change for the better the problem causing the stress). Emotion focused strategies involve trying to reduce the negative emotional response and are more likely to be employed when the source of distress is outside of the person's control. The deployment of problem-focused strategies can be successful when the individual is able to control the source of stress and these strategies aim to remove or reduce the cause of the stressor.

Perhaps the most influential approach for classifying emotion regulation is James Gross's "process model" (Gross, 1998a, 2001). Derived from his work with adults, this model suggests that the regulation of emotion can occur at different points in the process of emotion generation. As Figure 2.1 depicts, a broad distinction is made between antecedent-focused and response-focused regulation strategies. Within this model, antecedent-focused strategies can be applied early on in the process and before an emotion is generated. In adaptive regulation, antecedent strategies are deployed to re-evaluate or re-interpret the situation in order to decrease its emotional significance (Scherer, 1984). Early intervention allows for the alteration of the emotional trajectory and influences both the experience and subsequent expression of the emotion (Amstadter, 2008). According to Gross, examples of antecedent-focused strategies include: *situation selection, situation modification, attentional deployment* and *cognitive change* (Gross, 2014). *Situation selection* and *situation modification* strategies require the individual to take action to change the physical or social circumstances in order to maximise the potential outcome of desirable emotions (Gross, 2014). Situations can be both internal and external. In this case, *situational modification* refers to the external, physical environment. *Attentional deployment* and *cognitive change* strategies both influence the mental representations of the situation with a view to positively influencing the emotional outcome (Duckworth, Gendler, & Gross, 2014).

Conversely, response-focused strategies occur later in the emotion generation process once an emotional response is already underway (Gross & John, 2003) and thereby allow fewer opportunities for intervention. Since the emotions are fully generated at this point, response-focused strategies rely on the alteration of the expressional or physiological component of the emotion (Amstadter, 2008).

As will be discussed, response-focused strategies may have undesired or unintended effects on the emotional experience. Examples of response-focused strategies include *expressive suppression* and *avoidance*. We will return to a more detailed discussion on response-focused strategies below.

The potential utility of classifying emotion regulation strategies for theoretical and applied research has been made evident in research enquiry interested in the psychological problems associated with emotion regulation. However, in part due to the complexities arising from the mapping of theoretical conceptualisation of regulatory strategies onto clinically defined emotion and behavioural disorders, many questions over the most useful system of classifying emotion regulation strategies remain (e.g. Koole, 2009; Parkinson & Totterdell, 1999). For example, depending on the demands of the context, emotion regulation strategies can be deployed at any point along the antecedent- response-focused continuum and therefore cannot easily be categorised within Gross's model (Gross, 1998a). This is particularly problematic for naturalistic studies, such as the research described in the present study, in which participants regulate their emotions spontaneously and without instructions to respond with a specific strategy or to regulate in a particular direction, as they might be invited to do under controlled laboratory conditions. Nevertheless, it is helpful for the purposes of designing research, such as the current enquiry, to select a range of key regulatory strategies of interest in order to consider these in relation to the classroom emotions and behaviours of interest.

2.7 Examples of emotion regulation strategies

This section considers relevant research on a range of emotion regulation strategies of interest to the current study.

2.7.1 Attentional deployment

Attentional deployment plays a critical role in the early development of emotion regulation since the ability to direct attention resources towards or away from a stimulus can increase or reduce the affective valence with which it is associated, in turn changing the experience and potential salience (Rothbart, Posner, &

Rosicky, 1994). Children are continually exposed to arousing stimuli and their ability to flexibly direct their attention towards or away from stimuli is one of the earliest regulatory processes to appear (Rothbart, Ziaie, & O'boyle, 1992).

The ability to flexibly deploy attention away or towards emotion-inducing stimuli has been studied throughout childhood. In infancy, a supportive caregiver assists the child with the engagement or disengagement of attention, thereby providing co-regulation of arousal to external stimuli. M. H. Johnson, Dziurawiec, Ellis, and Morton (1991) found that four-month-old infants, who were able to easily disengage their attention from attractive stimuli, were rated by their mothers as more easily soothed and less fearful than those infants that were not. Effective disengagement strategies are found to decrease negative emotions, assist children in managing early frustration and fear (Calkins, Smith, Gill, & Johnson, 1998; Diaz & Bell, 2011; Stifter & Braungart, 1995) and also to decrease anxious behaviour over time (Crockenberg & Leerkes, 2004; Stifter & Spinrad, 2002).

In the school context, children are frequently confronted with tasks or events that they can neither choose nor change. In such situations, emotions can be regulated by selectively orienting attention towards a particular aspect of the situation, or away from the situation towards an alternative stimulus. One of the most common forms of attentional deployment strategies examined in school age children is *distraction*, in which children switch their attention away from the source of emotional arousal and re-direct attention towards an alternative aspect of a situation, or away from the situation altogether (Gross, 2014). Distraction may also involve changing the internal focus of thought, such as calling to mind memories that support the desired emotion (Thiruchselvam, Hajcak, & Gross, 2012).

According to Gross' (1998b) model, distraction is an antecedent-focused regulation strategy that appears early on in the process, preventing an emotional experience from developing (Gross & Thompson, 2007). In ER research, distraction is viewed as a positive, adaptive strategy since it is generally part of active problem solving (Braet et al., 2014). In some situations at school, distraction may also be seen as a positive. For example, a child struggling to complete a challenging reading task may turn away from chatty classmates in

order to avoid the negative affective consequence of a reprimand from their teacher.

According to Op't Eynde, De Corte, and Verschaffel (2007), children have a tendency to select distraction strategies for down-regulating frustration. More recently, N. B. Perry, Swingler, Calkins, and Bell (2016) found that infants who demonstrated greater attention to task stimuli at 10 months old, were less frustrated during a challenging puzzle task at 3 years of age. Higher observed frustration was indicative of less regulatory ability.

Thus, an apparent contradiction emerges suggesting that children's ability to both focus attention and disengage attention are positively related to emotion regulation ability. It may help to consider a focus on context to help resolve this inconsistency. In some situations it is more appropriate for a child to ignore distractions and focus their attention, such as in the example provided above of the child turning away from distracting classmates. Whereas in other tasks that involve a negative emotion (e.g. receiving a disappointing gift), disengagement may be more helpful.

Distraction has also been studied as a response-focused emotion regulation strategy (Denson, Moulds, & Grisham, 2012; Nolen-Hoeksema, 1991). In this case, the emotional response is already underway when the individual attempts to distract themselves from the negative emotions they are experiencing. To illustrate, a child that has just had an argument with a friend can distract herself from the emotional encounter by talking to another friend about their plans for after school activities. In this way the negative emotions associated with the argument should diminish. Although such a strategy may seem helpful, response-focused emotion regulation is generally viewed as maladaptive. This is seen in the context of psychological recovery from childhood trauma. In their meta-analysis of risk-factors, Trickey and colleagues (2012) found that distraction is strongly associated with the symptoms of post-traumatic stress disorder. In situations of extreme anxiety, disengaging from the emotions associated with distressing events may represent a powerful ability to down-regulate unhelpful emotions but in such circumstances, can lead to a worsening of symptoms. It is likely that a chronic reliance on response-focused distraction strategies may

obstruct the process of habituation to a stimulus in order to relearn its neutral or less threatening significance.

Like most emotion regulation strategies, distraction can be called upon to either help or harm educational outcomes (Jacobs & Gross, 2014) and thus according to the context, can be seen as either adaptive or maladaptive. As has been discussed, distraction is found to be helpful as a strategy to manage frustration (Tugade & Fredrickson, 2007) and in situations of classroom disruption, directing attention to relevant distractions is also helpful for task focus and completion (Kurki, Jarvela, Mykkanen, & Maatta, 2015). However, problems associated with distraction are also found in relation to classroom learning situations. Habitual use of distraction strategies may cause problems with peer relationships due to their tendency to make conversation partners feel less socially connected (Campbell-Sills & Barlow, 2007). Distraction is also well-studied feature of research related to disorders of attention and hyperactivity that result in learning difficulties. Such maladaptive concerns in relation to ER strategies will be discussed in more detail later in the present chapter.

On-going research attention is required to unravel the complexities and contradictions discussed here in relation to attentional deployment strategies. Recent research has begun to consider how early development of attention processes affect emotion regulation competencies in later childhood (Rueda, Posner, & Rothbart, 2005). Given distraction's leading role in the ontogeny of emotion regulation strategies, this work is important for understanding how emotion regulation develops throughout childhood and adulthood. Future studies may reveal that the early development of attentional deployment strategies underlie the downstream development of more complex emotion regulation abilities perhaps in part, by providing opportunities to practice regulating emotional arousal.

2.7.2 Cognitive change

Emotion regulation strategies that target the individual's cognitive interpretation of a situation are described as cognitive change strategies (Jacobs & Gross, 2014). Cognitive change refers to modifying how one appraises a situation in order to

change its emotional significance either by changing how one thinks about the situation, or about one's own capacity to manage the demands it poses (Gross & Thompson, 2007). *Reappraisal* is an example of a cognitive change strategy. In contrast to distraction strategies, reappraisal involves directly engaging with the emotionally arousing aspects of an event and changing the emotional response by reinterpreting the meaning of the stimulus (Sheppes, Scheibe, Suri, & Gross, 2011). In situations of negative emotion, reappraisal strategies are characterised by careful analysis of the situation, selective attention to certain aspects and the generation of alternative thoughts (Compas, 2006). Cognitive reappraisal requires an understanding that thoughts and not situations alone can cause changes in one's own feelings. This understanding was originally thought not to emerge until the age of eight (Flavell, Flavell, & Green, 2001) but more recent studies show that children as young as five and six can generate cognitive strategies such as changing goals or thoughts as a means to changing one's feelings (Davis, Levine, Lench, & Quas, 2010). For adaptive regulators, these thoughts and actions are likely to focus on the positive aspects of a situation, and generate positive, helpful strategies and outcomes. For example, a competitive student who feels stressed at the prospect of an exam can choose to reinterpret this situation as an opportunity to outdo his or her peers. Other examples of adaptive reappraisal strategies include: the generation of problem solving strategies, analysing situations, planning effective strategies, the inhibiting of interfering thoughts or actions and the mobilisation of available sources of social support to assist problem solving. In school, we might expect to see socially competent children employ a range of such positive strategies during challenging cognitive tasks or social interactions. In adults, every day use of reappraisal is related to greater experience of positive emotion and less of negative emotion and individuals who habitually use reappraisal show fewer symptoms of depression (Gross, Richards, & John, 2006).

The cognitive consequences of reappraisal come in the form of learning and performance effects that accrue over time. The student who uses cognitive strategies to decrease negative thoughts and feelings during classroom instruction may have enhanced memory for material (Dillon, Ritchey, Johnson, & LaBar, 2007). Reappraisal is an effective strategy for encoding and maintaining

memories of an emotional situation (J. P. Hayes et al., 2010) and can improve performance outcomes on stressful cognitive tasks (Jamieson, Mendes, Blackstock, & Schmader, 2010).

The affective consequences of using reappraisal to regulate one's emotions can determine whether a student finds school situations enjoyable and interesting or boring and under-stimulating (Jacobs & Gross, 2014). Socially, the selection of a particular emotion regulation strategy can also influence whether one is perceived as a happy student whom others want to be friends with. This has positive consequences for one's social connectedness. Reappraisers also have closer relationships with their friends, more peer support and are better liked than individuals using reappraisal less frequently (Gross et al., 2006).

Initial studies into reappraisal strategies showed them to be effective for reducing both the subjective and the physiological indicators of emotional arousal (Gross, 2002; Urry, 2010) but subsequent work suggests this is not always true. Sheppes and Meiran (2007) found that when cognitive reappraisal is initiated late in the emotion elicitation event (in this example participants were asked to watch a sad film) reappraisal is less effective than distraction for down-regulating negative emotions. In their follow-up study, relative to the control and distraction groups Sheppes, Catran, and Meiran (2009) found increases in sympathetic nervous system arousal (as measured by skin conductance response) in the late deployment of cognitive reappraisal strategies, presumably after the emotional response had sufficiently evolved. The authors are careful to distinguish between antecedent cognitive reappraisal and what they term 'online regulation,' i.e. "the attempt to change an emotion which starts and continuously operates during an emotional situation" (Sheppes et al., 2009, p.92).

In certain contexts, cognitive reappraisal may be maladaptive. In clinical research employing an emotion regulation perspective to study externalising problems (inattention, hyperactivity, anti-sociality and aggression), some children are found to display a tendency for estimating considerable personal gains from aggressive behaviour (Mullin & Hinshaw, 2007) and so may recruit antecedent cognitive reappraisal strategies in order to pro-actively create situations where planned, covert forms of aggressive or antisocial behaviour are precipitated.

Internalising problems (depression, anxiety and social withdrawal) may occur when an individual has learned that pro-actively creating, sustaining or exaggerating a negative emotion (such as distress) gains attention from a care-giver (Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993). Also, competence in problem solving-strategies may result in loss of attention and support from adults and therefore such strategies may be incongruent with the individuals early and unconscious wish for more reliable protection (Mikulincer & Shaver, 2009).

These findings illustrate the apparent complexity of classifying ER strategies as antecedent-focused or response-focused, adaptive or maladaptive and raise the possibility that an individual difference perspective may be helpful to shed light on some of the outstanding theoretical questions surrounding ER.

2.7.3 Emotion expression

For the purposes of this review, emotional expression is defined as the behavioural (e.g. facial, vocal and postural) changes associated with the experience of emotion (Gross & John, 1995). These may include smiling, laughing, frowning or venting anger. Emotional expression is likened by some authors to the sending of affective messages or social signals (Denham, 2007). From a functionalist perspective, the expression of emotion provides a signal for whether an individual or others need to modify or continue their goal-directed behaviour (Campos, Mumme, Kermoian, & Campos, 1994). Such signals can generate a contagious emotion and action readiness in another (Hatfield, Cacioppo, & Rapson, 1994) and can also provide meaning to an associated behaviour. Adaptive emotion regulators are usually able to honestly express their negative emotions without concern of risk to the relationship or the need to avoid or deny the emotion experience (Fonagy, Steele, Steele, Moran, & Higgitt, 1991).

According to Gross' model (Figure 2.1), strategies for regulating the expression of emotion are classified as *response-focused* adjustments of emotion response tendencies. These may include attempts to change the emotional experience, behaviour (e.g. disguise facial or vocal displays), or to decrease the physiological components of the emotional response (Gross, 2014). Response-focused

strategies are thought to be useful when deployed in an attempt to down-regulate otherwise overwhelming negative emotions (Shaver & Mikulincer, 2009) and similarly in order to up-regulate an emotion (either positive or negative) through focusing attention on that emotion and maximising its expression (Spangler & Zimmermann, 1999).

In their study of emotional expressivity using self-report measures, Gross and John (1995) identified three distinct features which they described as (1) impulse strength, (2) positive expressivity and (3) negative expressivity. The strength of an emotional impulse is believed to have an impact on the individual's 'ability to control one's thoughts and actions' (Larsen & Diener, 1987, p.9) and individuals who habitually experience strong emotional impulses that strain their regulatory capacities, are reported as having greater somatic complaints or physical symptoms of pain (Watson & Pennebaker, 1989). Given the relevance of positive and negative emotional expressivity to the present study, the literature describing these aspects of emotionality is presented in the two sub-sections that follow.

2.7.3.1 Regulation of negative emotion expression

Negative emotion expression, especially anger, is often problematic in social interactions (Miller, Fine, Gouley, Seifer, Dickstein & Shields, 2006). A child that routinely expresses anger towards other children may experience rejection or isolation from others. For example, if a child feels frustration during a joint working task with a peer, he or she may try to avoid that child the next day. Physical exercise and deep-breathing techniques are well-established strategies for down-regulating unwanted emotion (Neacsiu, Bohus, & Linehan, 2014), as are alcohol and drugs (Kober & Bolling, 2014) and even food (Barnes & Tantleff-Dunn, 2010).

Expressive suppression is a well-studied response-focused ER strategy in laboratory research. Both children and adults are capable of hiding overt displays of emotion. Suppressing anxiety elicited during a job interview or school examination is an example of situationally appropriate adaptive ER strategy. However, hiding how we feel often comes at a cost and in some studies, suppression is linked to poorer, problematic outcomes (e.g. Suveg et al., 2008)

when recruited to disguise or mask high levels of internal distress. Suppression can augment one's physiological reactivity, leading to greater cardiovascular responses than would be experienced where no emotional suppression has taken place (Gross & Levenson, 1993, 1997). Emotional suppression can also lead to negative social consequences. For example, a child that supresses his hurt feelings caused by being left out of a game with friends may inadvertently give the impression that he does not care. Studies have found that emotional suppression leads to the increase of blood pressure of people around us, resulting in others liking us less than they otherwise would (Butler et al., 2003). At an extreme, children with high levels of reactive responding to negative emotion have a tendency to display aversive emotional reactions to events including irritability, frustration, fear and anger (Frick & Morris, 2004), they may have problems recruiting strategies that assist with the down-regulation of emotional reactivity. Over the long-term, as individuals develop preferences towards using suppression strategies, there may be negative physiological or psychological consequences and clinicians work with individuals who have developed such problematic regulatory styles that become stable attributes of a client's temperament (Malatesta & Wilson, 1988). Expressive suppression as a response-focused ER strategy is described as the "least effective and least efficient" (p.211) of all ER strategies (Duckworth et al., 2014). In the school context, making an effort to hide one's feelings or inhibit the expression of emotional experience is viewed as ineffective as it can reduce the available cognitive resources required for learning (Boekarts, 2011; Richards, 2004).

Whilst some researchers have focused on suppression of the emotional expression (e.g. Gross & Thompson, 2007) others have focused on the suppression of unwanted thoughts (e.g. Wenzlaff & Wegner, 2000). Thought suppression attempts to suppress or inhibit unpleasant thoughts and may involve deliberate efforts to escape the thoughts or feelings associated with specific events (S. C. Hayes, Strosahl, & Wilson, 1999). Thought suppression is often associated with expressive suppression and is seen as a risk factor for depression, anxiety and maladaptive behaviour (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Thought suppression, or *experiential avoidance* occurs when a person is unwilling to remain in contact with a particular private experience (e.g.

thought, emotion, memory or bodily sensation) and takes steps to escape, avoid or modify the form or frequency of events and contexts that might provoke them (S. C. Hayes et al., 1999). Experiential avoidance is viewed as adaptive if recruited as a short-term strategy to manage emotional expression, as long as the individual is still able to make progress toward personally meaningful goals (Kashdan, Barrios, Forsyth, & Steger, 2006). An example of this would be a child that tries to control his or her nerves in advance of making a public speech. However, experiential avoidance becomes problematic when it is applied inflexibly and where enormous efforts are required to control private thoughts (S. C. Hayes et al., 1999). This struggle can obstruct the movement towards valued goals and diminish contact with present experiences, resulting in impaired functioning (Kashdan et al., 2006). In clinical and non-clinical studies, experiential avoidance is strongly correlated with general psychopathology (S. C. Hayes, Strosahl, Wilson, & Bissett, 2004). The unintentional consequence of experiential avoidance is that the same thoughts, feelings and sensations that are being inhibited are paradoxically increased in both frequency and intensity (Gross, 1998a, 2002). There is evidence to suggest that experiential avoidance amplifies anxiety symptoms in individuals who have no history of anxiety-related disorders, suggesting that experiential avoidance is not just a consequence of anxiety but also a psychological risk-factor for anxiety disorders (Kashdan et al., 2006). Psychologists have long argued that central to many psychological problems is the avoidance of painful feelings or fear of unwanted emotion (Freud & Strachey, 1966). Recognising and dealing with experiential avoidance is a central theme of traditional therapies that encourage either acceptance (Raskin & Rogers, 1989) or cognitively changing the beliefs and sensations (Beck & Rush, 1979) associated with the aversive emotion.

2.7.3.2 Regulation of positive emotion expression

Whilst a substantial amount of research has been devoted to understanding how people regulate their negative emotions, very little research attention has been given to the regulation of positive emotions. This is unsurprising given the concern in clinical settings is with the regulation of distress, rather than the modification or maintenance of pleasant experiences (Tugade & Fredrickson,

2007). In general, psychological research is focused on understanding disorder and finding effective interventions that decrease problems and increase functioning. Negative emotions are related to a huge array of social and emotional problems for individuals and society whereas positive emotions have been implicated in just a few (e.g. bipolar disorder; Davidson, 1993; and addiction/substance abuse; Nesse & Berridge, 1997). Arguably, efforts to understand negative emotions should be prioritised, but in taking such an approach researchers and practitioners may have overlooked potential important solutions that positive emotions may offer for the problems negative emotions generate. To illustrate, it is well understood that once the negative emotional experience is underway, the cognitive and behavioural possibilities for responding are narrowed. From a functional perspective, such a reduced repertoire of strategic response is important and necessary to facilitate action in threatening situations that require immediate life-saving reactions. In contrast, positive emotions are said to broaden an individual's thought-action repertoire. Some authors suggest there is a role for positive emotions in the regulation of negative emotions (Folkman & Moskowitz, 2000; Fredrickson, Mancuso, Branigan, & Tugade, 2000) and that positive emotionality *broadens* attentional resources and *builds* physical, cognitive and social resources. In their laboratory study, Fredrickson and Levenson (1998) tested the idea that positive emotions may undo the physiological effects that accompany anxiety-related emotions by showing participants films designed to elicit positive emotions. They found that inducing amusement and contentment did indeed speed autonomic recovery following negative emotional arousal. By consequence, according to the 'broaden and build' theory (Fredrickson, 1998) positive emotionality is seen as a personal resource that can be drawn upon in times of stress or challenge.

Positive emotions (joy, happiness, interest and curiosity) arise in contexts appraised as safe and familiar (Izard, 1997), as requiring low effort (Ellsworth & Smith, 1988) and in certain situations, by accomplishments or progress towards one's goals (Izard, 1997; Lazarus, 1991). As proposed above, positive emotions are believed to broaden the thought-action repertoire (Fredrickson, 1998). Through positive, playful experiences, joy is described as having the effect of building an individual's physical, intellectual and social skills (Fredrickson,

1998). Interest and curiosity facilitate oriented attention (Frijda, 1986a) and are associated with animated and enlivened feelings (Izard, 1977). Curiosity and interest generate exploration, explicitly and actively aimed at increasing knowledge and experience of the target of interest (Fredrickson, 1998). Positive affect is important for the initiation and regulation of social exchanges and may facilitate the formation of friendships (Denham, McKinley, Couchoud & Holt, 1990). Thus, it has been argued that positive emotions serve to build an individual's personal resources of attention (Derryberry & Tucker, 1994), cognition (Isen, 1987) and action (Green & Noice, 1988), as well as providing support for enduring social relationships (Tomkins, 1962) and protection from health problems (Stone, Neale, Cox & Napoli, 1994).

Under some circumstances, regulation may simply involve the *maintenance* of positive emotional experiences (Denham, 1998) in a desire to prolong pleasant feelings. *Savouring* is an example of an ER strategy that is used to maintain and extend positive emotional experiences. Examples include reminiscing about past positive experiences or celebrating current events (Bryant, 1989). Positive emotions may be up-regulated by, for instance, prolonging positive emotion by thinking about positive events and in this way they can reduce the impact of negative emotions (Tugade & Fredrickson, 2007). As has been discussed, although the suppression of negative emotion can have a negative impact on psychological functioning, smiling during sadness can speed physiological recovery from negative emotional arousal (Fredrickson & Levenson, 1998). Strategies for increasing or enhancing positive emotional experiences can aid coping with negative emotional experiences. The benefits to positive emotions may seem undervalued in both research and practice but research evidence increasingly points to the benefits of positive emotion expression in optimising health, well-being and resilience (Fredrickson, 2000).

In addition to considering the personal and social benefits of sustaining or maximising positive emotion expression, authors have considered the impact of down-regulating positive emotion expression. Gross and colleagues (2006) asked participants to report on the frequency with which they regulated emotions in their everyday lives. Whilst regulation of negative emotion expression was

reported more frequently, participants also reported using strategies to modify their experience and expression of positive emotions (Gross et al., 2006). For instance, out of respect for the feelings of a friend who had received a poor grade for a test, another student down-regulated their happiness and pride at receiving a high grade on the same assessment. Gross and John (2003) showed that the tendency to suppress positive emotions is negatively associated with life satisfaction and psychological well-being. As has been described in the previous section pertaining to negative emotions, expressive suppression of positive emotions similarly bears a physiological cost and leads to a decrease in the reported enjoyment of positive experience (Gross & Levenson, 1993).

The construct of emotion expression that accommodates the expression and regulation of either positive or negative emotions is not well accounted for in theoretical models of emotion regulation. This appears to be as a result of the aforementioned clinical focus on the impact of negative emotions but may also be as a result of difficulties arising from research that has attempted to fit specific emotions with specific regulatory strategies (Fredrickson, 1998). Psychologists need to better understand the role of positive emotion in regulating emotion during times of challenge or stress in order to consider the potentially important cognitive and affective consequences that positive emotions may offer.

2.8 The adaptive nature of emotion regulation strategies

Adaptive emotion regulation requires the selection and implementation of strategies that are appropriate for the context and are in accordance with one's long term goals (Bridges, Denham, & Ganiban, 2004). In experimental studies, adaptive regulation strategies (acceptance, problem solving and cognitive reappraisal) are shown to lead to beneficial outcomes, including a reduction in the experience of negative emotion (P. R. Goldin, McRae, Ramel, & Gross, 2008), an increased tolerance for pain (S. C. Hayes et al., 1999), interpersonal functioning (J. M. Richards & Gross, 2000) and decreased cardiac reactivity (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Some studies with young people suggest that adaptive antecedent-focused ER strategies have positive,

short-term, affective consequences and are associated with better psychological adjustment (Compas, 2006).

Emotion regulation is perceived as maladaptive when it does not alter the emotional response in the desired way (e.g. decrease unwanted negative emotion), or when the long-term costs of a particular regulation strategy outweigh the short-term benefits of emotion modulation (Werner & Gross, 2010). The process model of emotion regulation (Gross, 1998b) is based on the idea that emotions develop and gain strength over time (Sheppes & Gross, 2011). In clinical populations, emotion regulation difficulties may arise in situations where emotions are too intense (e.g. exam anxiety results in poor test performance), when ER strategies have not yet developed (e.g. an anxious child who rarely attends school may not develop socially appropriate emotion expressivity), or when ER capabilities have been compromised, perhaps as a result of disordered neurological developments such as Autistic Spectrum Disorders. Difficulties may also arise when ER strategies are poorly implemented, inflexibly or in context-insensitive ways that are contrary to one's goals (e.g. a child learning to regulate his anger, may lash out at a friend who pushes in front of him in the lunch queue).

Views of emotion as poorly controlled or dysfunctional are still popular in clinical conceptualisations of maladaptive behaviour and psychopathology (Cole, Michel, & Teti, 1994) and much important work is being done to establish healthy versus unhealthy, or adaptive versus maladaptive strategies of emotion regulation (e.g. Beijersbergen, Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2008). However, some authors (e.g. Gross, 1998b) argue against *a priori* judgements as to whether a particular regulatory strategy is 'good' or 'bad' since it is likely that different ER strategies will be functional (or adaptive) in some contexts and not others (Southam-Gerow & Kendall, 2002). Emotion and behavioural problems in childhood are often seen in situations where ER strategies that were useful in the family home, are now unhelpful or inappropriate in school context. For example, a child with a disorganised attachment style (Main, 1999) whose expressions of distress and discomfort were met with further threat or unavailability by his mother in his early years, is likely to express more negative than positive emotion (Kerns, Abraham, Schlegelmilch, & Morgan, 2007) and perhaps to burst out in

anger at the slightest provocation. For other children, problems can arise when an emotional response is resisted or suppressed. Such behaviours may have been motivated by the early desire to suppress the distress caused by frustrated bids for proximity to and support from a distant or rejecting attachment figure (Cassidy & Kobak, 1988) but may result in a self-reliance that is both dismissive of other people's need for intimacy and a reluctance to accept social support (Bowlby, 1988).

In the present study, as in many day-to-day school-based scenarios there are often restrictions on the range of emotion regulation strategies that children are able to activate. For educators, an understanding of the developmental trajectory of emotion regulation is a prerequisite for developing evidence-based interventions that are grounded in current theory. While adaptive emotion regulation is associated with a variety of benefits in adulthood, it is not fully understood how children regulate their emotions, nor what cognitive prerequisites are needed for successful regulation.

2.9 Emotion regulation in learning contexts

In the school context, the skills required for academic functioning are a significant component of adaptive functioning. However, to date, little research has considered the role of emotion regulation within the behaviours that support or obstruct learning and achievement at school. It is understood that ER supports social-competence and cumulatively, academic success (e.g. Kochanska, Murray, & Harlan, 2000) and also that the interactions within the early years of school are particularly taxing on a young child's emotion regulation skills. Play with peers is charged with conflict at an age when peers are neither skilled at negotiation, nor able to offer support for emotion regulation (Denham, 2007). Learning tasks require sustained attention and classroom rules are hard to follow when a child is overwhelmed with feelings. In addition, the social cost of uncontrolled emotional outbursts is high with both peers and teachers. Initiating, maintaining and negotiating social goals, earning acceptance and succeeding in the cognitive skills of reading and number tasks (Raver, Blackburn, Bancroft, & Torp, 1999) require

the cultivation of an emotional sentinel that can organise the increasing complexity of a child's own emotions within the social world of school.

Emotional competence involves the expression of emotion in a way that is advantageous for the individual. Children learn which expressions of emotion facilitate specific goals and must also understand which are the appropriate affective messages for the given context. What may be appropriate in the home and with one individual (a parent or sibling) may not be appropriate in school. As they mature, children begin to realise that overt expressions of socially disapproved feelings may be controlled and that a person may feel a certain way 'on the inside' but show a different display of emotion depending on the goals and rules of the given situation (Denham, 1998). This is particularly true during middle childhood when children learn with experience that their goals are not always met by freely externalising strong feelings. Emotional messaging becomes increasingly complex at this age and can incorporate more blended signals (Denham, 2007).

Emotional expression is regarded as an effective ER strategy in school context and may have a powerful effect on the social dynamics (Rimé, 2007; Yan, Dillard, & Shen, 2012). At preschool age, the expression of specific emotions relates to successful peer interactions and to teachers' evaluations of a child's friendliness/aggression (Denham, 2007).

	Decrease	**Increase**
Negative emotion	Trying to calm down after being shoved in the playground	Exaggerating frustration during a task to gain support from peer or teacher
Positive emotion	Stifling laughter in class at a friend's joke	Turning to a friend for support to help complete a boring task

Figure 2.2: Examples of emotion regulation goals in the school context, adapted from Gross (2014), p9.

The circumstances under which a student is motivated to decrease the experiential aspects of negative emotion are easy to imagine (see Figure 2.2). For

instance, if a child is angered in class by the unkind actions of a peer, they might try to down-regulate their anger by switching their attention to their work assignment or by seeking support from a friend or teacher. It is also useful to have a range of strategies that facilitate the up-regulation of positive emotion expression (i.e. increase the intensity or duration), perhaps in circumstances where the task is one that a student finds unpleasant or boring. Although it may seem difficult to imagine, there may be social situations where it is also useful to be able to up-regulate negative or down-regulate positive emotions. In the school context, exaggeration of frustration during a complex mathematics task may lead to the support of a teacher to aid completion of the activity. In school, it is also socially beneficial to be able to down-regulate positive emotions. For instance, stifling the giggles in a school assembly would be advantageous in a context where the rules require such controlled behaviour.

Insights from developmental research indicate that difficulties in effective emotion regulation in childhood may have serious implications for mental health (Aldao et al., 2010). Such problems may not fully manifest until early adulthood, as such an understanding of the antecedent ER indicators of future difficulties may provide clues towards vulnerabilities. The regulation of physiological arousal has been hypothesised to affect children's social relationship by facilitating their ability to flexibly engage and disengage with their environment (Porges, 2003). These skills can be considered fundamental to adaptive functioning as in the school context children need to decide when to engage with peers and teachers (i.e. talk, or play with them) and when to disengage (e.g. ignore them). The flexibility to engage and disengage during social interactions in such a way may be easier for children who are able to efficiently regulate their emotions (Graziano, Reavis, Keane, & Calkins, 2007). Unsurprisingly, children who appropriately regulate their emotions are more socially competent and more popular with peers (Eisenberg et al., 1996; Fabes & Eisenberg, 1992). Conversely, children who have difficulties regulating their emotions effectively are found to have interpersonal difficulties and greater externalising problems at school such as antisocial behaviour and hyperactivity (Rydell, Berlin, & Bohlin, 2003), anxiety and internalising problems (Braet et al., 2014; Rydell, Thorell, & Bohlin, 2007).

The demands of learning new academic material and developing sophisticated social skills in the middle years of primary, in combination with the gradual decline of the extensive support offered in early school years, presents a challenge for many young children. Such demands are likely to elicit a range of emotions to be regulated, including excitement, frustration, anxiety and fear.

2.10 Physiology of emotion regulation

As previously defined (section 2.5), emotion response tendencies are comprised of distinct aspects of experiential, behavioural and physiological response patterns. Measuring only one or two of these channels yields an incomplete picture of emotion and its regulation that can be enhanced by the contribution of micro-physiological processes that accompany emotion regulation behaviours.

William James (1884) originally proposed that subjective emotional feelings are derived from the bodily consequences of the perception of events that have some innate or acquired relevance to survival. Over the past two decades, psychologists have applied a range of physiological techniques to understanding the functions of the brain and its nervous system. Ample research demonstrates how emotions affect physiological factors such as body temperature, heart rate, blood pressure and gut motility (Critchley, 2002). Until the advent of functional neuroimaging, psychophysiological techniques, such as skin conductance measurement, were considered the primary means for inferring the neural processes underlying emotion, attention and learning (Navqi & Bechara, 2006).

Electrodermal activity (EDA) as indexed by skin conductance level (SCL) is influenced by increases and decreases in hydration of the eccrine sweat glands (Beijersbergen et al., 2008). Such physiological responses provide an index of the autonomic nervous system (Porges, 1995). Illustrated in Figure 2.3, the ANS consists of two subsystems: the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). EDA is directly controlled by the SNS (Dawson, Schell, & Filion, 2007) and in situations in which emotions are elicited, measures of EDA have been used to gain insight into the activity of the ANS (Bradley & Lang, 2000b). ANS activity has been recorded in a range of studies measuring negative emotions (e.g. anger, anxiety, disgust, embarrassment, fear

and sadness) and positive emotions (e.g. amusement, contentment and happiness; Kreibig, 2010). Reactivity, in the context of emotion, refers to the individual differences in emotional responsiveness to eliciting stimuli (Mullin & Hinshaw, 2007). In situations laden with emotional challenge, EDA activity can provide a window on emotions that may or may not be overtly expressed (Beijersbergen et al., 2008). In a range of studies, EDA reactivity has been shown to be a sensitive marker of aversion to, or avoidance of affective stimuli or cues such as punishment (Fowles, Kochanska, & Murray, 2000) in the context of family stress, including marital conflict (El-Sheikh, 2005), parental depression (Cummings, Davies, & Campbell, 2002) and paternal antisocial behaviour (Shannon, Beauchaine, Brenner, Neuhaus, & Gatzke-Kopp, 2007).

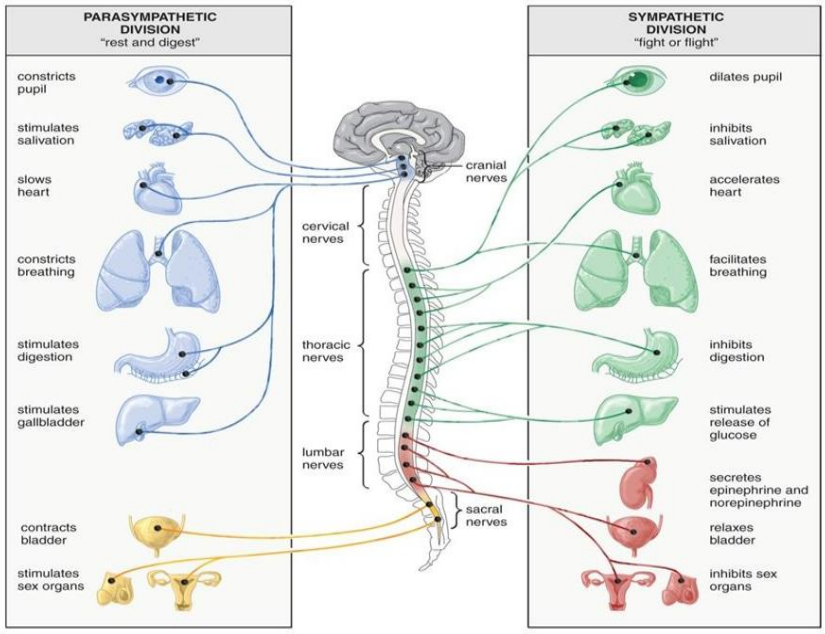

Figure 2.3: Organisation of the Autonomic Nervous System showing sympathetic and parasympathetic branches

Physiological over or under responsiveness to an emotional event may signal risk for the development of psychopathology (Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996). In studies with young people, sympathetic reactivity is associated with distress under conditions of threat and much research has focused on negative emotion associated with conduct problems and criminal behaviour (e.g. Herpertz et al., 2001). In studies of children and adolescents, EDA *hypo*-reactivity (low skin

conductance levels) is found to be a robust correlate with the antisocial and aggressive behaviours (e.g. Posthumus, Böcker, Raaijmakers, Van Engeland, & Matthys, 2009) associated with conduct disorder. Under-reactive individuals are believed to experience low fearfulness and disinhibited behaviour and are conceptualised as failing to learn avoidance and insensitive to punishment (Raine, 2002).

In contrast, EDA *hyper*-reactivity, as measured by a higher general arousal of skin conductance, is believed to denote increased sympathetic activation as a result of a) sensitivity to negative emotions, b) a desire to avoid negative consequences and c) the additional demand of suppressing emotionally expressive behaviour (Blair, 2003). High skin conductance levels are also associated with individuals who demonstrate reactive aggression (though not proactive aggression; Hubbard et al., 2002) and who are fearful and anxious (Weems, Zakem, Costa, Cannon, & Watts, 2005). In some studies, greater EDA reactivity is found to predict classroom-appropriate behaviour, particularly in children who are sensitive to punishment and prefer to avoid this consequence (Blair, 2003). Somewhat dichotomous are findings of physiological hyper-reactivity in children rated as less on task in the classroom. For these children, it is suggested that they may disengage from persisting at a task when overwhelmed physiologically from the demands of controlling their attention and inhibiting distractions (Eisenberg et al., 2005).

Recent work has begun to consider the interaction effects between hypo- and hyper-reactivity of sympathetic activation and the environment in which children are raised. In much the same way as genetic studies have begun to do (e.g. Caspi et al., 2002), current research enquiry is interested in whether SNS reactivity tendencies can provide a biological marker for later psychopathology. From a child development perspective, differential susceptibility suggests that some people are more vulnerable than others to the negative effects of early adversity but also may be disproportionately susceptible to the beneficial effects of supportive and enriching (or just the absence of adversity) environments (Belsky & Pluess, 2009). Kochanska, Brock, Chen, Aksan, and Anderson (2015) explored the idea of differential susceptibility in children with low and high skin

conductance levels. They found that positive and negative variations in parental responsiveness moderated the later emergence of externalising problems in children with hypo-reactive EDA. Whilst it seems that hyper-reactive children are predicted to be sensitive to the behavioural interactions of their environment the evidence for differential susceptibility in respect of EDA has yet to be established. As the emphasis on the interplay between children's early experiences and biological individuality increases, it seems likely that future research will consider plasticity in relation to the autonomic nervous system and measures of electrodermal activity. These will no doubt have an impact on understanding emotion regulation in both clinical and community samples.

As has been discussed, there is still some uncertainty in the literature as to how physiological processes relate to the internalising and externalising behavioural patterns on display in the classroom. Evidently, a range of individual differences in experience, behaviour and physiology of emotion regulation exists.

2.11 Individual differences

This section reviews the individual differences in emotion response tendencies in relation to: 1) classroom emotional and behavioural problems and 2) gender.

2.11.1 Individual differences in emotion and behavioural problems

Emotion regulation is a key component in the emotion and behavioural disorders typically observed in school and difficulties with ER are associated with a range of child and adult psychopathology (Aldao et al., 2010). Formal diagnosis of such problems may not be made until later in life, but difficulties with the regulation of emotions can be observed much earlier, which may provide indicators for later problems and also support the identification of children at risk. Specific emotion-regulation strategies are hypothesised to be risk factors for, or protective factors against, childhood psychopathology.

In their longitudinal study of individual differences in ER among pre-schoolers, Cole et al. (1996) found a significant difference in the autonomic reactivity between children that were emotionally inexpressive compared to those who frequently expressed their emotions. The inexpressive group showed little

change in electrodermal reactivity and their mothers reported more symptoms of oppositional and attention deficit disorders at age 7. The authors draw comparisons to an emotion regulation style of under-responsiveness associated with antisocial traits in adults (Fowles, 1988; Tranel & Damasio, 1994) and further suggest that the inexpressive style of emotion regulation in young children reflects a tendency to focus internally on distress (Cole et al., 1996). In the same study, the highly expressive group frequently displayed negative emotion during the experimental mood induction together with the greatest change in EDA. This physiological hyper-reactivity was associated with higher levels of behavioural problems at age 4 and 7 and symptoms of oppositional and attention deficit disorder at age 7. This pattern of combined EDA reactivity and behavioural problems underpinned a tendency for impulsivity, as well as heightened emotional responding to external stimuli and little skill to attend to and use internal experience to regulate responses (Cole et al., 1996).

This collection of findings in respect of the physiological indices of emotional and behavioural disorders underscores the complexity of recognising different patterns of emotion reactivity in childhood behaviour. The literature presented in the sections that follow summarises the emotion regulatory tendencies that have been linked empirically to each of the problematic social and emotional behaviours at the focus of this study whilst also considering individual differences in the physiological responses associated with these behavioural problems.

2.11.1.1 Anxiety and depression

Across the adult literature, there are two clear features of anxiety disorders: 1) heightened negative emotional experience and 2) a relative inability to effectively decrease negative emotion (Carthy, Horesh, Apter, & Gross, 2010). In both children (Suveg & Zeman, 2004) and adolescents (Silk, Steinberg, & Morris, 2003), difficulties with emotion regulation have been linked to internalising symptoms (anxiety and depression). Suppression and avoidance have long been seen as maladaptive responses to a range of stressors and risk factors for both depression and anxiety (Aldao et al., 2010). As previously mentioned, attachment research suggests that individuals with a tendency to suppress pain and distress

have developed this style of coping as a result of the early frustrated attempts at seeking emotional support from a distant or rejecting caregiver (Cassidy & Kobak, 1988). Having learned to cope in such a way, it is likely, when faced with an emotional trigger, that such individuals would keep their emotions hidden from others by trying to disguise or suppress them in their expressive behaviours. Support for this theory comes from research that finds children with internalising disorders are less emotionally expressive than healthy controls (Casey, 1996). In their 2002 study using self and peer report measures in a community sample of elementary school children, J. Zeman, Shipman, and Suveg (2002) found a number of predictive behaviours for internalising symptoms. These included: limited emotional self-awareness; inhibition of anger expressions; as well as a tendency to express angry and sad emotions in non-constructive ways (e.g. whine, cry, slam doors). Since anxious children are typically characterised by shy, withdrawn behaviours (Suveg & Zeman, 2004), these findings appear somewhat counter-intuitive. The authors speculate that under the strain of emotion inhibition, these feelings "bottle-up" until they are released or unleashed in dysregulated ways (J. Zeman et al., 2002). Undoubtedly, either method of emotional regulation (over-control or under-control) is likely to result in poor quality social relationships that in turn, exacerbate feelings of distress and anxiety.

In their 2010 study, Carthy et al. investigated the emotional regulation behaviours of anxious children in the laboratory setting. The regulatory profiles of these children were characterised by a reliance on avoidance, seeking help from others, as well as little use of problem solving and reappraisal strategies in situations eliciting negative emotions. The authors suggest that this may reflect a limited ability or motivation to engage in self-directed change of the negative emotional stimuli, either through practical problem solving or cognitive reappraisal but also that negative emotional hyperactivity may overwhelm the cognitive resources necessary for such ER strategies (Carthy et al., 2010). In support of these findings, Muris, Meesters, and Rompelberg (2007) found that anxious children reported that they were less able to flexibly control their attention (i.e. control their attention over time) or voluntarily switch attention from one stimulus to another.

Negative emotions are found to produce greater levels of physiological arousal than positive emotions (Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000). Although an optimal level of physiological arousal is believed to facilitate performance in a situation (such as delivering a speech to an audience), research suggests that high arousal may lead to over or under control of emotional experience (Cole et al., 1994; Eisenberg, Cumberland, & Spinrad, 1998). Physiological hyper-arousal is a distinguishing feature of anxiety (Clark & Watson, 1991), placing anxious children at significant risk for difficulties with employing adaptive emotion regulation strategies (Suveg & Zeman, 2004).

2.11.1.2 Antisocial and disruptive behaviour

Aggression and other forms of externalising behaviour are an inherent part of most early childhood. However, for some children, disruptive behaviours can continue across childhood. The first years of school are an important time for identifying children at risk and intervening before problems become intractable. Disruptive behaviour problems in children are a risk factor for conduct disorder, poor peer relationships, violence, substance abuse and mental health problems in adolescence (Havighurst et al., 2013). In middle childhood, peer relationships become a critical factor in developing adaptive regulatory strategies (Rose‐Krasnor, 1997) and peer rejection is consistently found to predict antisocial behaviour (e.g. Laird, Jordan, Dodge, Pettit, & Bates, 2001). Childhood disruptive behaviours are found to relate to problems of understanding, identifying and regulating emotions (Trentacosta & Shaw, 2009). Children with conduct problems or those that experience impairing temper tantrums are found to exhibit less positive emotion expression in response to successful task completion compared to their peers and also find it difficult to regulate negative emotionality when frustrated (Roy et al., 2013).

Trentacosta and Shaw (2009) looked at the role of emotion regulation strategies in boys with peer problems and antisocial behaviour. They found that boys who used fewer active distraction strategies during a frustrating task in early childhood were more likely to be rejected by their peers in middle childhood. In turn, peer rejection in middle childhood, predicted antisocial behaviour in early adolescence (Trentacosta & Shaw, 2009). The inability to adaptively direct

attention away from a frustrating situation may herald similar difficulties with the regulation of anger in social contexts. Over time, the inability to adaptively regulate anger and frustration may result in negative exchanges and rejection from peers (Maszk, Eisenberg, & Guthrie, 1999). However not all previous research that has examined the role of active distraction during early childhood in relation to social competence has supported this assertion (Calkins, Gill, Johnson, & Smith, 1999; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002) and the question of the role of distraction strategies in emotion regulation for children with disruptive behaviour remains.

In studies of children and adolescents, lower physiological reactivity is found to be a robust correlate with antisocial and aggressive behaviours (Posthumus et al., 2009). EDA hypo-reactivity is associated with antisocial behaviour, externalising disorders, callous-unemotional traits and insensitivity to punishment (Dadds & Salmon, 2003; Fowles & Kochanska, 2000; Raine, Venables, & Williams, 1990) and it has been suggested that EDA hypo-reactivity acts as a biological vulnerability for antisocial externalising problems (Fowles, 1993; Lorber, 2004; Raine, 2002).

Under-reactive individuals are believed to experience low fearfulness and disinhibited behaviour and are conceptualised as failing to learn avoidance and be insensitive to punishment (Raine, 2002). Children with serious, or clinical levels of antisocial behaviour and aggression may be diagnosed with conduct or externalising disorders (the most common form of childhood psychopathology; Green, McGinnity, Meltzer, Ford, & Goodman, 2005) and they may maximise the expression of negative emotions during processing (Spangler & Zimmermann, 1999). Such behaviours may be categorised in attachment research as disorganised; illustrated by explosive and defiant patterns of affect and behaviour guided by an unconscious wish to gain more attention from care-givers and provide more reliable protection (Cassidy & Kobak, 1988). In class, these children may have problems with social relationships, be unmotivated to behave appropriately, unafraid of discipline and unable to feel remorse (American Psychiatric Association, 2013). In some populations, physiological reactivity is also associated with peer problems, believed to be due to a

diminished capacity to attend to social cues, leading to the misinterpretation and incorrect processing of social information (Crick & Dodge, 1996).

2.11.1.3 Inattention, impulsivity & hyperactivity

Attention is characterised as a two-fold process that requires the ability not only to *attend* to something but to *ignore* irrelevant distractions (Gazzaniga et al., 2009). The inability to self-regulate attention, activity and impulsivity has direct implications for emotional regulation (Barkley, 1997). Young children are naturally active, impulsive and easily excitable. Excessive behaviour of this nature is usually outgrown. For some children however, attention span is so short, activity levels are so high and impulse control so limited, that learning and social development is severely impaired (Barkley, 2013). This section focuses on the emotion regulation tendencies of children who experience such difficulties. Some, though not all, of these children may end up with a diagnosis of Attention Deficit/Hyperactivity Disorder (ADHD) and for the purposes of this review, it must be noted that most of the available research on emotion regulation has been conducted on clinical populations with a formal ADHD diagnosis rather than with community samples that may relate more closely to the young participants in this study. That said, many of the symptoms of ADHD may also be present in community samples, as such this research is arguably important to educators. Where available, relevant findings on emotion regulation from community samples in relation to attentional problems in classroom context are included.

As discussed above, in Gross's (1998a) model, attentional deployment has an important role in the regulation of emotion and deficits in attention control may have a significant impact on the ability to adaptively regulate emotion (Denham, 1998). It is a well-established research finding that children diagnosed with attention deficits also have deficits in their emotional abilities that compromise effective interaction with others (Norvilitis, Casey, Brooklier, & Bonello, 2000). In particular, children with attention problems generally experience difficulties both with the understanding of their own emotions but also in their recognition and interpretation of other's facial expressions and body language (Casey, 1996; Saarni, 1999). Without adequate emotion appraisal skills, it seems unlikely that a child will be able to efficiently regulate their emotional responses, nor that they

will have adequate awareness for how their emotions affect and are affected by others (Norvilitis et al., 2000). Relational problems with peers are common among children with attention deficits (Walcott & Landau, 2004).

Emotion researchers have examined emotion expressivity in children diagnosed with ADHD. These children are found to be more emotionally expressive as well as more susceptible to emotional contagion than comparison children (Casey, 1996). When examining the effects of negative emotional contagion, children with ADHD are found to become increasingly emotionally positive in their emotional expressivity indicating a degree of emotion regulation effort required (J. Zeman, Cassano, Perry-Parrish, & Stegall, 2006).

From a research perspective, ADHD symptoms often co-occur with mood, anxiety, oppositional defiance and conduct problems, with up to 44% of children in community samples with ADHD having at least one other disorder (Barkley, 2006). Much research has focused on the co-occurrence of ADHD symptoms with externalising symptoms such as oppositional defiance and conduct disorder and less is known about shared symptomology with internalising conditions such as anxiety and mood disorders (Steinberg & Drabick, 2015). Given the potential diversity of these symptoms among children with attentional problems, the developmental pathways and behavioural outcomes are likely to differ. In the classroom, one child with attentional problems might have difficulties with controlling emotional outbursts and a tendency to frequently express strong negative emotionality whereas another may be prosocial, emotionally controlled and positively emotionally expressive.

This heterogeneity across ADHD symptoms has also been explored in relation to physiological reactivity. In their laboratory study, Musser, Galloway-Long, Frick & Nigg (2013) investigated physiological reactivity in children with ADHD. Children with ADHD were grouped on the basis of their prosocial scores of the Strength and Difficulties Questionnaire (R. Goodman, 1997). They found children with age-appropriate pro-social behaviour displayed atypically elevated sympathetic arousal across all laboratory induced conditions of emotion regulation. In contrast the ADHD low-prosocial group displayed reduced, or blunted physiological activity across baseline and task conditions. This reduced

autonomic activity is consistent with prior research on children with antisocial behaviour described in the previous section. Inattentive and hyperactive children showing high physiological reactivity during frustrating or challenging tasks when combined with difficulties in regulation, or "coming down" from emotional states, are shown to display impulsive, explosive or anti-social behaviours consistent with clinical diagnoses of attention deficit and hyperactive disorder (Walcott & Landau, 2004).

Given this heterogeneity and high degree of symptom overlap between attention/hyperactivity and a range of emotional and behavioural problems, there may be a lack of clarity in education settings on identifying children with difficulties and providing targeted, optimal support. As will be discussed, possible gender differences add further complexity to the existing literature on attentional problems in relation to emotion regulation and furthermore, recent research provides early indication of possible new variants and presentations of inattention and hyperactivity disorders (Barkley, 2013) that adds additional uncertainty for practitioners struggling to understand and manage such behaviours in their classrooms.

In the UK, inattention and hyperactivity is now the most common classroom behavioural problem reported by teachers (Brown & Schoon, 2010). Predictably, children with ADHD have less success with task completion and these children are also found to be less flexible in their responding to changing task situations. For example, Westby and Cutler (1994) found children with ADHD were easily able to provide directions during a task when such behaviour was required but struggled to switch roles, persisting with inappropriate behaviour when they were required instead to follow instructions. Several studies indicate that attention problems, with or without hyperactivity, are the most salient risk factor for academic problems (Reinke, Herman, Petras, & Ialongo, 2008), as such it is hoped that this study can shed light on some of this complexity of the nature emotion regulation tendencies in children with attentional difficulties in school.

2.11.1.4 Summary of individual differences in emotion and behavioural problems

The regulatory strategies theorised as most protective against the internalising disorders of anxiety and depression and externalising disorders of antisocial

behaviour and ADHD include cognitive change and problem solving strategies (Aldao et al., 2010). The strategies consistently argued as risk factors for emotion and behavioural disorders include the suppression of expressive thoughts and emotions, experiential and behavioural avoidance and rumination.

However, many of these trends come from literature on adults and clinical samples of psychopathological disorder. In respect of children, the internalising and externalising subgroups of maladaptive emotion regulation are not well explained by prior research and a central goal for the proposed study is to link emotion reactivity and regulatory behaviours to the maladaptive emotion and behavioural disorders manifest by children in their classroom.

2.11.2 Gender differences

An important goal for this research is to understand individual differences in emotion and behavioural problems and how these might relate to reactivity and emotion regulation. In the literature, many questions remain regarding the range of subjective differences in internal physiological reactivity and how these relate to different patterns of emotion regulation that unfold across childhood and adolescence (Cole et al., 2004). Interpretation of emotionally significant events is highly subjective. In neural terms, Damasio, Everitt, and Bishop (1996) argue that somatic markers place tags on emotionally significant events producing a physiological reaction, signalling a current event that had emotion-related consequences in the past. The reactivity to emotion-laden stimuli in the classroom is likely to be unique and highly dependent on the prior experience of the individual. Gender differences are likely to be observed in childhood as a result of the different cultural and social expectations that begin in childhood. For example, parents talk about emotions differently with boys and girls, focusing more on the emotion itself with their daughters and more on the causes and consequences of emotion with their sons (Fivush, Brotman, Buckner, & Goodman, 2000). Such differences may result in later patterns of gender-specific behaviours in respect of emotion regulation. In their meta-analysis Tamres, Janicki, and Helgeson (2002) showed that in times of relational stress, adult women were more likely to seek social support and to vent their emotions, whereas men were more likely to use avoidance of withdrawal strategies. In childhood, boys are

found to externalise their anger more often than girls, who are more likely to suppress anger and seek social support (Chaplin & Aldao, 2013). Gender differences in the deployment of emotion regulation strategies are important, partly due to the established relationship between specific strategies and the risk for emotion and behavioural disorders (Waters & Thompson, 2016). For example, seeking emotional support is an underused strategy in individuals with depressive symptoms where as suppression is a more frequently associated ER strategy (Nolen-Hoeksema & Aldao, 2011). Understanding the emergence of such differences during childhood may improve understanding of vulnerability and allow for the early identification of individuals who may benefit from support or intervention.

There is accumulating evidence from the field of cognitive neuroscience suggesting that males are more sensitive to emotional stimuli than females. Such research reveals anatomical differences in several brain regions, including the orbitofrontal cortex (OFC), a region that appears to be involved in the initial evaluation of the emotional significance of stimuli (Happaney, Zelazo, & Stuss, 2004). Andreasen et al. (1993) found significant differences in the metabolic rate of glucose utilisation in the OFC of 19 to 32 year-old men and women. During a mentally 'idling' state, males were said to have a higher relative metabolism than women in several brain regions including the OFC, suggesting that this area is more active in males than females. In a study of inhibition control in teenagers, Silveri and colleagues (2006) found different regions of the prefrontal cortex were activated in males and females and it is believed that the OFC matures earlier in males than females, perhaps as a result of testosterone levels (Overman, 2004).

Given these anatomical differences in the neural structures involved in emotion-related appraisals, previous researchers (e.g. Venables & Mitchell, 1996) emphasise the importance of taking gender into account in research that incorporates physiological measures. Using skin conductance measurement methods, Boucsein (2012) suggested that females generally show higher SNS levels than males, whilst males tend to show greater reactivity to specific events. In relation to specific emotions, preschool boys show greater SNS sensitivity to

happiness than girls (Sohn, Sokhadze, & Watanuki, 2001) and McManis, Bradley, Berg, Cuthbert, and Lang (2001) reported that 7-10 year old girls were generally more sensitive than boys to unpleasant affective pictures. Many researchers have explored the physiological signals of anger (e.g. Cacioppo et al., 2000; Levenson, 1994) in which SNS reactivity is slightly higher in boys than girls. On the other hand, gender differences in cardiac reactivity to sadness have been found in school age children with higher sensitivity in girls than boys (Sohn et al., 2001). These differences may be partly due to different societal expectations for boys and girls in relation to the expression of specific emotions, with anger not traditionally encouraged in girls and sadness not traditionally encouraged in boys.

In relation to emotion and behavioural problems, in their 2004 national study of 5 to 16 year olds, (Green et al., 2005) found that children with serious externalising or conduct problems, were more likely to be boys (69%) and in contrast, children with serious emotional problems (such as anxiety and depression) were more likely to be girls (54%). Due to the higher prevalence of externalising behaviour problems for boys, research in this area is more often conducted on males than females (Mullin & Hinshaw, 2007). It is therefore unclear whether patterns of physiological reactivity typically associated with externalising disorders apply similarly to girls. A gender-balanced sample, as proposed for the present study, would permit such comparisons between regulatory behaviours and physiological responding across SNS hypo and hyper-reactive groups in both males and females.

2.12 The current investigation

As the above review has shown, there are many outstanding questions regarding the patterns of emotion reactivity and regulation in respect of the complex emotion and behavioural problems observed in the school context. Emotion regulation strategies differ with regard to their operationalisation, measurement and classification. According to context, a specific ER strategy may be adaptive or maladaptive and also antecedent-focused or response-focused. Reappraisal and distraction strategies are seen as antecedent-focused, adaptive and helpful for the

down-regulation of negative emotion. However, in certain situations, these strategies can be deployed later in the emotion generation process and therefore could also meet Gross's (1998a) definition for response-focused and maladaptive emotion regulation. Suppression of negative emotion expression is also viewed as detrimental to physiological and behavioural functioning. Theoretical understanding of emotion regulation has predominantly been interested in the impact of negative rather than positive emotion expression and little work has considered the role of positive emotion expression as a strategic influence on adaptive emotion regulation.

There is still some uncertainty in the literature on how regulatory processes relate to externalising and internalising behaviour patterns and a central goal for the present study is to investigate the patterns of emotion regulation that might shed light on these behaviours. This research considers the question of whether specific strategies (such a distraction, cognitive reappraisal, emotion suppression and experiential avoidance) can be associated with specific problems on display in the classroom. Emotion and behaviour disorders are most often considered from a clinical perspective, using clinical samples and associated measures for distinct behavioural disorders. Such instruments may have less validity and utility in community samples and this study will test the value of measuring a combination of experiential, behavioural and physiological emotion response tendencies in respect of the emotion and behavioural concerns at school.

Despite the clinical and scientific evidence for maladaptive emotion regulation strategies in adulthood, this knowledge cannot be automatically applied to children. Little is known about the range of strategies children are able to use at a particular age. For example, children may be less capable of using cognitive strategies such as reappraisal and may not be able to effectively report on their use of particular strategies since self-awareness requires some degree of meta-cognitive development (Whitebread & Basilio, 2012).

Heterogeneity and symptom overlap from a clinical perspective causes difficulties with the identification of clear support pathways. These may be exacerbated by gender differences in strategic choices as well as differences in physiological reactivity. The evidence to support this premise, presented in the literature above, suggests that a) children with lower average levels of

physiological reactivity are likely to employ more adaptive antecedent-focused ER strategies, and that b) children with overall higher average levels of physiological reactivity are likely to employ more maladaptive response-focused regulatory strategies. However, it is also suggested that low reactivity, combined with maladaptive regulatory strategies may be associated with poor conduct and peer problems, whilst high reactivity may be associated with anxiety, inattention and hyperactivity in the presence of divergent environmental triggers and contexts.

Very little work has bridged the gap between the complex physiological contributions to emotion regulation in relation to both adaptive and maladaptive childhood emotion and behaviours. Individual variations are based on temperament, gender, and prior experience, which combine to shape the child's perceptions of an event and associate its meaning as stressful or not. A central goal for this project is therefore, to build on the unfolding knowledge base regarding emotion regulation and with a view to linking both adaptive and maladaptive patterns of emotion regulation to the physiological and behavioural manifestations of emotion and behaviour problems typically observed in education settings.

2.13 Research aims

The current study aimed to address a number of important questions that arise from the review of previous research. These can be summarised under the following general aims:

a) to understand the patterns of emotion arousal and regulation in relation to classroom emotion and behavioural problems, and
b) to identify groups of individuals who might be at risk of developing greater emotional and behavioural problems and for whom support or intervention may be beneficial.

In order to address these issues, the current project sought to uncover some of the complexity regarding the adaptive and maladaptive emotion regulation behaviours typically observed in the classroom. Specifically, it examined the

underlying physiological indicators that accompany adaptive and maladaptive ER strategies in a gender-balanced, educationally representative sample of 7 to 9 year olds. From within the naturalistic setting of the classroom, using an underlying measure of physiology, it investigated a range of emotional reactivity responses and regulatory strategies as observed in-situ during a problem solving task. These were considered alongside the children's self-reported emotion regulation competencies and compared to those reported behavioural characteristics observed by the child's teacher in school.

3 METHODOLOGY

3.1 Introduction

In the previous chapter, the research literature relating to emotion regulation in respect of classroom emotion and behaviour problems was reviewed and questions arising from this literature for the current thesis were raised. This chapter describes the main methodologies employed in the present study, commencing with a review of the contributions from previous research employing emotion regulation methodology, followed by a description of the measures selected for data collection in the current investigation.

3.2 Review of methods used in emotion regulation research

This study responds to calls for greater understanding of the individual differences in emotion reactivity and regulation in social context (Cole et al., 1994). Ecological validity is a high priority for the proposed study. The contention, supported by many theorists and researchers in the field (Immordino-Yang & Damasio, 2007; D. K. Meyer & Turner, 2002), is that in order to better understand the role of emotion in learning, perspective should be included from the consideration of real-life contexts, complete with all the complications and intricate relationships between affective, cognitive and behavioural processes this might entail (Do & Schallert, 2004). The challenge

therefore, is how to measure the affective experiences of a particular group of students in-situ, as they undertake a group problem solving task in the context of their school.

In studies of emotion regulation in children, multilevel and multi-method approaches are advocated (Adrian, Zeman, & Veits, 2011) and four different measurement techniques are typically employed: 1) self-report, 2) other report (parent, teacher or peer), 3) observation and 4) physiological-biological indicators (for reviews see Morris, Robinson, & Eisenberg, 2006; J. Zeman et al., 2007). Previous research utilising these different methodologies is summarised in the subsections that follow.

3.2.1 Self report

Even in children as young as 3 years old (e.g. Durbin, 2010), self-reports are found to provide useful information on the often hidden, unexpected feelings and behaviours of students (Linnenbrink, 2006). Self-report measures may take the form of questionnaires (e.g. Emotion Regulation Questionnaire for Children and Adolescents, Gross & John, 2003), electronic diaries (Suveg, Payne, Thomassin, & Jacob, 2010) or interviews (e.g. Emotion/Affect Regulation Interview, J. Zeman & Garber, 1996). Such methods can provide insight into the individual's ability to report, assess and integrate information (such as cognitions and physiological symptoms) about events, their emotions and responses.

Self-reports, however, are limited by the requirement for children to be aware of their emotions, have the ability to monitor them, recall their emotional reactivity retrospectively and then communicate this information (J. Zeman et al., 2007). An individual may be experiencing a feeling but may not be certain how to label a specific emotion nor its impact on subsequent decision-making. Whilst self-report can provide useful general information on emotion awareness and regulation, it is limited to pre or post-event data collection and does not allow for the capture of the emotional experience at the moment of stimulus.

The limitations of self-report, widely acknowledged in the literature, may be responsible for the relative absence of available tools for measuring children's emotional experiences (J. Zeman et al., 2007) and there are several limitations

with self-report measures available of children's emotion regulation. Some questionnaires measure the regulation of only a limited range of emotions (e.g. anger and sadness; Janice Zeman, Shipman, & Penza-Clyve, 2001) and others simplify the range ER strategies children reportedly use (e.g. suppression and appraisal; Gross & John, 2003). The choice of suitable measures available for the present enquiry was further restricted by the need for an appropriately validated tool for children aged 7-9 years old. Emotion Regulation Index for Children and Adolescents (ERICA) is one measure that was developed to enable research into ER during childhood and adolescence and was designed to capture phenomenological aspects of emotional lability, shame, guilt, empathy and depressive symptomatology (MacDermott, Gullone, Allen, King, & Tonge, 2010). Despite some criticisms in the literature for being too limited in age range (Callear, Harvey, & Bimler, 2016), the ERICA assesses ER behaviours more broadly than other available child self-report questionnaires, it is relatively short (24 items), and therefore easy to administer in school context. The ERICA also has the advantage of being appropriate for the age group of interest to the present enquiry.

3.2.2 Other reporters

Parents and teacher questionnaires and interviews are also enlisted to measure components of emotion as they provide the opportunity to understand children's emotion regulation in diverse social situations (Adrian et al., 2011). Although biases can affect ratings of children's behaviour (Fergusson, Lynskey, & Horwood, 1993), other-report measures are considered to have better reliability and validity than self-report (Morris et al., 2006). In prior studies with children, both parents and teachers have been asked to report on the emotion regulation of participants. Such information provides useful background on particular tendencies for emotion regulation as observed by a close adult. Investigations of individual differences in emotion regulation have found that individuals develop tendencies or preferences for certain emotion regulatory strategies (Fabes, Eisenberg, Karbon, Troyer, & Switzer, 1994). In order to cope with the specific environmental challenges under conditions of stress, the management of

emotional, physiological and behavioural responses draws on the resources that are available. These may be limited to the types of regulatory responses the individual is able to employ (Compas, 2006). Such response tendencies may include 1) high levels of expressive behaviour, for example in frustrated, so called 'under-controlled' children prone to aggression, 2) high levels of inhibition combined with a lack of flexibility in temperament, often socially withdrawn, sad, anxious, or 'over-controlled' children, and 3) competent, flexible regulators that are relatively popular and socially competent. Such interactions suggest the influence of temperament on regulatory abilities and the Temperament in Middle Childhood Questionnaire (TMCQ; Simonds & Rothbart, 2004) is one such instrument that has been developed for completion by parents.

Primary school teachers are well placed to provide objective measures of children's behaviours as they work with them every day of the school year. The Child Behaviour Checklist (CBCL; Achenbach & Ruffle, 2000) is established as a valid and effective measure for childhood affective disorders. However, whilst the CBCL is still viewed as a solid instrument for in depth assessment (Stone, Otten, Engels, Vermulst, & Janssens, 2010), it is a lengthy questionnaire (118 items), which may have a negative impact on completion rates amongst already over-stretched teaching professionals. The Strengths and Difficulties Questionnaire (SDQ; R. Goodman, 1997) is an alternative, shorter measure that has been developed to measure both problem behaviours and social competencies at an early age. Based on the Rutter Questionnaires developed in the 1960's (Rutter, 1967), the SDQ was initially introduced to screen young children for mental health problems. It is now a well-validated tool for identifying a range of social and emotional tendencies in community populations (Stone et al., 2010) and is increasingly used in education settings where children may be at risk of developing psychosocial problems that can be identified for intervention in school. The SDQ also has the advantage of being relatively short (25 items), free of charge and available online.

3.2.3 Behavioural observations

In their 2008 longitudinal investigation of emotions and engagement in middle and high-school students, Skinner, Furrer, Marchand, and Kindermann (2008) suggest that the depth and accuracy of their self-report investigation could have been improved if observational data had also been captured. Observational methods are increasingly considered the 'gold standard' for measuring emotion regulation in developmental research (Cummings et al., 2002). Body gestures, voice tone and facial expressions relay important information about emotional experiences and coding systems can be flexibly developed to capture participant emotional reactions and behavioural consequences.

In psychological research, observational measures of emotion regulation in the primary school age group have typically been investigated under controlled laboratory conditions, where emotions are typically induced (Fabes et al., 1994) or participants are asked to withhold or control an emotional response in order to achieve a reward. In one example, (Rice, Levine, & Pizarro, 2007) showed a sadness-invoking video excerpt and gave participants instructions to engage or disengage from emotion. Whilst such manipulations allow for controlled scientific measurement, these hypothetical assessments of social abilities are unlikely to generalise to naturalistic interactions. This may be especially true for certain child populations. For instance, children with attention deficit difficulties are found to produce more typical patterns of response to induced emotion than in naturalistic studies where impairments in managing emotional responses, effective problem solving and appropriate expressions of emotion are more likely (Melnick & Hinshaw, 2000).

Several naturalistic studies have observed emotion regulation within families (e.g. Klinnert, 1984) and peer interactions (e.g. Leary & Katz, 2005) where specific behaviours during joint tasks or conflict discussions can be observed and coded. Dewey, Lord, and Magill (1988) found that construction materials were an effective means of facilitating complex social interactions between collaborating children. LEGO construction toys are an example of such tools and they have been successfully employed in observation studies concerned with emotion regulation in young people. Hinshaw and Melnick (1995) designed a task, where subjects

and their parents were instructed to build a LEGO model in which the experimenters had surreptitiously omitted two pieces. This paradigm was more recently modified by Walcott and Landau (2004) in their study of young ADHD males, in which participants were invited to compete for a prize with another child (shown on video, allegedly in the next room) to build a LEGO model in the fastest time.

LEGO building has also been successfully developed into a social-skills intervention for children with Autistic Spectrum Disorder (LeGoff, 2004; replicated by Owens, Granader, Humphrey, & Baron-Cohen, 2008). Such LEGO therapy projects would aim to build a LEGO set in tryads, where each individual is designated a role ('engineer,' 'supplier' and 'builder'). Participants are paired with typically developing peers and verbal & non-verbal communication, collaboration, problem solving, creative and attention behaviours are observed and coded. LEGO is a highly structured, predictable construction toy and children are motivated to the extent that participation in the group is inherently rewarding and as such, no external rewards are required (LeGoff, 2004).

3.2.4 Physiological measures

Methodological constraints in naturalistic studies – such as those in education contexts – have tended to rely on measures of emotion arousal and regulation through self-report and observation methods. Although naturalistic studies provide ecological validity they are limited to researcher observations and descriptions that are unable to take into account the subtle biological differences in reactivity to the demands of social interactions. As has been stated, emotion regulation is not always conscious or intentional and the interpretation of observations is reliant on visible external displays of emotion with inference of internal, unobservable processes to be measured. Furthermore, validity of observation methods decreases as children develop the ability to dissemble emotional displays (Saarni, 1984), thereby affecting the validity of observational data.

Typically, measurements of underlying physiological responses to emotional stimuli are confined to experimental laboratory conditions. Emotions are rapid

and fluid, often involving micro-momentary fluctuations, which may only periodically reach a conscious level of detection by the individual or observer (Izard, 1977). Laboratory studies may be more sensitive, usually incorporating physiological measures of heart rate, electrodermal activity, cortisol, or brain activity analysis with event related potentials. Using such technologies, affective data is collected under controlled conditions in which feelings are artificially induced (Dunn, Billotti, Murphy, & Dalgleish, 2009).

With the advent of recent neuroimaging techniques, fMRI is often used to investigate the cortico-limbic circuitry involved in emotion regulation (LeDoux, 1998). Although brain imaging experiments can be, and are conducted with children, problems with movement, boredom or lack of concentration in child participants affect the reliability and validity of results (O'Shaughnessy, Berl, Moore, & Gaillard, 2008). Child participants also present additional ethical considerations, in particular with their ability to provide informed consent (Downie et al., 2007). Above all, the greatest challenge facing brain-imaging methodology is that a child's brain anatomy differs from that of a fully matured adult. Data analysis requires that brain images are mapped onto a brain atlas which is standardised for adult brains (O'Shaughnessy et al., 2008). Given these limitations, particularly in developing brains, interpretation of reduced laboratory research into the educational setting is required in order to investigate the ecological validity of scientific findings whilst identifying opportunities for both future laboratory and educational research.

3.2.5 Physiological measurement in naturalistic studies

Until recently, physiological measurement technologies would not have the flexibility to be incorporated into naturalistic studies. Recent advances in research methods, however, increasingly allow for measurement of underlying physiological reactivity, which may reduce dependence and over-reliance on inferential interpretation of behaviour and conscious reporting of emotion experience from participants (Cole et al., 2004). New techniques provide promise for achieving deeper understanding of inter-individual variability in the arousal and regulation of emotion in real-life contexts and it is now more possible, with a

variety of physiological measures, to examine the relationship between observed behaviour and measured physiological function.

Certain assessment devices now allow for the in-situ capture of physiological correlates of emotion in daily life (Wilhelm & Grossman, 2010) and measures used in studies with children include cortisol assays, heart-rate change and electrodermal activity (skin conductance). In situations of stress or conflict, such measures provide a window into emotions that may or may not be overtly expressed. Cortisol levels are increasingly incorporated into naturalistic studies of emotion and stress. The HPA axis (hypothalamic-pituitary-adrenocortical) is one of the core stress response systems implicated in emotion regulation and many studies with children use cortisol assays to measure the impact of HPA disruption on emotion regulation (e.g. Gunnar *et al*., 2010) due to its established links with behaviour and ease of sampling in children's saliva (e.g. Alink et al., 2008). Numerous cross-sectional and longitudinal investigations have shown that dysregulation of basal cortisol levels predicts emotional and behavioural problems in preschool and primary school-age children (e.g. Gunnar & Vazquez, 2001; Murray-Close, Han, Cicchetti, Crick, & Rogosch, 2008). However, the HPA axis is a relatively slow response system and its responding to elicited emotion is more protracted than the autonomic nervous system (McCrory et al., 2010). Thus, cortisol levels can only provide a general biological measure of emotionality and have limited sensitivity to the specific events and associated behaviours of the kind under investigation in the present study.

Changes in heart rate also reflect patterns of emotion reactivity that are often recorded alongside behavioural observations. Heart rate is influenced by both sympathetic and parasympathetic branches of the ANS and is thought to accelerate during times of stress or negative emotion (Fox & Davidson, 1987). Several studies with infants have recorded heart rate acceleration during the approach of an unfamiliar person (e.g. Campos, Emde, Gaensbauer, & Henderson, 1975) and highly fearful, inhibited children demonstrate high resting heart rate associated with chronic anxiety (Kagan, Reznick, & Snidman, 1987). However, interpretations of heart rate responses underlying emotions in children have not proved to be straightforward and a number of conceptual and methodological

problems are discussed in the literature. Firstly, heart rate changes can be modulated by different factors. Aside from emotion arousal, acceleration also occurs during muscular movements and situations that evoke laughter, smiling or positive emotion also elicit increases in heart rate (Sroufe & Wunsch, 1972). Moreover, heart rate is influenced by both the sympathetic and parasympathetic systems and yet only the parasympathetic system is considered truly regulatory. Proponents of the two-step process (emotion, then regulation) suggest that the reactivity component of heart rate response is not therefore an accurate measure in studies of emotion regulation (Hessler & Fainsilber Katz, 2007).

A sensitive physiological index of emotion reactivity in children is skin conductance or electrodermal activity (EDA; previously termed 'Galvanic skin conductance'), which is a widely used measure of emotion reactivity and regulation (e.g. Boucsein, 2012; Fowles et al., 1981; Venables & Christie, 1980). An individual's level of EDA is changing constantly, it is influenced by hydration of the eccrine sweat glands (Boucsein, 2012) and increased emotional arousal will result in higher skin conductance levels (SCL; Bradley & Lang, 2000a). Although EDA is a multifaceted phenomenon and does not reflect one single psychological process, it has a long history of use as an objective index of emotional arousal (Critchley, 2002), for example, in studies of fear conditioning, where a behavioural response to the fear stimulus can be temporally linked to a measure of EDA.

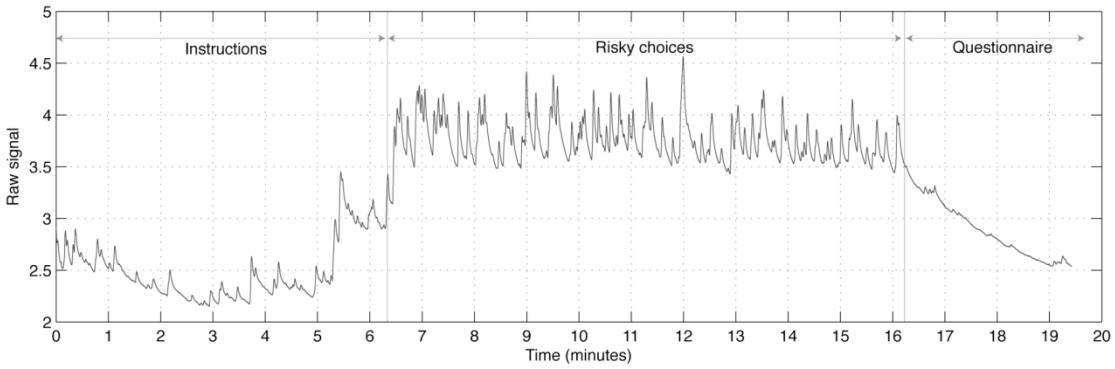

Figure 3.1: An example of the raw skin conductance signal from one participant over the course of an experiment.

EDA response is easily elicited from external stimuli, such as a loud noise or an angry face, but is also sensitive to a range of internal/subjective stimuli. It is

important to consider that sweat-gland activation is sensitive to a wide range of positively and negatively valanced stimuli such as novelty, reward, and anticipation, as well as stress and anxiety (Rockliff *et al.*, 2008). As such, it is best thought of as an indicator of physiological arousal or engagement with the task. EDA measures are popular in emotion research as they provide 1) a general measure of sympathetic arousal, which describes the overall conductivity of the skin over long time intervals, by calculating the difference between baseline and general level of activation; and 2) sympathetic activation in response to specific events or stimuli, denoted by sharp peaks in skin conductance (see Figure 3.1; Figner, Mackinlay, Wilkening, & Weber, 2009). EDA measurements are generally described as either 'tonic' or 'phasic.' Tonic EDA generally refers to changes in skin conductance that are not directly related to an eliciting stimulus and can occur in periods from tens of seconds to minutes (Navqi & Bechara, 2006). Tonic measures include: Skin Conductance Level (SCL) and Non-Specific Skin Conductance Fluctuations (NSFs). Tonic measures have been used extensively to study the relationship between ANS activity and arousal or "stress" (R. S. Lazarus, 1966). SCL has relatively stable individual differences, with test-retest correlations generally between .50 and .70 across periods ranging from a few days to a few months (e.g. Lovibond, 1992).

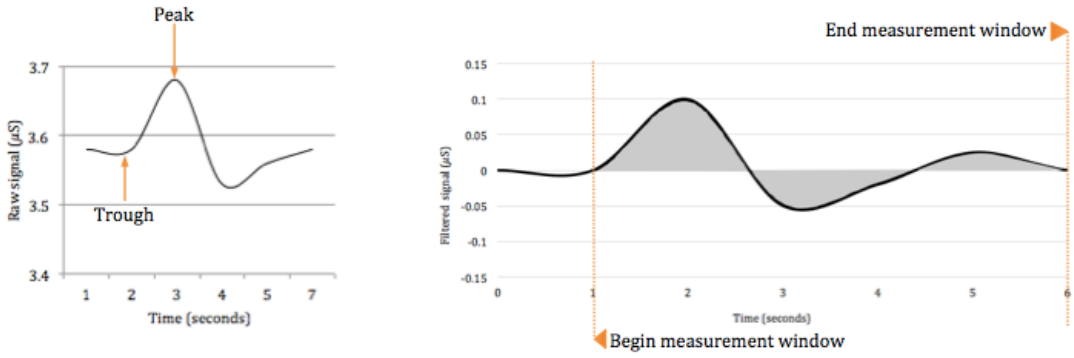

Figure 3.1a: Raw (left) and filtered EDA signal showing AMP (left) and AUC measurements.

Widely used as an indices of SNS arousal (Boucsein, 2012), NSFs are increases in EDA response that appear in the recording signal but are not necessarily elicited by a specific stimulus. According to Boucsein (2012), individuals who exhibit high frequency NSFs may be considered as EDA 'labiles,' whereas those that exhibit

few NSFs are referred to as EDA 'stabiles.' NSFs are recommended in studies of long-duration stimuli. Similarly to SCL above, test-retest correlations for NSFs are reported between .50 and .70 (Lovibond, 1992).

Phasic EDA measurements are interested in event-related processes and in laboratory studies, are usually discretely related to an eliciting stimulus. Amplitude (AMP) and Area Under the EDA Curve (AUC) are the two most commonly used phasic skin conductance measurements. AMP measures an individual's physiological sensitivity to an event as well as recovery time and is defined as the difference between the peak EDA value and the trough value that precedes this peak (see Figure 3.1a).

Traxel (1957) extended the concept of EDA recovery, proposing the calculation of an integral that measures under the curve of a single EDA response. In spite of the misleading term, the *area under the curve* includes a measure of area both under and above the EDA curve (see Figure 3.1a). AUC takes into account the amplitude of the response as well as its decay time. This is widely seen as a measure of "quantity of affect" (Boucsein, 2012) which not only describes physiological sensitivity but also provides information for how slowly or rapidly an individual is able to recover from emotional arousal. The ability to decrease or dampen negative feelings is an important feature of adaptive ER. In situations where it is not possible to identify discrete EDA responses occurring in response to a stimulus, both Amplitude and AUC can be usefully included as measures of activity over a defined time interval (Navqi & Bechara, 2006). As illustrated in Figure 3.1a, the curve may lie above or below the baseline. Areas above the baseline will produce a positive score; areas under the baseline will produce a negative score.

A few studies have measured the stability of EDA levels among children. In a sample of 7-8 year olds, Corah and Stern (1963) found there was high stability for resting SCL with an average test re-test correlation of .95 within the same session and .86 between day one and day two of measurement. More recently, (El-Sheikh, 2007) found similar patterns of stability over a two year period on a test of EDA Amplitude in children age ranged between 6 and 13 years with reliability coefficients ranging from .90 to .98.

The ability to measure EDA magnitude, frequency and baseline levels provides quantitative information to compare patterns of emotional arousal across individuals and supports the multi-method, multi-informant approach adopted for the present study.

3.2.6 Summary of research methods

Almost all of the current scientific knowledge about emotions is based on laboratory research methodologies since these, together with observational and self-report approaches, have been the most feasible, efficient and cost-effective in the past (e.g. R. S. Lazarus, 1966). Substantial methodological differences exist between laboratory and field research. Undoubtedly, there are aspects of emotion enquiry that can only be systematically investigated under controlled conditions and experimental findings are valuable for developing theory and generating hypotheses. Laboratory measures provide a window on emotions that may or may not be outwardly expressed, providing reliable information on the underlying functional relations between specific stimuli and behavioural responding. Nevertheless, laboratory research on human emotion makes little allowance for the individual subjectivity inherent within a social context (Wilhelm & Grossman, 2010) and furthermore, such studies are confined by controlled conditions and experimental manipulations that artificially induce emotions and their corresponding regulatory efforts. Such research is likely to miss important aspects of emotional functioning that may be central to life outside the lab.

The current study responds to calls from prior researchers who recommend that enquiry into emotion should not occur independently or detached from specific contexts (R. B. Johnson & Onwuegbuzie, 2004). Until recently, internal physiological indices have predominately been inaccessible to field research and remain the privilege of laboratory investigations. However, new ambulatory techniques provide the possibility to incorporate measurements of physiological factors that were previously inaccessible to studies in naturalistic settings. Together with observation sources and multiple viewpoints of student and teacher, this data can be combined and triangulated in order to shed light on the

affective experiences of students whilst working amongst their peers and within the context of their classroom. Using newly developed technology designed to capture physiological responding in-situ, this study will carry out a direct analysis of the emotions experienced by students in the real-life setting of the classroom. With the intention to build on existing knowledge from laboratory findings and using appropriate methods, it is hoped that this enquiry will contribute new insight in a test of generalisation of laboratory research to the field of education.

The methods selected for this study were guided by the research questions previously listed and are explained here in detail, together with a description of the tasks and behavioural coding scheme. In preparation for this research, a two-phase feasibility study was carried out. Its purpose was to rehearse the administration of each of the measures, develop appropriate LEGO construction tasks, and to rehearse the analysis and interpretation of data. The methods employed in the pilot study revealed a range of individual differences in temperament, physiological responding and emotion regulatory strategies and were thus carried forward into the main doctoral study to explore with a larger cohort.

3.3 Research design

In accordance with a multi-level, multi-methods approach (e.g. Cobb, Yackel, & Wood, 1989; Cole et al., 2004; D. K. Meyer & Turner, 2002), emotion regulation was measured using quantitative data collection techniques that included questionnaires, coded observations and electrodermal recordings. The data collected during video observations provided the additional possibility of qualitative descriptions of specific behaviours. This methodological approach is described by (Adrian et al., 2011) as the "concurrent embedded approach" (p. 214) in which the secondary method (qualitative descriptions, in this case) is nested, or embedded within the predominant quantitative data collection method. For the present study, the advantage of such an approach is that it provides the opportunity to enhance quantitative findings with rich illustrations of the emerging behavioural patterns among participants.

Data collection for the main study took place between May and July 2013. One hundred and twenty-eight children were recruited. Participants provided self-reports using the Emotion Regulation Index for Children and Adolescents Creswell (2009). Teachers provided background data on age and information for each child regarding any Special Educational Need (SEN) and eligibility for Free School Meals[1] (FSM), as well as reports on participant emotion and behavioural tendencies using Goodman's (ERICA; MacDermott et al., 2010) Strengths and Difficulties Questionnaire. From within their school setting, participant sensitivity to emotion-eliciting events were recorded using physiological (EDA) data, collected with Affectiva Q-Sensor technology whilst age-group paired children performed two LEGO construction tasks. Observed behaviours were video-recorded and coded to establish timing and frequencies of distinct regulatory behaviours. These were subsequently compared to teacher, and self-report data on social, emotional and behavioural tendencies in class.

3.4 Research questions

As described in Chapter Two, the aims of the present study were: a) to understand the patterns of emotion arousal and regulation in relation to classroom emotion and behavioural problems and b) to identify groups of individuals who might be at risk of developing greater emotional or behavioural problems and who might benefit from intervention. The four research questions were formulated from these aims.

1 What patterns exist in middle childhood between classroom behaviour, emotion reactivity and emotion regulation?
2 What patterns of emotion reactivity and regulation exist in children with emotion and behavioural difficulties in the middle years classroom?
3 How does gender influence the patterns of emotion reactivity and regulation in middle childhood?

[1]measure of low parental income widely used in policy and social research (Gorard, 2012)

4 To what extent does the analysis of individual cases enhance the understanding of participant's emotion regulation tendencies?

3.5 Sample

As far as possible, within the resource limitations of a doctoral study such as this, the intention was that the sample would represent a range of geographic and social demographics from within the UK. Table 3.1 describes the geographic locations and characteristics of the five UK schools that participated in the study. Three are government-funded mainstream community schools (Berkshire CJ, Cheshire and Hertfordshire HH), one is a voluntary controlled, state funded, Church of England school (Berkshire SL), and the remaining school is an independent, fee-paying school (Hertfordshire LW). During recruitment, the head teachers were contacted via email with a summary of the proposed study and a request to visit the school to work with children in years three and four. By way of incentive, the researcher offered each school an INSET (in service teacher training) session for all staff on the subject of 'Inattention, Hyperactivity and Impulsivity.' Three out of the five schools requested the INSET which was delivered in all cases, during a school staff meeting after completion of the data collection phase.

Table 3.1: Characteristics of participating schools

Location	Student age	No. on roll	State/private	Type	% FSM*
Berkshire CJ	7 to 11	387	LA maintained	Community	17.1
Berkshire SL	4 to 11	250	Voluntary-controlled	Community	19
Cheshire	4 to 11	203	LA maintained	Community	24.6
Hertfordshire LW	3 to 18	506	Independent	Day & boarding	0
Hertfordshire HH	4 to 11	138	LA maintained	Community	43.8

FSM: Free School Meals, **LA:** Local Authority (state funded school), **Community:** controlled by local council & not influenced by religious or business group. *2014 data (1997). National average = 16.3%.

One of the important findings from the pilot study was that the proportion of moderate to serious emotional and behavioural problems were found to be more than twice the reported national average (Hatton, 2014), suggesting that no

special provision be made in the main study to seek out specific schools with a prevalence of emotional or behavioural problems.

3.6 Participants

Across the four schools, one hundred and twenty-eight children (72 males, 56 females) volunteered to take part in the study, ranging from age 7 – 9 years (see Table 3.2). To minimise the possibility of sampling bias a balance of both genders was sought: a) the recruitment phase specifically requested girls volunteer as well as boys, and b) the choice of Lego models available appealed to both genders appropriately. Sixteen participants were eligible for Free School Meals (FSM) and twelve were on the school register for Special Educational Needs.

It was agreed that class teachers would select the dyads for the LEGO tasks. It was agreed that no child would be partnered with another if either child were put at risk of undue stress, i.e. in a situation that had the potential for high levels of interpersonal conflict. Similarly, no pairing was to be selected where there was unlikely to be any social challenge, i.e. where children were the best of friends.

Table 3.2: Characteristics of participant children

Total n=	Male (%)	Female (%)	Age (SD)	FSM (%)	SEN (%)
128	72 (56)	56 (44)	9.16 (0.73)	16 (13%)	12 (9%)

FSM: Free School Meals, **SEN:** Special Educational Need

3.7 Procedures

Participants were collected from their classrooms in pairs and taken to a separate area in which they received an explanation of the recording equipment and LEGO tasks. The Q-Sensor device was moistened and attached to the (non-dominant) wrist of each child. Care was taken to ensure the child was comfortable before they were then invited to complete the ERICA questionnaire. Children sat side by side at a table, each session was video and voice-recorded. Video recording began on commencement of the first task and was terminated at the end of the second task, after which each child was given a small gift (a LEGO key ring) before they

then returned to their classroom. At a convenient moment during the school day, the researcher provided the teacher(s) with SDQs to be completed for each of the participants. These were collected at the end of the day, or returned by post to the researcher via the pre-paid envelope supplied.

3.8 Measures

This section describes the different methods that were selected to provide data on the behavioural, experiential and physiological processes that underpin emotion regulation tendencies.

3.8.1 Questionnaire screening measures

Context-specific strategies for emotion regulation have immediate social consequences and with repeated use, may formalise into social or behavioural styles (Brown & Schoon, 2010). For this reason, it was considered important to measure children's emotional and behavioural response tendencies in general terms as well as to specific emotion-eliciting events during observations. The screening measures selected to measure these general tendencies are described below.

3.8.1.1 Parent-report: Temperament in Middle Childhood Questionnaire

In phase one of the initial pilot study, a parental report of temperament was included among the battery of screening measures. Parents were provided a copy of the Temperament in Middle Childhood Questionnaire (Cole et al., 1994) when they came to collect their child and asked to return it to the school the following day. The TMCQ is a parental report used to assess individual differences in coping mechanisms as well as the tendencies children have to regulate their response to different sources of stress (TMCQ; Simonds & Rothbart, 2004) The TMCQ measures seventeen dimensions of temperament: Activity Level; Affiliation; Anger/ Frustration; Assertiveness/ Dominance; Attentional Focusing: Discomfort; Fantasy/ Openness; Fear; High Intensity Pleasure; Impulsivity;

Inhibitory Control; Low Intensity Pleasure; Perceptual Sensitivity; Sadness; Shyness; Soothability/ Falling Reactivity; Activation Control.

A central aim for the pilot was to test the content of the questionnaires and gain an indication of how acceptable and comprehensible the questions were for respondents. However, concerns were raised by one parent regarding the nature of some of the items, who expressed her reluctance to complete the questionnaire due to fears for the sensitivity of how the data might be used. These concerns may have been reflected in the high non-completion rate (29%) of the TMCQ, as a result of which, a decision was taken not to carry its administration forward into the main study.

Instead of a parent-report measure, it was decided to rely on data from the teacher's report questionnaire described below. Goodman's (Derryberry & Tucker, 1994) Strengths and Difficulties Questionnaire is a measure that is increasingly used in school communities and with good completion rates (1997). The SDQ is described in more detail below.

3.8.1.2 Teacher-report: Strengths and Difficulties Questionnaire

Teachers were asked to complete the SDQ for each of the volunteer children. The SDQ is a 25 item behavioural screening questionnaire that can be administered to parents and teachers of 4 to 16 year olds (see Appendix 3.1). The teacher version has been well validated as a tool for identifying social competencies together with emotional and behavioural disorders in both clinical and community (e.g. school) populations (Brown & Schoon, 2010). The 25 items generate scores for five subscales: 1) Emotional symptoms, e.g. *many worries, often seems worried*; 2) Conduct problems, e.g. *often fights with other children or bullies them*; 3) Inattention/Hyperactivity symptoms, e.g. *constantly fidgeting or squirming*; 4) Peer problems, e.g. *rather solitary, tends to play alone*; and 5) Prosocial behaviour, e.g. *considerate of other people's feelings*. Each of the subscales consists of five items, rated on a 3-point Likert scale (R. Goodman, 1999; R. Goodman, Ford, Simmons, Gatward, & Meltzer, 2000). Social competency is measured by summing the values of the Prosocial scale. Emotion and behaviour problems are calculated from an aggregate of the 4 other scales to provide a Total Difficulties (also referred to as Total Problems) score.

Table 3.3: Categorical scores from teacher-completed Strengths and Difficulties Questionnaire

	Normal	**Borderline**	**Serious**
Total Difficulties	0 – 11	12 – 15	16 - 40
Emotional symptoms	0 - 4	5	6 - 10
Conduct problems	0 - 2	3	4 - 10
Inattention/Hyperactivity	0 - 5	6	7 - 10
Peer problems	0 - 3	4	5 - 10
Prosocial behaviour	6 - 10	5	0 - 4

As explained in Table 3.3, higher scores indicate greater presence of a particular behaviour with scores in the serious range indicating a level of clinical concern. The scales of the teacher version have demonstrated test–retest reliability of 0.55–0.90 (0=not true, 1=somewhat true and 2=certainly true; Likert, 1932) and internal consistency (Cronbach's alpha) of 0.62–0.85 (R. Goodman, 1999; R. Goodman et al., 2000). For the present sample, the SDQ appeared to have good internal consistency, α=.70.

3.8.1.3 Child self-report: Emotion Regulation Index for Children and Adolescents

As soon as the children were seated and comfortable with the fitted Q-Sensor, they were asked to complete a self-report questionnaire. The ERICA, (Stone et al., 2010) is a revision of (also referred to as ERQ-CA, MacDermott et al., 2010) emotion regulation scale for school-age children. The ERICA (a copy of which can be seen in Appendix 3.2) consists of three scales that measure emotion regulation competencies. The authors report a test-retest reliability of .77 and internal consistency (Cronbach's alpha) of .75 Shields and Cicchetti (1997). For the present sample, the ERICA appeared to have good internal consistency, α=.78. The Emotional Control scale reflects the ability to regulate negative emotion and restrain from inappropriate emotional displays (e.g. *When things don't go my way, I get upset easily; I have angry outbursts*). The Emotional Self-Awareness scale assesses emotional recognition (e.g. *I am a happy person*) and emotional modulation (e.g. *When I get upset, I can get over it quickly*). It has been consistently proposed that emotional awareness and recognition are central to development of competent emotion regulation (MacDermott et al., 2010). The Situational Responsiveness items assess the ability to react or behave in a socially

or situationally appropriate manner, to be sensitive to other's affective displays and to respond appropriately. This is an important aspect of emotion regulation since emotionally competent functioning is dependent on the ability to regulate emotions in a flexible and adaptive way in response to the demands of the social context (Fischer & Manstead, 2000; Saarni, 1999; J. Zeman et al., 2002). Example items include: *I enjoy seeing others hurt or upset* (reverse scored).

3.8.1.4 Behavioural Observations

As have been used in prior ER research (Gratz & Roemer, 2004; Saarni, 1999) and in therapeutic interventions targeting the improvement of social skills (Hinshaw & Melnick, 1995; Walcott & Landau, 2004), LEGO construction toys are central to the two tasks in the current study. There is inherent flexibility in LEGO toys as different construction models are tailored to suit different ages and genders. LEGO appeals to a child's natural interests and motivations, and many of the participants in the pilot study reported having previous experience of model building with LEGO. Participation seems inherently rewarding (e.g. Owens et al., 2008). The two LEGO tasks were designed to be socially challenging and were expected to lead to interpersonal provocation within the peer groupings that volunteered to participate. Such interactions are considered interpersonal stressors that are commonly experienced by children in middle childhood, resulting in the elicitation of a range of emotional reactions (LeGoff, 2004). The emotional stimuli that naturally occur during these tasks, within the familiar school setting and amongst peers, allows for naturalistic assessment of regulatory abilities in a developmentally appropriate and adequately challenging context.

Task 1 is a construction task that requires interaction, communication and collaboration with a peer in order to build a model under time pressure. Task 2 is a competitive challenge in which participants are required to construct the biggest tower in the time available. These are explained more fully below.

3.8.1.5 Task One: Collaborative model building task (Task 1)

Participants worked together in dyads with each pair offered a choice of two different LEGO models (helicopter or house) and collectively asked to decide

which model they would like to build together. In a similar paradigm described by (Gottman & Parker, 1986), roles were divided between children with one person designated as 'builder,' (assembles the pieces) and another as 'engineer' (explains the instructions). The children would play in their role for a certain length of time and then swap roles with the other. Each activity required children to practice joint attention, turn taking, sharing, joint problem solving, listening and to use general social communication skills Owens et al. (2008).

In a task adapted from (Owens et al., 2008), each group was encouraged to build their model in a shorter time than the previous group had completed the same model. Participants were given the time to compete against and encouraged to build as quickly as possible (e.g. *"the last group completed the same model in 8 minutes and 43 seconds, do you think you can build it more quickly*?"). They were given frequent time-checks during the task, which served as a reminder of its competitive aspect. As a further challenge, and unbeknown to the participants, their model had a small number of missing pieces. When the children discovered this, they were encouraged by the researcher to "*do their best*" to complete the model as quickly as they could.

In phase 1 of the pilot study, at the end of this session, children were given time to build a model freestyle, which they could choose to build alone or with another child. Consultation on this data was sought from a group of researchers from the Self-Regulated Learning research group at the Faculty of Education, University of Cambridge, as a result of which it was felt that the task had limitations for inducing adequate emotional and social challenge. Based on this feedback and discussion, the freestyle task was subsequently removed from the battery and replaced with a competitive building task described below.

Figure 3.2: Participants during tower building task

3.8.1.6 Task Two: Competitive tower building task (Task 2)

In a second task, based on a paradigm described in Walcott and Landau (2004), participants were required to build a vertical LEGO tower and challenged to see who could build the highest tower. They were given two minutes to complete the task and a stopwatch was set with an alarm to indicate the end of their allocated time. As illustrated in Figure 3.2, the winner was declared as the one with the highest tower.

3.8.1.7 Physiological measure

As previously described, the SNS controls physiological responding typically associated with emotional arousal such as heart rate, blood pressure and sweating (Hinshaw & Melnick, 1995). The SNS is multimodal and whilst no single measure can capture the complexity of it's functioning, EDA is a widely used and flexible index (Fisher, Granger, & Newman, 2010). This study used the Affectiva Q-sensor, a newly developed, battery powered wireless device, worn on the wrist, which provides the opportunity to measure physiological activity during guided activities and within natural settings (see Figure 3.3).

Affectiva Q-Sensor technology was released in 2010 and the technology was discontinued and upgraded in 2013. Although no peer-reviewed studies have been published in support of its reliability and validity, in the last few years a number of studies, using Q-Sensor technology, have been published interested in a range of phenomena including: sleep patterns (Fisher et al., 2010), autism (Sano, Picard, & Stickgold, 2014), and epilepsy (Gay & Leijdekkers, 2014).

Figure 3.3: Affectiva Q-Sensor device

For the present study, children were able to participate in the LEGO construction activity whilst wearing the device, which provides immediate and continuous information. Traditionally EDA technologies measure conductivity on the palm or the finger-tips (Poh et al., 2012). The Q-Sensor device can be attached to either the wrists or ankles. Both sites were tested in the pilot study, and the wrist was selected as providing optimal recording of EDA data for this sample. For the present investigation, the researcher moistened the electrodes and placed the Q-Sensor on the inside wrist of the non-dominant hand.

3.9 Data analysis

The aim of this section is to present a detailed description of the different procedures involved in the analysis of data. Data analysis involved three stages: (1) preparation of data, (2) quantitative analysis of whole group patterns and (3) qualitative analysis of individual behaviours.

As previously described, there are many different techniques employed to study the invocation, observation and measurement of emotion arousal and associated regulatory behaviour in children. In the present study, children's emotional arousal was elicited during social interactions between construction-partners, whilst behaviours were video-recorded and electrodermal responses were recorded using Q-Sensor technology. Questionnaire data provided self-

perceptions on their own emotion regulation abilities from the child and a measure of in-class strengths and difficulties from their teachers.

Table 3.4: Methods of data collection and analysis for the present study, by research question.

RQ	Measure	Analysis
1	ERICA: self-report SDQ: Teacher report VIDEO: ER during LEGO tasks Q-SENSOR: EDA during LEGO tasks	Bivariate correlations Hierarchical Cluster Analysis K-means Cluster Analysis - Discriminant Function Analysis - One-way ANOVA/Welch's test - Post hoc tests - Cohen's *r* - Chi-Square test
2	ERICA: self-report SDQ: Teacher report VIDEO: ER during LEGO tasks Q-SENSOR: EDA during LEGO tasks	Chi-Square test Independent sample *t*-tests Cohen's *r* Bivariate correlations
3	Gender data SDQ: Teacher report VIDEO: ER during LEGO tasks Q-SENSOR: EDA during LEGO tasks	Independent sample *t*-tests Cohen's *r* Bivariate correlations
4	VIDEO: ER during LEGO tasks	Transcription of dialogue and qualitative descriptions

ERICA: Emotion Regulation Index for Children and Adolescents, **SDQ:** Strength and Difficulties Questionnaire, **EDA:** Electrodermal activity

3.9.1 Data preparation

The following sections describe the statistical analysis (summarised in Table 3.4) and interpretation steps that were taken to address the research questions listed above.

3.9.1.1 Analysis of questionnaire data

Scores for each of the ERICA and SDQ items were input into Microsoft Excel and summary scores were then calculated for each of the subscales. A total ERICA score was calculated from a summary of the three subscales. SDQ data was used to calculate both a Prosocial and a Total Difficulties score for each participant based on the process described in section 3.8.1.2. By way of preparation for

addressing the second research question, participants were grouped into one of three categories (Normal, Borderline & Serious) based on their Total Difficulties score in relation to the category thresholds recommended by (Fowles, 2008) presented in Table 3.3.

3.9.1.2 Analysis of behavioural observations

Video recordings of the LEGO tasks were event-coded for the presence of facial, behavioural and vocal displays of emotion expression and regulatory behaviours according to a coding scheme adapted from (Wheeler Maedgen & Carlson, 2000) and presented in Table 3.5. The coding separates the expression of emotion from the regulation of emotion. Emotional expression was coded as either *positive* (e.g. satisfaction or delight) or *negative* (e.g. frustration or anger). Intensity of emotional expression was coded as either *strong* or *mild*. Emotion regulation was coded as behaviour that was instrumental in changing the current or expected elicitation of emotion. The scheme supports prior studies suggesting that the ability to organise oneself to work towards one's goals is founded upon an ability to regulate emotion (Gottman, Katz, & Hooven, 1996). According to Gross's process model, emotions are linked with the goals of the individual (Gross, 2002). However, his model does not account for how ER strategies may be deployed in relation to a particular goal. Nor does the model acknowledge the context in which ER strategies are deployed which is required for the interpretation of a particular strategy as adaptive or problematic. For the present enquiry, in which children volunteered to participate in the LEGO construction tasks, the successful completion of the task required goal-oriented problem-solving skills. For interpretation and coding of such behaviours, support is drawn from Lazarus and Folkman's (1984) model introduced in section 2.6 above. This framework proposes that targeted problem-focused strategies can address the source of stress and reduce the negative emotion experience. In the present study, participants had the possibility to control the arousal of negative emotions during the LEGO tasks through their management of themselves and – to some extent – their co-operation with their construction partner. As such, given the inherent challenge of the tasks and their deliberate design to provoke emotional arousal,

the scheme frames all behaviours (including cognitive behaviours) as operating at least partially in the service of emotion regulation.

Emotion regulation behaviours were coded as *positive* each time they were cooperative and helpful, such as drawing attention to appropriate aspects, offering or requesting support, neutralising potentially negative emotion-eliciting situations or re-appraising an event in order to increase the potential for a positive outcome. ER was coded as negative each time unhelpful (impatient, ignoring, critical) or avoidant (withdrawal) behaviours were observed.

During the course of the coding development process explained in section 3.9.1.2a below, two Distraction codes were added to the original coding scheme. As described in the literature above, Distraction is a form of attentional deployment ER strategy. Laboratory studies are able to distinguish between active versus passive distraction strategies (Webb, Miles, & Sheeran, 2012) but there are inherent difficulties of making such a distinction in behavioural observations such as the present study. As such, Distraction was only coded when it was judged to be self-directed and not in situations where an external event (e.g. a knock at the door) momentarily broke attention/concentrated efforts of the participant during the tasks. Distraction was coded each time participants were observed to re-direct their attention away from the construction task, either *cognitively* (e.g. off-task verbalisations) or *behaviourally* (e.g. moving away from the task).

Table 3.5: Coding scheme for emotion regulatory behaviours

Code	Descriptions	Example behaviours & non-verbal indicators	Verbal examples
	Regulated Emotion		
Mild negative emotion expression	Negative emotion (e.g. frustration) is subtly externalised or displayed accompanied by a mild utterance or gesture	• downturned mouth • frown/grimace • lip curl • shoulders drop • body drops • sigh/exhalation • disappointment •	"oh dear, I'm destroying everything" "uh-oh" "ah, this is stuck" "we haven't got all the right pieces"
Strong(er) negative emotion expression	Negative emotions (e.g. anger), are overtly externalised or displayed, usually (but not always) accompanied by an utterance or gesture	• sudden arm gestures • closed fists • hand banged on table • sudden vocal cry out • verbal complaints • whining noise •	"oh! These are so hard to put on" "this is very annoying" "Alfie, put it on"
Mild positive emotion expression	External gestures or utterances of satisfaction	• slight smile • nodding • body relaxing • relieved sigh •	"ah, yes"
Strong(er) positive emotion expression	Overt, externalised gestures or utterances of satisfaction or excitement	• broad smile • eyes smiling, corners crinkled • laughter • giggling • chuckling • sharp intake of break • exclamation	"ta daaa" "I know why!"

Code	Descriptions	Example behaviours & non-verbal indicators	Verbal examples
	Regulated Behaviour		
Positive - problem solving response	Careful & sensitive planning of, or drawing attention to appropriate & helpful aspects. Cognitively neutralising a potentially emotion-eliciting situation so as to reduce emotional impact. Re-appraisal, re-evaluation or re-interpretation of an event in order to decrease potential negative or increase potential positive outcome.	• simple instructions • request to modify own (self-correct) or another's behaviour • inclusive suggestions & gestures verbal or non-verbal reassurance to self or other • seeking clarification • providing encouragement • providing acknowledgement • appeal for support turn-taking	"put this red one here" "another one of those" "ah, we'll have to take that off" "hang on, you're just a bit ahead of me" "no that's not supposed to be 2 greens" "we'll have to use something else" "yes, put that upside down" "do I put that there?" "shall we get an orange one because we can't find a green?" "come on, keep on going" "ok then" "pass me that" "is it this?"
Negative – unhelpful response	Negative, frustrated, irritated, impatient, ignoring, revengeful, aggressive or critical statements (*self or other*) or behaviours. Not necessarily intentionally disruptive.	• raised or impatient tone of voice disruptive gestures • belittling/critical statements (self or other • taking over another's role (*engineer or builder*) • blocking gestures, removing other's hands • ignoring instructions or requests for help • non turn-taking	"no, don't take them off!" "quick, come on!" "see? Told you girl" "we're not gonna make it"
Negative - avoidance response	Attempts to avoid, withdraw, distance self or 'shut-down'	• backs-off • crosses arms • refuses to participate	"we give up"
Distraction (behavioural)	Physically removing oneself from the cause of negative emotion.	• preoccupation with irrelevant object	fiddling with wrist sensor fiddling with LEGO character
Distraction (cognitive)	Cognitively removing oneself from the cause of negative emotion	• staring into distance • off-task verbalisations (may/may not be co-attending to the task)	staring out of the window "all the other people have been saying 'these make a mark'" "you remind me of my little brother when you…

3.9.1.2a Development of the coding scheme

An initial effort to develop, refine and validate the coding scheme took place during the pilot phase and was further developed once the data had been collected for all participants in the main study. At this point, each video was coded according to the coding scheme and adjustments were made to improve descriptions and examples for each of the codes. Inter-rater reliability testing was conducted with a doctoral student of emotion regulation from within the Faculty of Education, University of Cambridge. After viewing an initial sample of videos, areas of agreement and disagreement were discussed and two additional codes were added to the original scheme. The finalised scheme is presented in Table 3.4. Inter-rater reliability testing was conducted and no further modifications to the scheme were made. Finally, all videos were re-coded for the last time.

To summarise, the development of the coding scheme used in this study took place in 6 parts. (1) Initial development of coding scheme using pilot data, (2) coding of main corpus video data, (3) adjustments made to original scheme, (4) initial viewing of videos by inter-rater, (5) two codes added and final modifications, (6) inter-rater reliability, (7) final coding of complete data set.

The coding process was carried out using Noldus Observer XT software (version 11.5). The Observer is a tool designed for the collection, management, analysis and presentation of observational data and has been used in a wide range of human and animal studies (Cole et al., 2004). Coding categories were mutually exclusive (they referred to a single behaviour at a time) but not exhaustive. As described in the coding scheme (Table 3.5) verbal and non-verbal behaviours were each coded as events but not for their duration.

3.9.1.2b Reliability of the coding scheme

Of the 62 hours of video observations recorded, 11.2% were double-coded. The inter-rater agreement (Zimmerman, Bolhuis, Willemsen, Meyer, & Noldus, 2009) achieved for Task 1 was Cohen's Kappa (k) = 0.72 and for Task 2 was k = 0.48. The lower score for Task 2 may be explained by the lower frequency of observed behaviours during the second task (see Table 4.4). Overall agreement achieved across both tasks was Cohen's Kappa (k) = 0.72. Following the coding process,

summary scores of observed behaviours were calculated for each participant. Since the duration of the recorded sessions varied considerably (ranging from 15 to 40 minutes), rate per minute frequencies were calculated.

3.9.1.3 Analysis of electrodermal data

Electrodermal data (in microsiemens; μS) was recorded continuously during the questionnaire phase and throughout the two tasks, using the Affectiva Q-Sensor, acquiring data at 32 samples per second. EDA data files were analysed using LabChart for Mac (version 7.0). The raw EDA signals were filtered with a low pass filter (cut-off frequency of 1 Hz) to reduce motion artifacts and electrical noise.

A baseline skin conductance level is typically computed as a mean of several measurements taken during a specific non-stimulation period, for example at the onset of a stimulus before a skin conductance response has been elicited (i.e. the extent to which the observers agreed the behaviour constituted a unit of coding and assigned the same code; Whitebread et al., 2009). In laboratory settings, participants may be required to sit for a 5-minute period to establish a reliable baseline. In the naturalistic setting of the classroom, such a period of inactivity was unachievable due to the constraints of school activities and timetabling restrictions, thus, in order to identify the most reliable baseline for each participant, an analysis of three alternatives was completed and is presented in Chapter Four (section 4.1.2.1).

In line with previous studies incorporating measures of skin conductance with long duration stimuli (Boucsein, 2012), multiple variables were calculated for the collaborative model-building task one (Task 1) and competitive tower building task two (Task 2). These are defined as follows:

- *SCL: Skin Conductance Level* is calculated by taking the mean of measurements over the duration of the task.
- *PPM (peaks per minute)*: Frequency of non-specific EDA fluctuations are expressed as the number of responses per minute and are computed as an average number of EDA peaks over the duration of the task. For the present study, PPM was calculated from initial SCL level to peaks above 0.01μS.

- *AMP (Amplitude)*: A minimum amplitude of 0.05μS was specified as the threshold for a peak to be counted. Amplitude was calculated for each identified peak by subtracting the peak EDA value from the trough value that preceded the peak
- *AUC (Area under the Curve):* In line with methods described in previous studies of EDA (e.g. Bechara, Damasio, Damasio, & Lee, 1999; Navqi & Bechara, 2006), the LabChart software calculates AUC by first specifying a measurement window within which the onset, peak and decay of each EDA response can be identified. AUC is then calculated by computing an integral between the start and end points of the measurement window. As illustrated in figure 3.1a, areas under the EDA curve will be negative, areas above will be positive. Results are recorded in units of μS/sec.

3.9.2 Analysis for RQ1: overall patterns of emotion regulation

In order to address the first research question, data analysis explored whole group patterns of children's emotion regulation tendencies with a view to identifying linear relationships between the different types of data collected. Bivariate correlations were run between the key variables (ERICA, SDQ, video observations and EDA physiology) to look for evidence of linear relationships between the central measures of interest. Patterns of participant emotion regulation behaviours were then analysed using the statistical technique of K-means Cluster Analysis. The Cluster Analysis revealed four main 'cluster' profiles. A series of statistical tests were then performed to assess the validation of the four cluster groupings, these included:

1. Discriminant Function Analysis, to determine the nature of the relationships between the four different groups,
2. One-way ANOVA considered the differences in means across all variables and between all four cluster groups,
3. Post hoc tests confirmed where specific differences occurred between groups,
4. Cohen's *r* provided a measure of effect size in order to facilitate the interpretation of the substantive significance of group differences,

5. Analysis of the five central cases from each cluster group considered the variation of scores within each group.

3.9.3 Analysis for RQ2: patterns of emotion regulation in children with emotion and behavioural difficulties

Analysis of data for the second research question considered the patterns of emotion regulation in children reported by their teachers as having emotional and behavioural difficulties. As detailed below, the full sample was split into categorical 'Normal' and 'Problem' groups according to their scores on the Strength and Difficulties Questionnaire. Independent sample *t*-tests were carried out to compare groups on all background, subscale, coded-observation and EDA physiological variables. Effect sizes were calculated using Cohen's *r*. Bivariate correlations were carried out to consider the relationships between the key variables of interest for those children with serious or borderline problems in school.

3.9.4 Analysis for RQ3: comparing patterns of emotion regulation between males and females

Analysis for this third question followed a similar approach to RQ2. The full sample was split into two gender groups. Independent sample *t*-tests considered differences between males and females on all background, subscale, coded-observation and EDA physiological variables. Effect sizes were calculated using Cohen's *r*. Bivariate correlations were carried out to consider the relationships between these variables for both males and females.

3.9.5 Analysis for RQ4: analysis of individual participant's emotion regulation tendencies

For the final stage of data analysis, eight individual participants were selected for qualitative description of behaviours observed during LEGO construction activities. Excerpts of interactions are transcribed and described with the purpose of providing an illustration of the specific behaviours identified during the Cluster Analysis. In respect of emotion regulation, the risk and protective

factors underlying emotion and behavioural problems in middle childhood are identified for discussion.

3.10 Ethical considerations

This study follows the BERA Ethical Guidelines for Educational Research Crider and Lunn (1971) and was conducted in line with the code proposed by the British Psychological Society for research with human participants (2011), with particular care taken for the young children recruited. This research was undertaken under the following BPS premises:

- *Voluntary Informed Consent:* Both parents and children received an explanation of the study and its measures before being invited to complete a consent form (see below). A child-friendly consent form was provided, together with an information sheet regarding the Q-Sensor measure.
- *Deception:* No deception was required. Participants and their parents were informed that the research was to help understand how children manage their emotions and behaviours in school.
- *Debriefing*: All schools and teachers were offered a presentation of the research findings, together with a chance to discuss the implications for their teaching practice.
- *Confidentiality*: Video files were captured as electronic files and stored in a secure-access Faculty server. Electronic files were named using case numbers as identifiers to ensure the anonymity of each child and access is available only to the researcher and supervisor. Video data is backed up using an external hard drive. Back-ups are securely locked. Electronic files will be kept for two years from the date of first publication and held in case the published data is challenged in any way.
- *Protection of participants:* The procedures of the study were described to the children prior to their participation when they were also introduced to the researcher. The video-recording equipment was in the room and children were asked if they would wear the Q-Sensor device which attached to their wrist. Great care was taken to ensure each child was comfortable. There were no health and safety concerns and although

movements were necessarily limited due to the scope of recording equipment, there were few limitations to movement required.

3.10.1 Consents

As indicated above, an important requirement for the study was that all participants had to give informed consent to take part. On behalf of the researcher, the head teacher approached the year three and four teachers who then appealed for participants from within their class. Researcher-created letters of explanation were sent home with requests for parental consent (see Appendix 3.3). These were authorised by parents and returned to the school. On the day(s) of data collection, each class was introduced to the researcher (who became known as 'the Lego Lady') and were provided with an initial verbal explanation of the project and an opportunity to ask questions. During the introduction to the Lego tasks children were invited to ask any further clarifying questions and reminded that they could return to class any time they wished. None did. Children were then asked to complete a written consent (Appendix 3.4). Of the one hundred and twenty-eight participants, one child refused consent for video-recording and a further three participants refused authorisation for video footage to be used publically.

The present chapter has described the research questions of this thesis, providing a detailed account of the participants, procedures and methods involved in the study's data collection and analysis. The next chapter describes the data collected and the initial preparation phase for subsequent analysis.

4 RESULTS

As stated, the central aims of this study were to understand the patterns of emotion regulation in children with emotion and behavioural problems in school and to identify groups of children who may be at risk of developing greater emotional or behavioural difficulties. Described in the previous chapter, the measures employed in this study were designed to provide data on the multiple behavioural, experiential and physiological processes that underpin emotion regulation tendencies. In addition to appropriate measurement methods, it is also important that the analytical methods selected are appropriate for a study of this nature. Emotion regulation tendencies are complex, involving multiple factors that have developed over time and are unique to the individual. As such, data analysis strategies selected for the present study seek to shed light on the complex patterns of children's emotion reactivity and regulation in relation to their behavioural characteristics on display in the classroom.

This chapter compares the relationships between student behaviour in class with their emotion reactivity and regulation during the LEGO construction tasks described in Chapter Three. The first section (4.1) summarises the steps that were taken to prepare the data for analysis. The sections that follow (4.2 to 4.5) report the data collected and subsequent analyses that were undertaken to address the research questions as set out in section 3.4.

4.1 Data preparation and descriptives

Initial steps were taken to prepare the data for analysis by research question. In this section, these necessary steps for preparation are explained and data is described for each of the three data collection methods in turn: 1) questionnaires, 2) ER behavioural observations and 3) physiological (electrodermal) measures.

4.1.1 Questionnaires

As stated, the questionnaire screening measures administered in this study were a) the teacher report Strength and Difficulties Questionnaire (British Psychological British Psychological Society, 2010), and b) the child report Emotion Regulation Index for Children and Adults (R. Goodman, 1997). Descriptive findings for these measures are summarised in the two sections that follow.

Table 4.1: Means, Standard Deviations and Ranges for Strength and Difficulties Questionnaire

		n =	Mean	SD	Range
Strength and Difficulties Questionnaire					
PS	Prosocial behaviour	128	7.23	2.44	0 - 10
E	Emotional symptoms	128	1.68	2.21	0 - 10
C	Conduct problems	128	1.09	1.58	0 - 6
I/H	Inattention/Hyperactivity	128	3.23	2.82	0 - 10
PP	Peer problems	128	1.29	1.64	0 - 8
SDQ_TOTAL	SDQ Total Difficulties	128	7.29	5.97	0 - 25

4.1.1a Classroom behaviour (SDQ teacher report)

Completion rates for the teacher report Strength and Difficulties Questionnaire were 100% (n=128). Table 4.1 shows a summary of descriptive statistics for each of the five subscales (Emotional symptoms, Conduct problems, Inattention/Hyperactivity, Peer problems and Prosocial behaviour) as well as a 'Total Difficulties' score. Possible scores for each subscale range between 0 and 10. A Total Difficulties score is calculated by summing the scores across all subscales apart from the prosocial scale. Total Difficulties scores range from a minimum of 0 to a possible maximum of 40. Scores of 16 and above are classified as serious behaviour problems (MacDermott et al., 2010), scores between 12-15

fall within the borderline category. Participants scoring 11 or below for Total Difficulties are categorised as 'normal'.

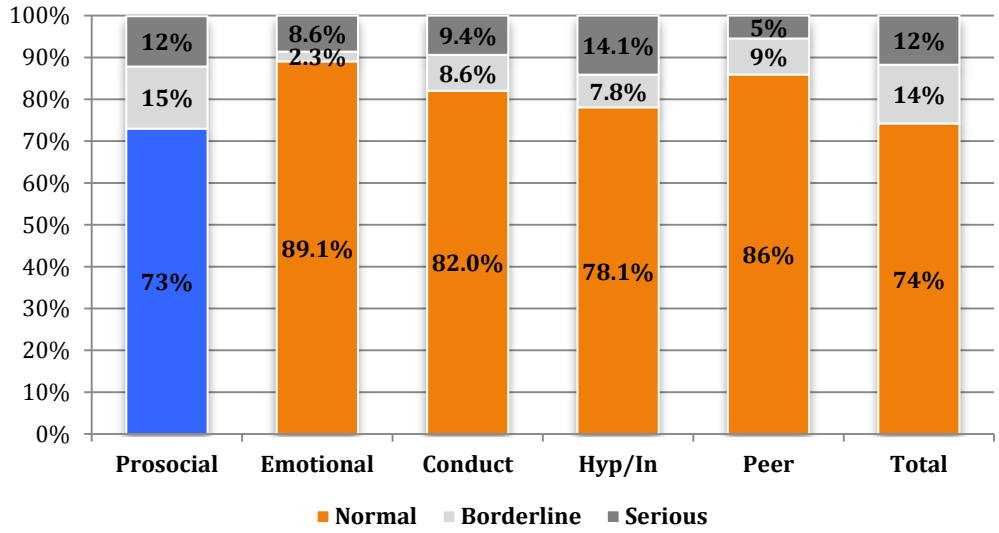

Figure 4.1: Scoring responses to SDQ by strength (Pro-social) and difficulties (Emotional symptoms, Conduct problems, Hyperactivity/Inattention, Peer problems; n=128). The summed score for Prosocial behaviour is interpreted as: Normal (6-10), Borderline (5), and Abnormal (0-4)

Across the sample, a range of scores was reported. The overall mean prosocial score was 7.2 (SD=2.4), with 73.4% of participants reported as having normal to high levels of prosocial behaviour (Figure 4.1). This suggests that on the whole, children are considerate, helpful and happy to share with others. Inattention/ Hyperactivity was the problematic behaviour most reported by teachers, (M=3.2, SD=2.8), suggesting that these children are restless, overactive and/or may have difficulties with sustaining concentration or attention. Conduct problems (e.g. *often fights with other children or bullies them*) were the least reported of the four problem areas (M=1.09, SD=1.58). Indicated by the shaded areas, Figure 4.1 shows the proportions categorised as 'normal', 'borderline' and showing 'serious difficulties'. According to (R. Goodman, 1997), a 'serious' score of Total Difficulties is used to identify mental health disorders of likely clinical concern. In terms of their symptoms, this sample represents a diverse group, ranging from normal to serious difficulties. According to their teachers, 11.7% of participants (n=15) were reported as having serious problems, with a further 14.1% at the borderline (n=18). A Total Difficulties mean score of 7.29 is higher than the

British national norms for the teacher version of the Strength and Difficulties Questionnaire. In their study of 8,208 5-15 year olds, (A. Goodman & Goodman, 2011; R. Goodman, 1997) found a Total Difficulties mean score of 6.6 (SD=6.0). More closely related to the age range sampled in the present study, (Meltzer et al., 2003) found a mean Total Difficulties score of 7.5 (SE=0.0) in middle childhood (age 7) from scores calculated for 13,363 children in the UK.

4.1.1b Emotion regulation behaviour (ERICA self report)

Completion rates for the ERICA questionnaire were 100%. Summary scores for each of the three emotion regulation subscales of the ERICA are presented in Table 4.2. Total ERICA scores range from 31 to 80 (minimum possible score: 15, maximum possible score: 80), with higher scores indicating more confidence in self-reported ER ability. The overall sample mean for Total ERICA was 60.12 (SD=8.01). These results compare to a mean of 57.10 (SD=8.34) for Total ERICA scores taken from a larger sample (n=801) of Primary School aged children Hansen and Joshi (2007).

Table 4.2: Means, Standard Deviations and Ranges for ERICA questionnaire

		n	Mean	SD	Range
Emotion Regulation Index for Children and Adolescents					
EC	Emotion control	128	24.18	5.34	7 - 35
ESA	Emotion self awareness	128	18.55	2.78	12 - 25
SR	Situation responsiveness	128	17.39	1.99	11 - 20
ERICA_TOTAL	Total ERICA	128	60.12	8.01	31 - 80

The highest scoring subscale was Emotional Control (M=24.2, SD=5.3), which includes a self-report of externalising components of emotion regulation. A high score would suggest confidence in feeling in control of emotions. Situational Responsiveness (e.g. *when others are upset, I become sad or concerned for them*) was the lowest score reported (M=17.39, SD=1.99). Although questions have been raised regarding the accuracy of child self-report (as previously discussed in section 3.2.1), the results demonstrate a range of opinion that can provide useful corroboration and comparison with teacher reports and the observed emotion regulation strategies recorded in this study.

4.1.2 Emotion reactivity (EDA - electrodermal data)

Electrodermal data was collected for all participants (n=128), however as is typical of studies where physiological measures are employed, not all data was useable. Of the 128 children who participated in the study, data was excluded from thirty-five participants, 28 of which were due to the absence in recording any significantly labile regions, 6 were due to equipment malfunction and 1 child refused to wear the sensor. As such, the data for 93 children (54 boys) were used for analysis.

4.1.2.1 Baseline selection

A baseline was selected for each participant by analysis of three alternative electrodermal activity periods. These were during 1) the completion of the ERICA questionnaire, 2) the ten seconds prior to commencing Task 1, and 3) the ten seconds prior to commencing Task 2. Paired *t*-tests were run to compare the first and final five seconds for each of the three possible periods. The results of the three *t*-tests were as follows: 1) $t(116)=7.815$, $p<.001$; 2) $t(116)=1.502$, $p=.136$; 3) $t(116)=3.28$, $p=.001$. Based on these test results the ten seconds prior to the start of Task 1 (test 2 above) was selected as the baseline since the difference between the first and last five seconds of this period had the *least* change and therefore was deemed to be the most stable non-stimulation period of the three options.

4.1.2.2 Baseline correction

Electrodermal activity generates a constantly moving skin conductance level that is perpetually changing for each individual. In order to establish a representation of background SCL, the ten seconds prior to the start of Task 1 was subtracted from each of the PPM, AMP and AUC measurement variables listed in Table 4.3. This subtraction procedure acts as a form of normalisation for the participant's EDA data (MacDermott et al., 2010). Table 4.3 shows the means, standard deviations and range of electrodermal responding across all participants. Paired *t*-tests were calculated to compare baseline with Task 1 and Task 2 for each of three EDA measurements. With one exception (Amplitude during Task 2) each of the tasks significantly affected skin conductance levels when compared with baseline (Table 4.3).

Table 4.3: Means, Standard Deviations and Ranges for physiological (EDA) data with baseline *t*-test results

		n	Overall Mean	SD	Range	*t*	Sig.
Electrodermal data							
ACCEL	Movement	93	0.84	0.07	0.68-1.02	-	-
BSL_PPM	Baseline PPM	93	0.16	0.14	0-0.73	-	-
PPM_T1	Peaks per minute Task 1	93	0.06	0.16	-0.44-0.99	3.88	.000
PPM_T2	Peaks per minute Task 2	93	0.02	0.17	-0.52-0.73	5.24	.000
BSL_AMP	Baseline AMP	93	0.85	3.35	-7.18-22.96	-	-
AMP_T1	Amplitude Task 1	93	0.30	2.48	-7.18-14.81	2.15	.034
AMP_T2	Amplitude Task 2	93	0.61	3.75	-6.93-17.02	0.55	.587
BSL_AUC	Baseline AUC	93	-0.06	9.30	-86.58-11.70	-	-
AUC_T1	Area under curve Task 1	93	-703.69	1186.91	-6958-1754	5.60	.000
AUC_T2	Area under curve Task 2	93	-178.02	347.21	-2460-609.8	4.98	.000

ACCEL: Accelerometer (movement); **BSL**: Baseline; **PPM**: number of peaks per minute; **AMP**: mean amplitude of peaks; **AUC**: area under the EDA curve; **T1**: Task 1; **T2**: Task 2, ***t***: *t*-test statistic, **Sig:** significance level

As explained in Chapter Three, the Q-Sensor includes a three-axis accelerometer that records movement for each participant on three separate dimensions. A composite *Movement* (ACCEL in Table 4.3) variable was computed for each of the three axes to allow for a control comparison between EDA reactivity (PPM) and SDQ Inattention/Hyperactivity scores. A partial correlation was run between ACCEL, Sum_PPM and SDQ Inattention/Hyperactivity. This revealed a moderate correlation between Sum_PPM (M=0.39, SD=0.23) and SDQ Inattention/ Hyperactivity (M=3.23, SD=2.82) whilst controlling for movement (M=0.84, SD=0.07), which was statistically significant $r(90)=.241$, n=93, $p=.021$. However, zero-order correlations showed that there was a statistically significant, moderate correlation between Sum_PPM and SDQ Inattention/Hyperactivity $r(91)=.240$, n=93, $p=.021$), indicating that movement had very little influence in controlling for the relationship between EDA physiological reactivity and Inattention/ Hyperactivity scores. On the basis of this finding, and since participant movement was not of interest to the central questions of enquiry, this variable was not included in further analysis.

Table 4.4: Means, Standard Deviations, and Ranges for ER observations (video) data by task and overall

Emotion / Behaviour		n	Mean T1	SD	Range	Mean T2	SD	Range	Overall Mean	SD	Range
Video data – rate per minute											
NE_Mild	Mild Negative Emotion Expression	124	0.21	0.17	0-1.0	0.05	0.11	0-1.09	0.26	0.19	0-1.12
NE_Strong	Strong Negative Emotion Expression	124	0.07	0.11	0-0.55	0.04	0.08	0-0.55	0.11	0.15	0-0.76
Sum_NE	Sum of Negative Emotion Expression	124	0.28	0.23	0-1.08	0.09	0.13	0-1.09	0.37	0.26	0-1.20
PE_Mild	Mild Positive Emotion Expression	124	0.35	0.34	0-1.48	0.14	0.15	0-1.09	0.49	0.42	0-1.99
PE_Strong	Strong Positive Emotion Expression	124	0.22	0.34	0-2.94	0.09	0.11	0-0.54	0.31	0.39	0-3.06
Sum_PE	Sum of Positive Emotion Expression	124	0.58	0.57	0-3.49	0.24	0.20	0-1.09	0.8	0.68	0-3.73
PosPS	Positive Problem Solving	124	4.77	2.20	0.64-10.29	0.12	0.23	0-1.95	4.95	2.2	0.64-10.29
NegUR	Negative Unhelpful	124	0.66	0.59	0-2.90	0.04	0.07	0-0.31	0.71	0.6	0-3.06
NegAV	Negative Avoidance	124	0.00	0.01	0-0.13	0.00	0.01	0-0.08	0.003	0.02	0-0.13
DIS_Beh	Behavioural Distraction	124	0.05	0.12	0-0.67	0.00	0.01	0-0.06	0.04	0.1	0-0.61
DIS_Cog	Cognitive Distraction	124	0.15	0.32	0-2.63	0.03	0.07	0-0.49	0.18	0.36	0-3.12

T1: Task 1; **T2**: Task 2

4.1.3 Behavioural observations: ER during LEGO construction tasks

In four cases, emotion regulation observation (video) data was missing due to recording equipment failure. Thus, data for 124 children (70 boys) was used for analysis. Over the 62 hours of video analysed, a total of 19,800 behaviours were counted and coded according to the coding scheme in Table 3.4. Table 4.4 provides summary data for each of the observed behaviours. Data is presented by task and by overall score (Task 1 and Task 2 combined). As explained above, the two different tasks were constructed to provoke emotional arousal. It was anticipated that some children would have greater emotional reactivity to Task 1, and conversely others would react more strongly to Task 2. The present enquiry was not concerned with comparing differences in reactivity between the two tasks, as such observed behaviour scores for Task 1 and 2 were combined. The results described below refer to these combined (overall) scores for behavioural observations. The milder versions of emotion expression were more frequently observed across both positively and negatively valenced emotions: Mild Positive Emotion (M=0.49, SD=0.42) was more frequently observed than Strong Positive Emotion (M=0.31, SD=0.39), $t(123)=4.49$, $p>.0001$. Mild Negative Emotion (M=0.26, SD=0.19) was more frequently observed than Strong Negative Emotion (M=0.11, SD=0.15), $t(123)=7.54$, $p>.0001$. Described in Table 4.4, composite scores were calculated to create combined variables for Negative Emotion Expression and Positive Emotion Expression. A paired *t*-test found a statistically significant difference between the mean number of positive emotions expressed (M=0.80, SD=0.68) compared to the mean number of negative emotions expressed (M=0.37, SD=0.26), $t(123)=7.04$, $p>.0001$. Although this finding suggests an overall tendency for positive emotionality, the large standard deviations for Sum_NE & Sum_PE presented in Table 4.4 suggest that this pattern of positive emotionality was not consistent throughout the sample. In fact, of the 124 participants, 73% (n=91) expressed more positive emotion, whereas 27% (n=33) displayed more negative emotionality.

As a result of this finding a new variable (PEminusNE) was computed for which the sum of Negative Emotion Expression was deducted from the Sum of Positive Emotion Expression (M=0.43, SD=0.69). From this scale data, as can be seen in

Figure 4.2, participants were then placed into three categorical groups, Low PE (n=43), Medium PE (n=53) and High PE (n=28). Group separation was calculated based on individual mean values plus or minus half a standard deviation from the overall mean. Levene's *F* test revealed that the homogeneity of variance assumption was not met ($p<.001$) and so Welch's *F* test was used. The one-way ANOVA on the measure of PEminusNE revealed a statistically significant difference between each of the three groups, Welch's $F(2, 56.26)=131.34$, $p<.001$. Post-comparisons, using the Games-Howell procedure, found significant differences between the Low group and both the Medium, $p<.001$, $d=2.47$, and High, $p<.001$, $d=7.77$ groups and also between the Medium and High groups, $p<.001$, $d=5.87$.

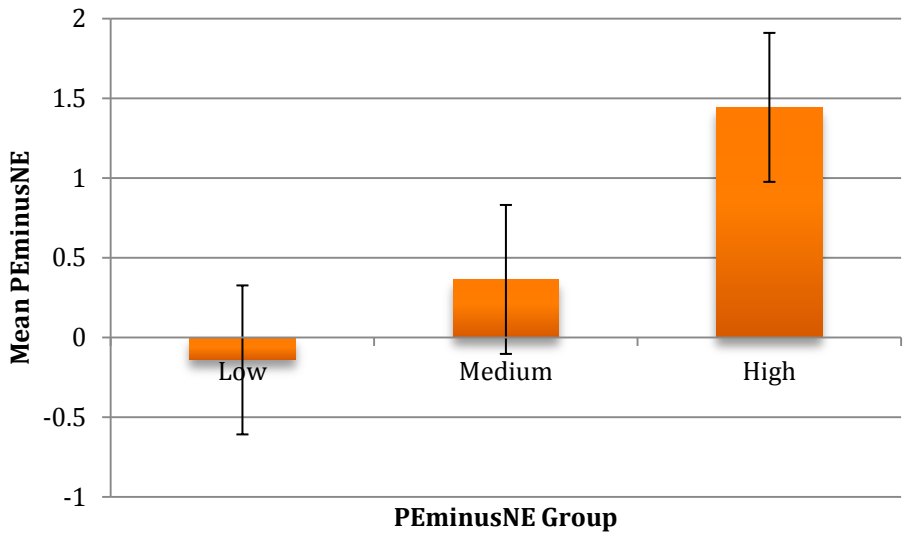

Figure 4.2: Error bar chart to show group differences in Positive Emotion (PE) less Negative Emotion (NE)

Of the regulatory strategies observed during the LEGO construction tasks, Positive Problem Solving ER (M=4.95, SD=2.20) made up 70% of all behaviours counted (Table 4.4) and was more frequently observed than both of the negative regulatory behaviours: Negative Unhelpful ER (M=0.71, SD=0.60), $t(123)=20.38$, $p>.0001$ and Negative Avoidance ER (M=0.0031, SD=0.02), $t(123)=24.99$, $p>.0001$. Due to the small number of Negative Avoidance events observed (M=0.0031, SD=0.02) this variable was collapsed into a combined *Regulation* variable in which the sum of Negative Avoidance ER and Negative Unhelpful ER

was deducted from Positive Problem Solving ER to create a new combined *Regulation* variable for subsequent analysis.

4.1.4 Summary of data preparation and descriptives

As described above, a range of scores were calculated, resulting in twenty-three distinct variables measuring classroom behaviour, electrodermal reactivity and emotion regulatory strategies. Data preparation revealed a good range of scores across the sample. Overall, participants were found to be socially competent, confident in their own ability to manage their own emotions and respond appropriately to others' feelings. However, there appeared to be a group of children within the sample that had a tendency to display emotional and behavioural problems in the classroom. In line with other authors (Braithwaite, Watson, Jones, & Rowe, 2013), Inattention/Hyperactivity problems were found to be the most common classroom behavioural problem reported by teachers in the present study. Initial analysis also revealed that participants expressed a range of positive and negative emotion and used a range of positive and negative emotion regulation strategies. Furthermore, participants were physiologically responsive to the different cognitive and emotional challenges involved in participating in the two construction tasks.

4.2 RQ1: What patterns exist in middle childhood between classroom behaviour, emotion reactivity and emotion regulation?

In order to address this first research question, initial analysis sought to discover any defining linear relationships between classroom behaviour, physiological reactivity and the emotion regulation strategies described above.

4.2.1 Linear relationships

The scores presented in Tables 4.1 to 4.4 were entered into SPSS (version 22) together with each participant's age (calculated from date of birth) and the computed PEminusNE scale variable described in section 4.1.3. In studies where residuals are non-normally distributed, common statistical advice exists to transform data to achieve normal distributions, i.e. larger scores are relatively

compressed, while smaller ones are relatively expanded. However, some authors caution against such transformations, particularly in clinical contexts where symptoms are expected to be highly positively skewed. In such circumstances, transformation have unfortunate consequences resulting in scores that become empirically less meaningful and constructs that differ from those originally measured (Grayson, 2004). This has obvious implications for interpretation. Prior studies concerned with the consequences of transforming non-normal data rely on The Central Limit Theorem. This states that in large samples, (n > 30), the sampling distribution will be normally distributed, regardless of the shape of the data collected (Lumley, Diehr, Emerson, & Chen, 2002). On this guidance and with a total sample size of 128 for the present study, parametric bivariate correlations were calculated, the results of which are presented in Table 4.5.

On initial examination of Table 4.5, it should be acknowledged that many of the stronger correlations between variables are as a result of similarities between measures. For example, the significant (p<.01) relationships between the three subscales of the ERICA self-report measure (Emotional Control, Emotional Self Awareness and Situation Responsiveness). Clearly, individuals who perceive themselves to be proficient at Emotional Control, also believe themselves to have good Emotional Self Awareness (r=.445, p<.001) and Situation Responsiveness (r=.381, p<.001). This pattern of inter-relationships can also be seen from the multiple correlations (significant at the p=.01 level) between the five related SDQ classroom behaviour variables, the nine related ER behaviours during LEGO construction, and between the six related measures of physiological reactivity (EDA). These relationships will be discussed in turn in the sections (4.2.1.1 to 4.2.1.4) that follow.

4.2.1.1 Linear relations between background and questionnaire variables

Correlations between aspects of the child self-report (ERICA) and teacher reports of classroom behaviour (SDQ) measures provide support for the questionnaire measures employed in this study. As explained in section 3.8.1.2 of the previous chapter, the SDQ has good reliability and has been well validated in community populations (e.g. Brown & Schoon, 2010). Although some authors express concerns about the value of self report measures (R. Goodman, 1999; R. Goodman

et al., 2000), the correlations between teacher and child report provide additional validity and corroboration to the ERICA self-report data collected in the present study.

Emotional Control (ERICA) was positively associated with Prosocial behaviour, r=.238, p=.007, indicating that children described as prosocial by their teachers had a tendency to keep their negative emotions under control (e.g. reverse scored Emotional Control items: *I have angry outbursts, I can be disruptive*). Emotional Control was negatively correlated with all four problem subscales of the SDQ: Emotional (r=-.229, p=.009), Conduct (r=-.249, p=.005), Inattention/Hyperactivity (r=-.258., p=.003) and Peer (r=-.175, p=.048), suggesting that children were self-aware of their limitations with controlling their unhelpful emotions at least in respect of their classroom behaviour, as corroborated by their teachers.

Emotional Self Awareness (ERICA; e.g. *When I get upset, I can get over it quickly*) was negatively correlated to the Emotional symptoms subscale of the SDQ (r=-.177, p=.045). Emotional symptoms (SDQ; e.g. *many worries, often unhappy downhearted or nervous*) were negatively related to Age (r=-.174, p=.050), suggesting the older children displayed fewer emotional symptoms than the younger children within this sample.

Table 4.5: Bivariate correlations across all data. **Significant at the 0.01 level, *Significant at the 0.05 level

		ERICA self-report			SDQ teacher-report					ER during LEGO construction										Emotion reactivity (EDA)					
	Age	**EC**	**ESA**	**SR**	**SDQps**	**SDQe**	**SDQc**	**Sdih**	**SDQpp**	**NE_Mild**	**NE_Strong**	**PE_Mild**	**PE_Strong**	**PosPS**	**NegUR**	**NegAV**	**DISbeh**	**DIScog**	**PEminusNE**	**PPM_T1**	**PPM_T2**	**AMP_T1**	**AMP_T2**	**AUC_T1**	**AUC_T2**
Age																									
EC	.210*																								
ESA	.132	.445**																							
SR	.064	.381**	.238**																						
SDQps	-.030	.238**	-.047	.012																					
SDQe	-.174*	-.229**	-.177*	-.136	-.040																				
SDQc	-.053	-.249**	-.055	-.054	-.564**	.248**																			
SDQih	.028	-.258**	-.100	-.097	-.545**	.257**	.573**																		
SDQpp	.009	-.175*	-.011	-.042	-.453**	.300**	.495**	.301**																	
NE_Mild	.106	.040	.018	.065	-.117	-.107	.033	.010	.113																
NE_Strong	.041	.023	-.128	.057	-.089	.073	-.140	.070	.022	.207*															
PE_Mild	.052	-.008	.014	-.061	.035	-.045	-.128	-.152	.053	.141	-.066														
PE_Strong	.016	-.014	-.117	.127	.182*	-.030	-.189*	-.084	-.143	.150	.242**	.418**													
PosPS	.089	.120	.150	.228*	.164	-.181*	-.184*	-.170	.027	.091	.034	.135	.021												
NegUR	-.089	-.063	-.035	.026	-.171	-.091	.028	.069	.077	.311**	.301**	-.134	.008	-.055											
NegAV	-.078	-.072	-.115	-.125	-.099	.238**	.106	.080	.038	-.029	.250**	-.036	.013	-.085	.084										
DISbeh	-.112	-.186*	-.177*	-.039	.070	.044	.012	.109	-.132	-.118	.259**	-.099	.118	-.176	.078	.107									
DIScog	-.232**	-.120	-.248**	.046	.099	.081	-.138	.180*	-.069	.065	.412**	-.006	.291**	-.114	.209*	.040	.654**								
PEminusNE	.003	-.029	-.036	.005	.177*	-.030	-.165	-.159	-.086	-.149	-.174	.824**	.733**	.062	-.228*	-.061	-.016	.056							
PPM_T1	-.037	-.013	-.075	-.142	.122	.018	.154	.176	.109	-.099	.051	-.114	-.072	-.040	-.001	.114	.109	.098	-.093						
PPM_T2	-.250*	-.060	-.301**	-.002	.016	.260*	.064	.205*	-.077	.024	.046	.005	-.006	-.037	.059	.104	.035	.180	-.018	.273**					
AMP_T1	.290**	.206*	.001	.015	-.008	-.109	-.072	-.068	-.001	.030	-.042	-.018	-.005	-.122	.062	-.059	-.033	.005	-.011	-.241*	-.276**				
AMP_T2	.323**	.168	.034	-.085	-.053	-.080	.013	.106	.033	-.075	-.015	-.106	-.036	-.156	.013	-.086	.117	.006	-.058	-.165	-.369**	.708**			
AUC_T1	.136	-.051	.004	.060	-.216*	-.111	.169	.148	.120	.246*	.116	.066	.072	.094	.209*	.018	.076	.202	-.011	.128	.107	.318**	.216*		
AUC_T2	.085	.010	-.002	.095	-.081	-.182	.033	.035	-.014	.133	.079	.027	.048	.026	.162	.034	.057	.175	-.009	.124	.069	.368**	.258*	.845**	

EC: Emotional Control, **ESA:** Emotional Self Awareness, **SR:** Situation Responsiveness, **SDQps**: Prosocial behaviour, **SDQe:** Emotional symptoms, **SDQc:** Conduct problems, **SDQih:** SDQ Inattention/Hyperactivity, **SDQpp:** SDQ Peer problems, **NE:** Negative Emotion Expression, **PE:** Positive Emotion Expression, **PosPS:** Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER, **NegAV:** Negative Avoidant ER, **DISbeh:** behavioural distraction, **DIScog**: cognitive distraction, **PPM:** Peaks per minute, **AMP:** Amplitude, **AUC:** Area under the EDA curve.

4.2.1.2 Linear relations between SDQ subscales, ER observations and EDA

Separate from the correlations between indirect questionnaire measures described above, the correlations between emotional and behavioural problems and direct observational and physiological measures are described in this section.

Emotional symptoms were positively associated with Negative Avoidant ER strategies (r=.238, p=.008) and with Peaks per minute during Task 2 (r=.260, p=.012). These results suggest that participants reported as more anxious or with more depressive symptoms were likely to utilise more negative avoidant emotion regulation strategies and fewer positive problem solving strategies during the LEGO construction tasks. In addition, these children were particularly physiologically sensitive during the competitive LEGO construction Task 2.

Conduct problems were negatively correlated with Strong Positive Emotions (r=-.189, p=.036) and Positive Problem Solving ER strategies (r=-.184, p=.041) indicating an absence of both emotional and regulatory positivity for participants scoring highly on the Conduct subscale (e.g. *often has temper tantrums, fights with other children, lies or cheats*).

There were significant positive associations between Inattentive/Hyperactive symptoms (e.g. *easily distracted, concentration wanders*) and Cognitive Distraction ER (r=.180, p=.045) and also with Peaks per minute during Task 2 (r=.205, p=.49) suggesting that distraction was common to both teacher report and the emotion regulation behaviours observed during the LEGO construction tasks. In addition, children with high scores for inattention and hyperactivity displayed increased physiological reactivity during Task 2, perhaps indicative of the additional physiological burden required for them to concentrate on the completion of this task.

Peer problems were negatively related to self-reported Emotional Control (r=-.175, p=.048). This finding may provide explanatory support for the self-perceptions of children experiencing social problems with peers (e.g. *I can be disruptive at the wrong time, I do things without thinking about them first*).

4.2.1.3 Linear relations between observed ER behaviours

There were several inter-relationships between the different emotionally expressive behaviours recorded during the two LEGO construction tasks. Mild Negative Emotion Expression was positively associated with Strong Negative Emotion Expression (r=.207, p=.021), Strong Negative Emotion Expression was also positively associated with Strong Positive Emotion Expression (r=.242, p=.007) and Strong Positive Emotion was positively associated with Mild Positive Emotion expression (r=.418, p<.001). These results suggest that participants who expressed more negative emotion were also more likely to express more positive emotion, or perhaps could be described more generally as *emotionally expressive*. Participants who expressed more negative emotion during these tasks (both NE_mild r=.311, p<.001, and NE_strong r=.301, p=.001) were likely to employ more Negative Unhelpful ER strategies during the LEGO construction tasks. Strong Negative Emotion Expression was also positively related to Negative Avoidance ER (r=.250, p=.005), Behavioural Distraction ER (r=.259, p=.004), and Cognitive Distraction ER (r=.412, p<.001). Finally, Strong Positive Emotion Expression was positively related to Prosocial behaviour (r=.182, p=.04)

4.2.1.4 Linear relations for EDA physiological reactivity

The remaining correlations provide initial evidence of the patterns of responding across the emotion regulation tendencies measured in the present study. The correlation matrix revealed a relationship between age and electrodermal activity. On the measure of Peaks per minute, older participants were less likely to be as physiologically sensitive during Task 2 (r=-.250, p=.016). In contrast, younger participants showed increased EDA Amplitudes during both Task 1 (r=.290, p=.005.) and Task 2 (r= .323, p=.002).

A negative relationship was found between EDA Peaks per minute during Task 2 and participant Emotional Self Awareness (ERICA: r=-.301, p<.003). PPM during Task 2 was also positively related to Emotional (r=.260, p=.012) and Inattention/ Hyperactivity symptoms (r=.205, p=.049), indicating that the competitive LEGO construction Task 2 may have added an additional physiological burden for children with emotional or inattention/hyperactivity difficulties but that this may

be negated by greater emotional self awareness (e.g. '*when I get upset, I can get over it quickly'*).

Amplitude is a measure of the height of an electrodermal peak. It is suggested (e.g. J. Zeman et al., 2007) that elevated amplitudes reflect an increase in the level of attention required during a task, playing a crucial role in the elicited response. When pre-attentive mechanisms identify a stimulus as novel or significant, their call for additional controlled processing elicits an increase in physiological reactivity (e.g. Frith & Allen, 1983). In the present study, a positive relationship was found between Amplitude during Task 1 and Emotional Control (r=.206, p=.047) indicating that the attention required to complete the collaborative LEGO construction challenge may have demanded additional physiological resources for children who indicated they *have trouble waiting for something I want, and* are *impatient* and *impulsive* (Fowles, 2008).

Area under the curve has been proposed as an index of "quantity of affect" (ERICA; MacDermott et al., 2010) and takes into account the amplitude of the response as well as its recovery time. Area under the curve during Task 1 was negatively associated with Prosocial behaviour (r=-.216, p=.037) and positively associated with both Mild Negative Emotion Expression (r=.246, p=.017) and Negative Unhelpful Response ER (r=.209, p=.044). This suggests that children who demonstrated slow physiological recovery were more likely to express mild negative emotion whilst also displaying a tendency to recruit unhelpful emotion regulation strategies.

4.2.2 Summary of bivariate correlational analysis

The correlation matrix has revealed a pattern of medium positive correlations between unrelated measures (9 between .10 and .30), with the same number of strong positive correlations (9 between .20 and .41) and a smaller number of strong (6 between -.22 and -.33) and medium (7 between -.10 and -.21) negative correlations. It would appear that while there are some overall trends, these are not particularly strong unless the measures are related, as in the example of the physiological measures of Amplitude and Area under the Curve (Table 4.5). Many of the weaker correlations are between the variables of interest, suggesting that these relationships may not be strongly linear and the potential presence of

subgroups within the overall sample. This possibility is explored in the following section.

4.2.3 Non-linear relationships

The rather complicated pattern of inter-relationships, revealed in Table 4.5, together with the evidence reviewed earlier regarding the multiple processes involved in developing emotion regulation tendencies suggests that Cluster Analysis might be a beneficial method of analysis. This method is not limited to comparing data on one or two linear factors but is able to identify patterns in multivariate data of the kind collected for the present study. One of the major uses of Cluster Analysis has been to identify groups of people at risk of developing clinical problems and vulnerable to poor outcomes (Traxel, 1957) and as such has the potential to shed light on the patterns of children's emotion regulatory behaviours within the current enquiry.

The next section presents a description of the Cluster Analysis carried out. This includes:

a) Details of the process through which variables were selected and prepared for the analysis,
b) The basis upon which a four-cluster solution was reached,
c) Validation of the four-cluster solution by means of Discriminant Function Analysis,
d) Validation of the four clusters with additional variables (Clatworthy, Buick, Hankins, Weinman, & Horne, 2005),
e) Labelling and description of each of the four clusters,
f) Description of the five central cases within each cluster.

4.2.4 Hierarchical Cluster Analysis

As stated, one of the central aims of this study was to identify groups of individuals with particular patterns of behaviours who might be at risk of developing greater problems and who could benefit from a targeted school based intervention. Cluster Analysis has the potential to make such a contribution to psychological and educational research. Typically for Cluster Analysis techniques,

a series of prior analyses are run in order to select the study variables to include. In the present study, the correlation analyses have revealed relationships between the twenty-five variables listed in Table 4.5. Using the compute function in SPSS, selected variables were combined to create nine new variables for inclusion into the cluster analysis. These are listed in Table 4.6.

Table 4.6: Nine combined variables (in bold) included in the Cluster Analysis

Questionnaires		ER behaviours during LEGO tasks		Physiology (EDA)	
1. Total ERICA	EC ESA SR	**4. Overall Emotionality**	PE_Mild PE_Strong NE_Mild NE_Strong	**7. Peaks per minute**	PPM_T1 PPM_T2
2. Prosocial	SDQps	**5. Behavioural Regulation**	PosPS NegUR NegAV	**8. Amplitude**	AMP_T1 AMP_T2
3. Total Problems	SDQe SDQc SDQih SDQpp	**6. Distraction**	DISbeh DIScog	**9. Area Under the Curve**	AUC_T1 AUC_T2

EC: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **PE:** Positive Emotion Expression, **NE**: Negative Emotion Expression, **PosPs**: Positive Problem Solving ER, **NegER**: Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distraction, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2

Since Cluster Analysis is very sensitive to outliers, each variable used in the analysis was first carefully examined for outliers. Potential outliers were evaluated by examining standardised residuals. Z-scores were calculated and any score less than -3.29 or greater than +3.29 was removed from the analysis. Table 4.7 describes the excluded data for each of the nine variables after outliers have been excluded. After exclusions, cluster analyses were then performed on 89 participants.

First, agglomerative hierarchical cluster analysis was run using Ward's method and squared Euclidean distance which takes into account the elevation of scores in grouping participants (e.g. grouping cases with high versus low scores for Total Problems). In agglomerative hierarchical cluster analysis, means are first calculated for each of the variables. Then for each participant (case), the squared Euclidean distance to the cluster means is calculated. These distances are summed for all of the cases. Each case begins as an individual cluster. At the next step, the two participants who have the smallest squared Euclidean distance

value are joined into a single cluster. Step-by-step the clusters that merge are those that result in the smallest increase in the overall sum of the squared within-cluster distances, eventually result in one cluster containing all cases.

Table 4.7: Missing data by variable

	Total n	Present n	Present %	Missing n	Missing %
Total ERICA	128	128	100%	0	0.0%
Pro-social	128	128	100%	0	0.0%
Total Problems	128	128	100%	0	0.0%
Emotionality	128	124	97%	4	3.1%
Regulation	128	124	97%	4	3.1%
Distraction	128	122	95%	6	4.7%
Peaks per minute	128	93	73%	35	27.3%
Amplitude	128	92	72%	36	28.1%
Area under the curve	128	92	72%	36	28.1%

Table 4.8: Final stages of the hierarchical agglomeration schedule

Stage	No. of clusters	Coefficients	% change
75	15	276.04	5%
76	14	290.54	5%
77	13	306.47	5%
78	12	324.29	6%
79	11	343.18	6%
80	10	363.23	6%
81	9	386.95	7%
82	8	413.29	7%
83	7	439.85	6%
84	6	481.19	**9%**
85	5	523.65	9%
86	4	576.26	**10%**
87	3	660.38	**15%**
88	2	776.53	**18%**

Hierarchical clustering also provides an agglomeration schedule of coefficients for each stage of the clustering process. Each coefficient is the within-cluster sum of squares at that step. If there is a large increase (or percentage change) between one coefficient and the previous, this indicates a cut off point for each cluster. Through examination of the output, a decision is then made on grouping participants based on minimal distance, or similarity. In order to visualise this

process, for the present study, the agglomeration coefficients were calculated and plotted. The full agglomeration schedule is available as Appendix 4.1. For the purposes of visualisation here, only the final 14 stages are reported in Table 4.8 and plotted in Figure 4.3. As can be seen from the agglomeration schedule and associated figure, the first sizeable change occurred when 7 clusters were reduced to 6 (stage 83 to 84) and then again when 4 clusters were combined into 3 (stage 86 to 87). Based on this information and with the aim of identifying relatively distinct groups of participants, a detailed investigation was conducted at these stages using K-means cluster analysis. This investigation is described in the following section.

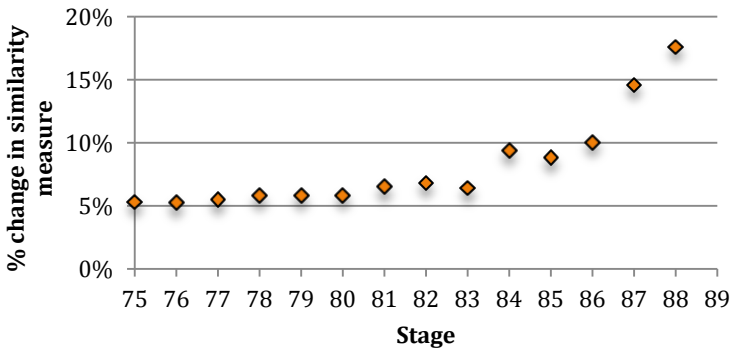

Figure 4.3: Final stages of the hierarchical clustering agglomeration schedule

4.2.5 K-means Cluster Analysis

K-means is a more preferable method for defining cluster groups as it uses iterative partitioning methods for selecting the number of cluster groups relying less on researcher subjectivity to decide on the most appropriate number of clusters to describe their data. Iterative partitioning begins by dividing the cases into the required number of clusters, each case is then assigned to the closest cluster, based on its distance from the cluster centre (as recommended by Everitt & Hothorn, 2011). Once all cases have been assigned to their initial clusters, the cluster centres are recalculated based on all of the cases in the cluster. Case assignment is repeated using these updated cluster centres and this process continues until no cluster centre changes or the maximum number of iterations

(10 by default) is reached. K-means cluster analysis provides summary scores for each cluster and an ANOVA table to explain the usefulness of each variable within the procedure. It also saves cluster membership for each case, allowing for post hoc testing.

4.2.5.1 Comparing cluster solutions

Three solutions were requested from the K-means analysis of 6, 5 and 4 clusters respectively. One-way ANOVA's were used to identify differences between cluster group means for each of the nine individual variables. Examination of ANOVA statistics showed that all but one variable (Area under the EDA curve) contributed significantly ($p>.01$) to each of the 4, 5 and 6-cluster solutions. The 6-cluster solution had the fewest number of iterations, converging by the fifth. The four-cluster solution converged by the seventh iteration and the only solution that failed to converge at the maximum of 10 attempts was the five-cluster solution.

Table 4.9 shows the numbers of cases in each cluster solution. A more detailed analysis of each of the clusters will be presented in the following section but for the purposes of deciding on the final cluster solution, an initial description follows. At the 6-cluster level, the first group to emerge (initial n=32) had high scores for pro-social behaviours and emotion regulation (both ERICA and observed Regulation) and low scores for classroom behavioural problems (Total Problems). The next group (initial n=29) scored highly on classroom behavioural problems and distraction and low on pro-social behaviours. The third group (initial n=6) were physiologically reactive, with extreme scores for Amplitude and low scores for (observed) Regulation, Emotionality and Distraction. The fourth (initial n=4) showed low regulation, moderate emotionality and high physiological reactivity (Peaks per minute). The fifth cluster (initial n=16) scored highly on Emotionality. This group appears to have been formed from a sub-sample of the first cluster with which its members share similar characteristics. These include low scores for classroom behavioural problems and moderate scores for positive regulation and prosocial behaviour. The sixth and final, small (n=2) cluster was formed from the third (physiologically reactive) cluster, with

high scores for Peaks per minute and low scores for emotion regulation and emotionality.

On the basis of these comparisons and for purposes of the description, analysis and discussion to follow, it was decided to split the sample into four cluster groups. Both the five and six cluster solutions produced two small cluster groups, which at the 4-cluster level were absorbed into clusters 1 and 3.

Table 4.9: Numbers of cases in each cluster group

	6 Cluster solution	**5 Cluster solution**	**4 Cluster solution**
1.	32	26	34
2.	29	29	25
3.	6	6	17
4.	4	9	13
5.	16	19	
6.	2		

Whilst reasonably possible to interpret all six groups, some of the groups are small, which produces limitations for further analysis. The four cluster solution showed distinct profiles and good separation of the clusters, providing scope for theoretical and practical relevance for this study. On this basis, the four-cluster solution would appear to be the more reasonable and valuable solution to pursue. Furthermore, as we shall see, each of the four cluster groups represents a pattern of strategic behaviour predictable from the previous research on ER behaviour, as outlined in the earlier review of this work.

4.2.5.2 Four-cluster validation

Validation of the four cluster solution was carried out in two stages: 1) Discriminant Function Analysis was performed to explore the distinguishing factors between groups, 2) cluster groups were compared using background and subscale variables not included in the K-means clustering process. To support interpretation of these findings, each cluster has been given a descriptive label (*Adaptive, Maladaptive, Reactive* and *Distracted*). These are fully described in section 4.2.7 below.

4.2.5.2.1 Discriminant Function Analysis

Table 4.10 describes the means, standard deviations and ANOVA *p* values describing the contribution of each of the nine variables included within the four-cluster solution. Examination of the ANOVA statistics showed that all variables contributed significantly to the four-cluster solution with the exception of Area under the EDA curve. As such, AUC was excluded from the Discriminant Function Analysis. The four-cluster solution was tested using MANOVA to compare the overall difference between the four groups. This revealed a statistically significant difference between each of the four-cluster profiles $F(24, 226) = 19.67$, $p<.0001$; Wilk's $\Lambda = .038$, partial $\eta^2 = .66$.

Table 4.10: Means, SD's and ANOVA significance values of clustering variables for all four cluster groups

	Cluster 1: *Adaptive* (n=34)		**Cluster 4: *Maladaptive* (n=25)**		**Cluster 3: *Reactive* (n=17)**		**Cluster 2: *Distracted* (n=13)**		*p*=
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Total ERICA	0.62	0.72	-0.88	0.89	-0.13	0.91	-0.07	0.83	.000
Pro-social	0.59	0.70	-0.67	0.89	-0.07	0.89	0.03	0.79	.000
Total Problems	-0.74	0.45	0.91	0.80	0.07	0.90	-0.02	0.77	.000
Emotionality	0.47	1.29	-0.34	0.71	-0.48	0.73	0.12	0.74	.003
Regulation	0.65	0.84	-0.34	1.17	-0.42	0.62	-0.28	0.79	.000
Distraction	-0.24	0.46	-0.32	0.55	-0.34	0.58	1.85	0.98	.000
Peaks per minute	0.05	0.62	0.56	0.97	-1.38	0.53	0.57	0.57	.000
Amplitude	-0.21	0.32	-0.33	0.47	1.20	1.68	-0.29	0.54	.000
Area under curve	0.08	0.87	-0.06	1.11	-0.32	0.58	-0.03	1.27	.587

Discriminant Function Analysis (DFA) was carried out on the four clusters to explore the factors distinguishing between different patterns of emotion regulation for each of the four groups. DFA is a multivariate test of differences between groups that determines the minimum number of dimensions (or functions) required to describe these differences.

The Pooled within-groups correlations between discriminating variables and standardised canonical discriminant functions are reported in Table 4.11. The shading indicates a significant relationship between Function and measure. As can be seen, three discriminant functions were revealed. All three functions significantly differentiated the four cluster profiles, Wilk's $\Lambda=0.43$, $X^2(6)=63.76$, $p>.001$.

Table 4.11: Discriminant Function Analysis of four cluster groups: Function/ER-variable correlations

	Function		
	1	**2**	**3**
ERICA Total	0.295	-.374*	0.142
Pro-social	0.261	-.309*	0.127
Total Problems	-0.386	.476*	-0.168
Emotion	.199*	-0.063	0.187
Regulation	0.184	-0.173	.343*
Distraction	0.457	0.442	-.713*
Peaks per minute	0.188	.632*	0.391
Amplitude	-0.175	-0.363	-.386*

*Significant at the 0.05 level

The functions were interpreted as follows:

Function 1: this function explains 52.4% of the variance (canonical R^2=.76) and loads heavily on to Emotion expressivity (r=.20) which is described as the sum of positive and negative emotions expressed during the construction task. As such, this function can be interpreted as reflecting the emotional expressivity of participants.

Function 2: this function accounts for 28.8% of the variance (canonical R^2=.64). Physiological reactivity (PPM: r=.63) and classroom behaviour problems (Total Problems: r=.48) weigh positively on to Function 2, whereas self-reported ER competence (ERICA Total: r=-.37) and teacher-report prosocial behaviour (Prosocial: r=-.309) both load negatively on to this function. Function 2 appears to discriminate between clusters 2 and 4, reflecting distinct patterns of negative ER behaviour and physiological reactivity.

Function 3: explains just 18.8% of the variance, (canonical R^2=.54) and loads negatively on to Distraction (r=-.71) and Amplitude (r=-.39). Regulation weighs positively on to this function (r=.34), reflecting and discriminating between the different emotion regulation patterns observed in clusters 1 and 2.

The loadings of individual cases within the four-cluster solutions on the three functions described above (which together account for 100% of the variance) are displayed in Figures 4.4 to 4.6. These plots demonstrate good separation of the four cluster groups and seem to represent distinct patterns of emotion reactivity, regulation and behaviour, providing useful validation of the structure of cluster profiles identified.

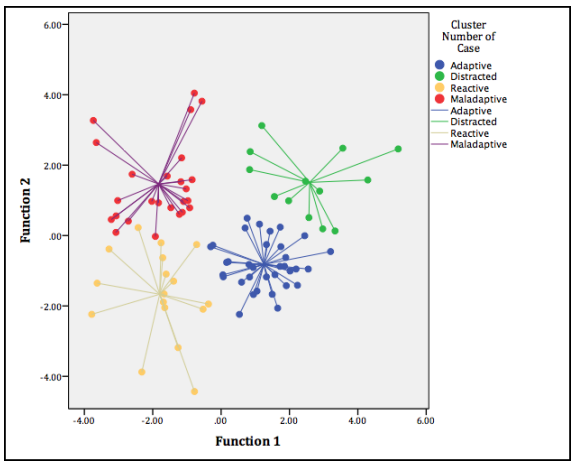

Figure 4.4: Scatter plot of individual cluster loadings onto Functions 1 & 2

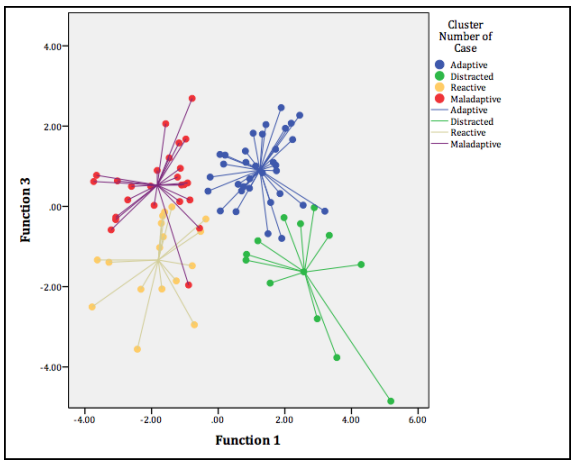

Figure 4.5: Scatter plot of individual cluster loadings onto Functions 1 & 3

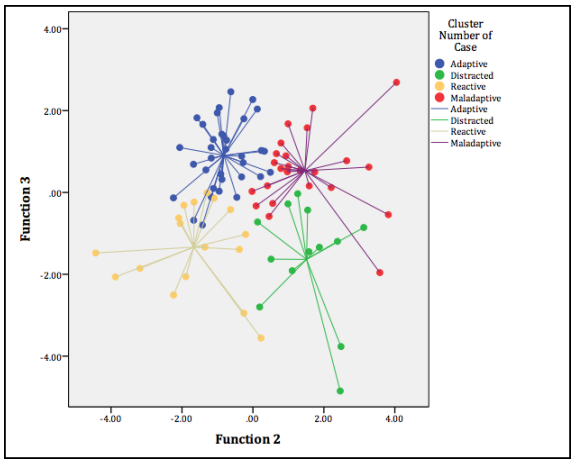

Figure 4.6: Scatter plot of individual cluster loadings onto Functions 2 & 3

4.2.5.2.2 Group similarities/differences: background variables and subscales

To begin with, a chi-square test of independence was run to assess whether gender (male or female) was related to cluster group (*Adaptive, Maladaptive, Reactive or Distracted*) as shown in Table 4.12. There was no significant association between gender and cluster group $X^2(3)=1.94$, $p=.59$ suggesting that membership of each cluster was unlikely to be related to a particular gender.

Table 4.12: Contingency table showing numbers of males and females in each cluster group

	Adaptive	**Maladaptive**	**Reactive**	**Distracted**	**Total**
Male	16	16	9	8	72
Female	18	9	8	5	56
Total	34	25	27	13	128

The four main clusters were then tested for group differences across the range of variables described in Table 4.13. Group differences were tested with a one-way ANOVA and where equal variances could not be assumed, Welch's test is reported. Post-hoc multiple comparisons (Tukey and Games-Howell) were performed to identify where differences lay between groups. In the following analysis, only the variables with statistically significant differences (highlighted in bold in Table 4.13) are described. Effect sizes for group mean differences were calculated using Cohen's *r*. (Clatworthy et al., 2005) has made some widely accepted suggestions about what constitutes a large or small effect: .10 small, .30 medium; >.50 large.

Table 4.13: Means, Standard Deviations and ANOVA significance values for all cluster groups

		Adaptive n=34		Maladaptive n=25		Reactive n=17		Distracted n=13		ANOVA
		M (SD)	Range	M (SD)	Range	M (SD)	Range	M (SD)	Range	Sig
BACKGROUND	**Gender**	1.53 (0.51)	-	1.28 (0.46)	-	1.53 (0.51)	-	1.23 (0.44)	-	.100[a]
	Age	9.24 (0.59)	8.1-10.3	8.81 (0.59)	'8-10.5	9.43(0.79)	7.9-10.5	9.01 (0.72)	8-10.3	**.016**
	FSM	0.18 (0.39)	-	0.17 (0.38)	-	0 (0)	-	0.15 (0.38)	-	.530
	SEN	0.06 (0.24)	-	0.12 (0.33)	-	0.06 (0.24)	-	0.31 (0.48)	-	.340[a]
ERICA	**Emotional Control**	27.32 (3.48)	21-35	19.12 (4.76)	7-30	23.47 (5.29)	16-33	23.92 (4.13)	16-32	**.000**
	Emotional Self-Awareness	19.53 (2.3)	13-25	17.36 (2.68)	12-25	19.35 (3.30)	14-25	17.77 (2.65)	14-23	**.010**
	Situation Responsiveness	18.21 (1.67)	13-20	16.60 (2.12)	12-20	16.29 (2.39)	11-20	17.85 (1.52)	15-20	**.002**
SDQ	**Prosocial**	8.68 (1.72)	4-10	5.6 (2.18)	1-10	7.06(2.16)	3-10	7.31 (1.93)	5-10	**.000**
	Emotional symptons	0.85 (1.16)	0-4	3.60 (3.06)	0-10	1.47 (1.46)	0-4	1.08 (1.80)	0-6	**.002[a]**
	Conduct symptoms	0.29 (0.63)	0-2	2.16 (1.46)	0-5	1.18 (1.43)	0-4	0.77 (1.43)	0-4	**.000[a]**
	Inattention/Hyperactivity	1.12 (1.72)	0-7	4.84 (2.30)	1-10	3.47 (2.94)	1-10	4.31 (2.59)	0-9	**.000[a]**
	Peer problems	0.59 (0.78)	0-3	2.12 (1.83)	0-6	1.59 (1.81)	0-6	1.00 (1.29)	0-4	**.002[a]**
ER DURING LEGO CONSTRUCTION	**Mild negative emotion expression**	0.27 (0.17)	.04-.82	0.25 (0.17)	0-.61	0.16 (0.11)	0-.39	0.27 (0.15)	.05-.52	.137
	Strong negative emotion expression	0.12 (0.14)	0-0.55	0.09 (0.13)	0-0.45	0.07 (0.07)	0-0.55	0.13 (0.17)	0-0.55	.509
	Mild positive emotion expression	0.57 (0.45)	0.07-1.74	0.40 (0.36)	0.04-1.82	0.31 (0.26)	0.06-1.09	0.45 (0.36)	0.06-1.4	.113
	Strong positive emotion expression	0.47 (0.42)	0-1.54	0.13 (0.12)	0-0.37	0.22 (0.18)	0-0.66	0.34 (0.23)	0.11-0.86	**.000[a]**
	PEminusNE	0.64 (0.77)	-0.49-2.77	0.16 (0.52)	-0.68-1.82	0.30 (0.34)	-0.04-1.37	0.60 (0.93)	-0.52-3.18	**.041[a]**
	Positive problem-solving	6.41 (1.83)	2.91-10.29	4.24 (2.50)	1.49-7.4	4.06 (1.52)	1.49-7.4	4.14 (2.01)	1.69-8.19	**.000**
	Negative ER	0.67 (0.53)	0.04-2.48	0.78 (0.61)	0.05-1.89	0.80 (0.45)	0.09-1.72	0.55 (0.49)	0.25-2.14	.521
	Behavioural Distraction	0.03 (0.06)	0-0.24	0.02 (0.04)	0-0.19	0 (0)	-	0.09 (0.08)	0-0.2	**.000**
	Cognitive Distraction	0.09 (0.09)	0-0.28	0.08 (0.10)	0-0.4	0.09 (0.14)	0-0.48	0.52 (0.25)	0-0.28	**.000[a]**
EDA DATA	**PPM Task 1**	0.23 (0.07)	0-0.41	0.24 (0.07)	0-0.35	0.08 (0.12)	0-0.46	0.26 (0.06)	0.14-0.36	**.000**
	PPM Task 2	0.16 (0.12)	0-0.37	0.27 (0.18)	0-0.95	0 (0.01)	0-0.03	0.25 (0.09)	0-0.38	**.000[a]**
	AMP Task 1	-0.11 (0.7)	-1.41-1.61	-0.25 (0.92)	-1.56-1.6	0.49 (0.53)	-0.31-1.2	-0.25 (0.94)	-1.65-1.64	**.033**
	AMP Task 2	-0.39 (0.76)	-2.14-1.51	-0.78 (1.13)	-3.04-1.42	4.89 (6.79)	0-17.02	-0.60 (1.37)	-2.14-1.51	**.016[a]**
	AUC Task 1	-549.97 (847.17)	-2682-1754	-630.20 (1107.86)	-2546-1501	-922.21 (625.89)	-2249-0	-636.20 (1139.9)	-2775-991	.615
	AUC Task 2	-126.11 (218.89)	-543-416.4	-196.98 (238.43)	-683-290.4	-207.19 (145.15)	-534-0	-154.48 (399.74)	-926-609.8	.454

[a]Where equal variances cannot be assumed, Welch's test is reported

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE**: Negative Emotion Expression, **PPM:** Peaks per minute, **AMP:** Amplitude, **AUC:** Area under the EDA curve

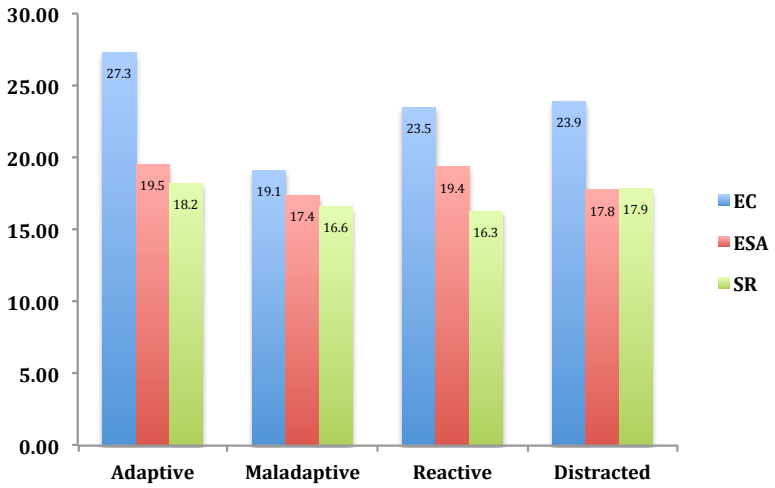

Figure 4.5: Mean scores for ERICA questionnaire across cluster group

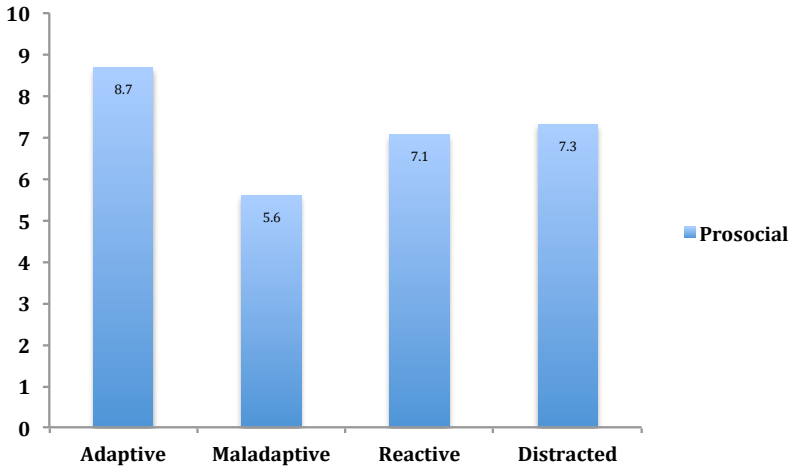

Figure 4.6: Mean Prosocial (SDQ) scores across cluster groups

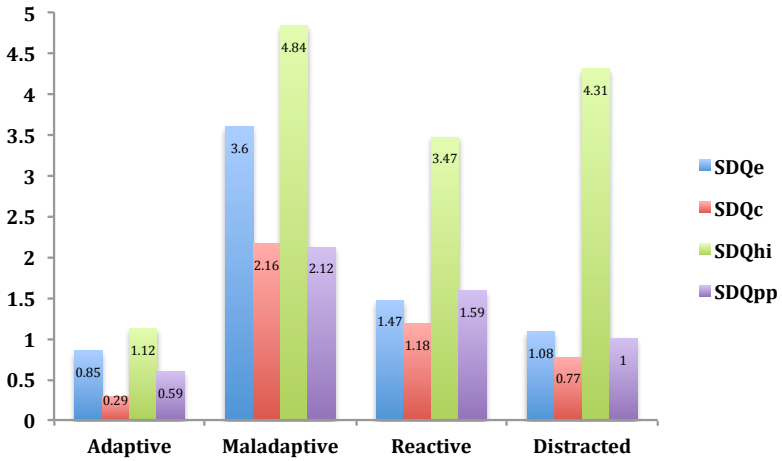

Figure 4.7: Mean Problem (SDQ) scores across cluster groups

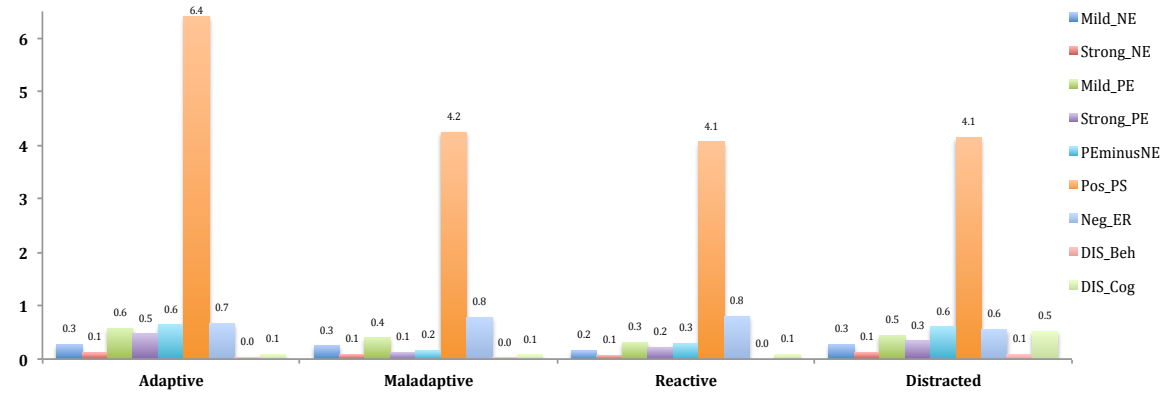

Figure 4.8: Mean scores for ER behaviours observed during LEGO construction

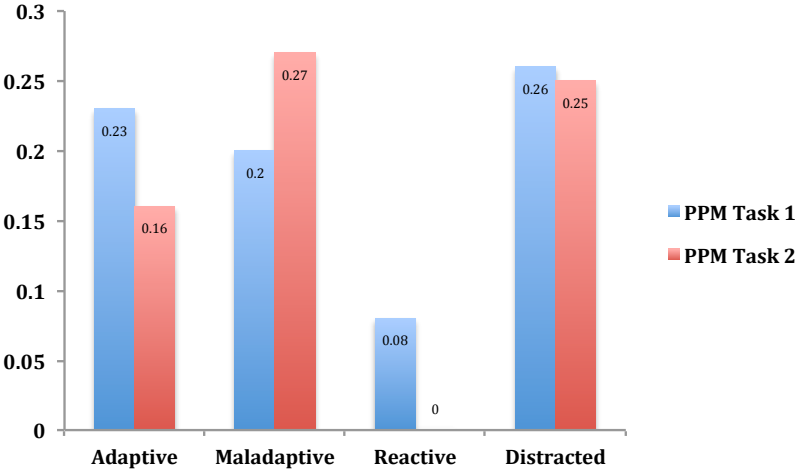

Figure 4.9: Mean peaks per minute (EDA) scores during LEGO construction

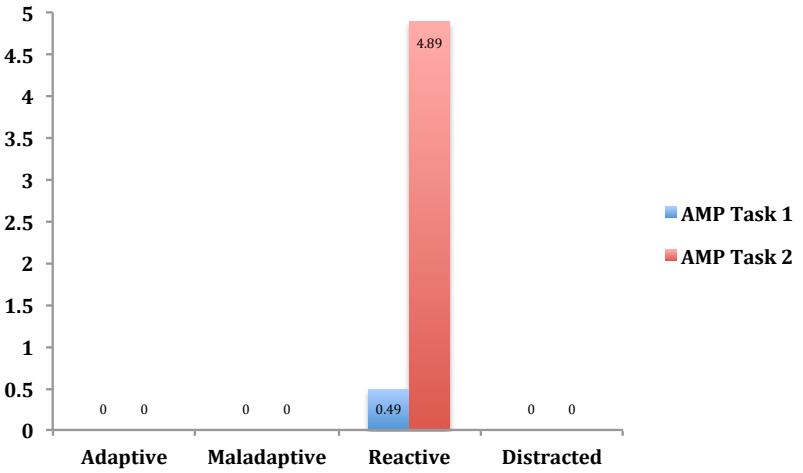

Figure 4.10: Mean Amplitude scores (EDA) during LEGO construction

4.2.5.2.3 Background variables

There were no statistically significant differences between gender, FSM and SEN variables across cluster groups. There was a significant difference between Age $F(3, 85)=3.62$, $p=.016$, specifically between cluster 2 and 3 ($p=.018$, $r=.42$) with a greater number of older participants in cluster 3.

4.2.5.2.3a ERICA subscales

A number of differences were found between the three subscales of the self-report Emotion Regulation Questionnaire (ERICA). Mean ERICA scores have been visualised in Figure 4.5. Emotional Control scores were found to significantly differ between cluster groups, $F(3, 85)=17.26$, $p<.001$. Tukey's procedure revealed statistically significant differences lay between cluster 1 and both clusters 2 ($p<.001$, $r=.51$) and 3 ($p=0.19$, $r=.44$), and between cluster 2 and both clusters 3 ($p=.010$, $r=.40$) and 4 ($p=.009$, $r=.46$). Significant differences were found between scores for group members on the ERICA Emotional Self Awareness subscale, $F(3, 85)=4.03$, $p=.01$, specifically between group members of cluster 1 and cluster 2 ($p=.014$, $r=.40$). Scores also differed significantly for the Situation Responsiveness subscale, $F(3, 85)=5.43$, $p=.002$, with specific group differences revealed between cluster 1 and both clusters 2 ($p=.012$, $r=.40$) and 3 ($p=.007$, $r=.43$).

4.2.5.2.3b Classroom behaviour

Significant differences were found between Prosocial scores, $F(3,85)=11.78$, $p<.001$ with specific group differences between cluster 1 and both clusters 2 ($p<.001$, $r=.63$) and 3 ($p=.035$, $r=.38$), see Figure 4.6. Statistically significant differences were found for all four problem subscales of the Strength and Difficulties Questionnaire (Figure 4.7). 1) Emotional symptoms differed across cluster groups (Welch's $F(3, 33.8)=6.13$, $p=.002$) with Games Howell's procedure revealing specific differences between cluster 2 and both cluster 1 ($p=.001$, $r=.15$) and cluster 4 ($p=.015$, $r=.47$). 2) Conduct problem scores were significantly different (Welch's $F(3, 30.3)=12.56$, $p<.001$) between cluster 1 and cluster 2 ($p<.001$, $r=.54$). 3) Inattention/Hyperactivity symptoms were statistically different (Welch's $F(3, 33.57)=6.129$, $p<.001$) between cluster 1 group members and all three other groups: cluster 2 ($p<.001$, $r=.52$), cluster 3 ($p=.028$, $r=.55$) and

cluster 4 (p=.004, r=.71). Finally, 4) Peer problem scores were significantly different (Welch's F(3, 31.77)=6.012, p=.002) between clusters 1 and 2 (p=.002, r=.58).

4.2.5.2.3c Observed ER behaviours during LEGO construction

The one-way ANOVAs revealed statistically significant group differences between five of the individual coded emotion regulation behaviours during LEGO construction (Figure 4.8). 1) Strong Positive Emotion scores differed across the four clusters, (Welch's F=(3, 33.76)=8.98, p<.001), post-hoc multiple comparison tests showed specific differences lay between cluster 1 and both clusters 2 (p<.001, r=.58) and 3 (p=0.23, r=.39), and also between cluster groups 3 and 2 (p=.035, r=.64). 2) For the computed PEminusNE variable, significant differences were identified (Welch's F=(3, 37.37)=3.04, p=.041) between clusters 1 and 2 (p=.029, r=.36) groups. 3) Positive Problem Solving ER scores were significantly different (F=(3,85)=8.76, p<.001), specifically between the cluster 1 and each of the three other cluster groups: cluster 2 (p=.004, r=.47), cluster 3 (p<.001, r=.55) and cluster 4 (p=0.10, r=.48). 4) Behavioural Distraction scores differed statistically (F(3,83)=7.43, p<.001) between group members of cluster 4 and each of the three other groups: cluster 1 (p=.002, r=.41), cluster 2 (p=.001, r=.50) and cluster 3 (p<.001, r=.43). 5) Cognitive Distraction ER scores were significantly different (Welch's F(3, 32.63)=12.93, p<.001) between cluster 4 group members and each of the three other groups: cluster 1 (p<.001, r=.86), cluster 2 (p<.001, r=.86) and cluster 3 (p<.001, r=.81).

4.2.5.2.3d Physiological reactivity (EDA)

The remaining identified differences between cluster groups arose from the electrodermal data, for which separate readings were calculated for each of the two LEGO construction tasks (Figures 4.9 and 4.10). Differences were identified for Peaks per minute and Amplitude reactivity during both tasks. PPM reactivity during Task 1 significantly differed (F(3,84)=16.881, p<.001) between cluster 3 and all three of the other groups: cluster 1 (p<.001, r=.62), cluster 2 (p<.001, r=.65) and cluster 4 (p<.001, r=.68). EDA reactivity (PPM) during Task 2 also differed significantly (Welch's F(3, 32.46)=68.53, p<.001) between cluster 3 group members and the three other groups: cluster 1 (p<.001, r=.81), cluster 2

(p<.001, r=.83), and cluster 3 (p<.001, r=.94), and also between the clusters 4 and 1 (p=.049, r=.49). Amplitude reactivity during Task 1 differed significantly (F(3, 82)=3.053, p<.033) between clusters 3 and 2 (p=.031, r=.41) and Amplitude reactivity during Task 2 differed significantly (Welch's F(3, 29.57)=4.059, p<.016) between cluster 3 and each of the three other groups: cluster 1 (p=.026, r=.62), cluster 2 (p=.016, r=.64) and cluster 4 (p=.022, r=.61).

4.2.6 Summary of four cluster validation process

Analysis of the four-cluster solution has revealed clear differential patterns of behaviour amongst the sample of 89 cases. The Discriminant Function Analysis has provided helpful validation of the four group classification, with explanation for the expressions, behaviours and physiological responses that discriminate between the four groups. The one-way ANOVAs, using a range of variables external to the cluster-forming process, have confirmed the separation and uniqueness of each of the cluster groups.

4.2.7 Description and interpretation of the four clusters profiles

The following section provides a detailed description and interpretation of each of the four cluster profiles. To support this discussion, scores for each cluster group are presented in Tables 4.14 to 4.17. As noted previously, an overall label is ascribed to each cluster, providing an indication of each group's pattern of regulatory behaviour relative to the other cluster groups. The central variables are described together with a list of constituent cases within each cluster group. The number of cases and percentages (of the sample) for each of the background variables is displayed. The description of scores follows, which looks at their general position relative to the other clusters.

4.2.7.1 Emotion regulation components for cluster 1

Cluster 1 is the largest of the four cluster groups and has a fairly equal representation of males to females. Although not significantly different from the other three groups, cluster 1 has the largest proportion of participants on Free School Meals and the lowest number of students diagnosed with a Special Educational Need. This group has no participants categorised within the serious or borderline categories of the SDQ (as defined in Table 3.3, section 3.8.1.2). This cluster is characterised by participants' strong self-perception (ERICA; see Figure

4.5) of their ability to effectively regulate their emotions (Emotional Control), to recognise emotions (Emotional Self Awareness) and to respond in an appropriate manner (Situational Responsiveness). Compared to the other clusters, this group had the highest scores for Prosocial behaviour (e.g. *considerate of others and shares readily;* see Figure 4.6*)* and conversely, the lowest scores for classroom emotion and behaviour problems (Total Problems, see Figure 4.7). During the LEGO construction tasks, this group demonstrated the highest values for Strong Positive Emotion Expression since they frequently expressed positive emotions (Figure 4.8). They also employed more Positive Problem Solving regulation strategies during Tasks 1 and 2 (Figure 4.8) than any other group. This cluster group was the least physiologically reactive of all four cluster groups (Figures 4.9 and 4.10). Cluster 1 is labelled *Adaptive* since all values suggest these participants generate positive, helpful emotion regulatory strategies and outcomes whilst managing their physiological responses during the construction tasks. This also appears to be the case more generally in their classroom behaviour, as reported by their teachers.

Table 4.14: Cluster 1 profile

Cluster 1: Adaptive	n=34 (38%)
Cases:	20, 23, 25, 26, 29, 32, 36, 38, 39, 40, 42, 47, 48, 57, 69, 70, 72, 75,76, 78, 79, 80, 81, 90, 95, 96, 98, 99, 100, 101, 102, 103, 104, 112
Gender:	47% male, 53% female
Age:	29% 7-8 year olds, 71% 9-10 year olds
FSM:	18%
SEN:	6%
SDQ group:	100% normal range
PEminusNE:	Low: 26%, Medium: 35%, High: 38%
ERICA:	High (M=0.62, SD=0.72).
ProSocial	High (M=0.59, SD=0.70),
Behaviour problems:	Low Total Problems (M=-0.74, SD=0.45)
Observed ER Behaviours:	High Emotionality (M=0.47, SD=1.29), High positive problem solving Regulation (M=0.65, SD=0.84)
EDA Reactivity:	Low Amplitude (AMP: M=-0.21, SD=0.032)

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **EDA:** Electrodermal activity

4.2.7.2 Emotion regulation components for cluster 2

Cluster 2 is predominantly male. Of all four groups, this group has the youngest membership. Cluster 2 had the lowest values for self-reported emotion regulation ability across all three ERICA subscales (Figure 4.5). Teachers reported this group as having the lowest scores for Prosocial behaviours (Figure 4.6) and the highest

scores across all four subscales of the SDQ for classroom emotion and behavioural problems (Figure 4.7). During LEGO construction, this group expressed less emotion overall and more negative emotion than any other cluster group. Cognitive Distraction scores were low for this group (Figure 4.8), meaning that participants in this group generally employed fewer Distraction ER strategies than members of the other cluster groups. Peaks per minute scores were high for this group, particularly during Task 2 (Figure 4.9) and Amplitude scores during Task 1 were the lowest across groups. Cluster 2 is labelled *Maladaptive* due to their tendency to employ negative unhelpful or avoidant strategies.

Table 4.15: Cluster 2 profile

Cluster 2: Maladaptive	n=25 (28%)
Cases:	2, 3, 4, 5, 8, 12, 21, 33, 34, 35, 46, 49, 52, 55, 67, 68, 74, 77, 82, 84, 85, 86, 87, 114, 121
Gender:	72% male, 28% female
Age:	60% 7-8 year olds, 40% 9-10 year olds
FSM:	16%
SEN:	12%
SDQ group:	68% problem group 32% normal group
PEminusNE:	Low: 44%, Medium: 48%, High: 8%
ERICA:	Particularly low ERICA (M=-0.88, SD=0.89)
ProSocial	Particularly low Prosocial (M=-0.67, SD=0.89),
Behaviour problems:	Particularly high Total Problems (M=0.91, SD=0.80)
Observed ER Behaviours:	Particularly Negative Regulation (M=-0.34, SD=0.71) Particularly low Distraction (M=-.32, SD=0.55)
EDA Reactivity:	High Peaks per minute (M=0.56, 0.97)

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **EDA:** Electrodermal activity

Table 4.16: Cluster 3 profile

Cluster 3: Reactive	n=17 (19%)
Cases:	6, 7, 17, 24, 41, 43, 44, 54, 73, 111, 115, 120, 123, 124, 126, 127, 128
Gender:	47% male, 53% female
Age:	24% 7-8 year olds, 76% 9-10 year olds
FSM:	None
SEN:	6%
SDQ group:	24% problem group, 76% normal group
PEminusNE:	Low: 35%, Medium: 59%, High: 6%
ERICA:	Generally low ERICA (M=-0.13, SD=0.91)
ProSocial	Generally low (M=-0.07, SD=0.90)
Behaviour problems:	Some (Total Problems M=0.07, SD=0.90)
Observed ER Behaviours:	Low Emotionality (M=-0.48, SD=0.73) Particularly negative Regulation (M=-0.42, SD=0.62) Low Distraction (M=-0.34, SD=0.58)
EDA Reactivity:	High Amplitude (M=1.20, M=1.68)

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **EDA:** Electrodermal activity

4.2.7.3 Emotion regulation components for cluster 3

Cluster 3 has a fairly equal representation of females to males. Of all four clusters, this group has the largest proportion of members in the older 9-10 age range. This group was the only group to have no participants on Free School Meals. Equal to the Adaptive group, this cluster has the smallest percentage of students with a registered Special Educational Need. In relation to the Adaptive group, teachers reported this group as demonstrating few Prosocial behaviours (Figure 4.6) and as having high scores for Inattention/Hyperactivity symptoms (Figure 4.7). During the LEGO construction tasks this group was more likely to employ negative unhelpful or avoidant regulation strategies (Figure 4.8). Of the four groups, Cluster 3 had the lowest scores for Emotionality (Table 4.10), in other words, during the construction tasks, they displayed very little or no observable expression of emotion in a positive or negative direction, suggesting the possibility that emotional displays are frequently disguised or supressed for this group. Cluster 3 is labelled *Reactive* due to its physiological sensitivity during Task 1 and 2 for both Peaks per minute (Figure 4.9) and Amplitude (Figure 4.10) measures. It is possible that this reactivity reflects the additional physiological effort required to recruit attention processes during the LEGO tasks, which may also be reinforced by the low Distraction values (i.e. low frequency of Behavioural and Cognitive Distraction ER strategies observed during LEGO construction).

Table 4.17: Cluster 4 profile

Cluster 4: Distracted	n=13 (15%)
Cases:	Cases: 13, 27, 28, 37, 53, 58, 61, 66, 71, 83, 89, 97, 111
Gender:	77% male, 23% female
Age:	60% 7-8 year olds, 40% 9-10 year olds
FSM:	15%
SEN:	31%
SDQ group:	23% problem group 77% normal group
PEminusNE:	Low: 38%, Medium: 31%, High: 31%
ERICA:	Low (M=-0.072 SD=0.83)
ProSocial	Mid level prosocial scores (M=0.03, SD=0.79)
Behaviour problems:	Some behavioural problems (Total Problems: M=-0.02, SD= 0.77)
Observed ER Behaviours:	Negative ER strategies (Regulation M=-0.28, SD=0.79) High Distraction scores (M=1.85, SD=0.98)
EDA Reactivity:	High Peaks per minute (M=0.57, SD=0.57)

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **EDA:** Electrodermal activity

4.2.7.4 Emotion regulation components for cluster 4

Cluster 4 is the smallest group of the four, with extreme scores for Distraction (Table 4.10). Of all four groups, this cluster has the largest proportion of males and most members registered with a Special Educational Need. Self-perceptions (ERICA) of Emotional Control and Situation Responsiveness are low for this group, suggesting they have little confidence in their own ability to effectively regulate emotions, particularly in relation to the Adaptive cluster group (Figure 4.5). Prosocial behaviours and Positive Problem Solving ER scores are also low compared to those of Adaptive group members. Teacher reports suggest some classroom behaviour difficulties, particularly with Emotional and Hyperactivity/Inattention symptoms (Figure 4.7). This is also reflected in the group's high frequency in employing both Cognitive and Behavioural Distraction strategies during the LEGO construction tasks (Figure 4.8). Cluster 4 was physiologically reactive during the LEGO construction Task 2 with the highest Peaks per minute values (Figure 4.9). Cluster 4 is labelled *Distracted* due to their tendency to manage emotionally arousing information through cognitive and behavioural disengagement from emotionally arousing triggers.

4.2.8 Description of central cases in each cluster

As a further method of investigating the qualities of the different emotion regulation patterns identified by the Cluster Analysis, the 5 most central cases within each cluster were selected for more detailed investigation. The cases can be easily identified by reference to the full Agglomeration Schedule reproduced in Appendix 4.1 in which the cluster coefficients for each case are listed. Cases were selected by their distance from the cluster centroid. The cases with the lowest coefficients are those most similar to the cluster centroids. Thus, the cases identified for each cluster are as follows:

Adaptive cluster (1): 20, 90, 112, 39, 48

Maladaptive cluster (2): 86, 55, 85, 34, 52

Reactive cluster (3): 113, 115, 54, 17, 73

Distracted cluster (4): 58, 61, 89, 28, 83

Examination of the scores of these central cases serves to reinforce aspects of the analysis of clusters based on overall means: in particular, it serves to highlight those variables upon which the central cases are strongly consistent, as opposed to those variables where even the central cases show some variation. This helps to enhance the interpretation of the essential nature and characteristics of clusters. In the present case, the relative positions of the four clusters described in the previous section are clearly reinforced.

Tables 4.18 to 4.21 show raw scores for each of the questionnaire, observed ER behaviours and EDA data by for each cluster group. These have been visualised graphically in Figures 4.11 to 4.13. For the purposes of presentation and discussion, scores for the EDA data (PPM & AMP) were standardised due to the different units of measurement used to calculate each variable (as explained in section 4.2.4).

Table 4.18: Five Central Cases - *Adaptive* cluster

	Case 20	**Case 90**	**Case 112**	**Case 39**	**Case 48**
Gender	Male	Female	Male	Male	Male
Age	9.9	9.3	10.3	8.5	8.2
FSM	No	No	No	No	No
SEN	None	None	None	None	None
SDQ Group	Normal	Normal	Normal	Normal	Normal
PEminusNE	Medium	High	High	Medium	High
ERICA	65	70	70	66	62
Prosocial	7	10	6	10	7
Total Problems	4	2	3	0	7
Emotion	1.06	1.22	1.71	0.99	1.68
Regulation	6.54	5.01	5.19	6.5	3.55
Distraction	0	0.06	0	0.29	0.18
PPM	0.37	0.48	0.39	0.41	0.38
AMP	-0.96	-1.78	0.36	0	-1.68
AUC	-497.2	-849.9	-1007.5	-1703.6	-1017.9

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **PPM:** Peaks per minute, **AMP:** Amplitude, **AUC:** Area under the curve

Table 4.19: Five Central Cases - *Maladaptive* cluster

	Case 86	**Case 55**	**Case 85**	**Case 34**	**Case 52**
Gender	Male	Male	Female	Male	Male
Age	8.2	9.2	8.2	9.4	9.4
FSM	Yes	No	Yes	No	No
SEN	None	None	None	None	None
SDQ Group	Normal	Problem	Normal	Normal	Problem
PEminusNE	Low	Medium	Low	Low	Medium
ERICA	52	56	58	44	59
Prosocial	6	8	8	4	4
Total Problems	9	12	10	9	15
Emotion	0.89	0.79	0.37	0.84	0.86
Regulation	3.28	1.65	2.46	4.75	0.14
Distraction	0.21	0	0.08	0	0
PPM	0.56	0.5	0.53	0.32	0.55
AMP	-0.85	-2.18	-2.38	-2.26	-0.06
AUC	-621	-1744.7	-1550.8	-1049.1	-147.89

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **PPM:** Peaks per minute, **AMP:** Amplitude, **AUC:** Area under the curve

Table 4.20: Five Central Cases - *Reactive* cluster

	Case 113	**Case 115**	**Case 54**	**Case 17**	**Case 73**
Gender	Male	Female	Male	Female	Female
Age	10.4	10.2	9.3	9.8	9.9
FSM	No	No	No	No	No
SEN	None	None	None	None	None
SDQ Group	Normal	Normal	Normal	Normal	Normal
PEminusNE	Medium	Medium	Low	Medium	Medium
ERICA	63	61	52	53	51
Prosocial	5	7	7	7	10
Total Problems	7	10	8	3	4
Emotion	0.8	0.91	0.5	1.17	0.54
Regulation	2.68	3.99	2.75	4.23	4.96
Distraction	0.13	0	0.15	0	0.06
PPM	0	0.12	0.19	0.05	0.03
AMP	7.23	0.46	-0.1	0.83	1.36
AUC	-335.5	-989.3	-1506	-614.37	-1873.8

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **PPM:** Peaks per minute, **AMP:** Amplitude, **AUC:** Area under the curve

Table 4.21: Five Central Cases - *Distracted* cluster

	Case 58	**Case 61**	**Case 89**	**Case 28**	**Case 83**
Gender	Male	Male	Male	Male	Female
Age	9.2	8.4	8	9.6	8.3
FSM	No	No	No	No	No
SEN	None	Yes	None	None	None
SDQ Group	Normal	Normal	Problem	Normal	Normal
PEminusNE	High	Low	High	Low	Medium
ERICA	59	55	55	55	60
Prosocial	8	5	5	6	10
Total Problems	2	10	14	9	5
Emotion	1.41	0.88	1.18	1.26	1.2
Regulation	4.84	2.8	4.69	5.6	2.44
Distraction	0.72	0.53	0.53	0.59	0.4
PPM	0.55	0.74	0.53	0.38	0.65
AMP	-3.11	-1.42	-0.37	1.67	0.02
AUC	-1537.7	-692.1	-449.47	301.7	-40.41

FSM: Free School Meals, **SEN:** Special Educational Need, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **PPM:** Peaks per minute, **AMP:** Amplitude, **AUC:** Area under the curve

4.2.8.1 Description of central cases in each cluster group

The five central cases of the Adaptive group, who exhibited the strongest patterns of emotion regulation, consistently demonstrated positive emotion expression (PEminusNE) during the construction tasks. They all reported high self-confidence in their ability to regulate their emotions (ERICA), particularly in respect of Emotional Control. They had few classroom behavioural problems (SDQ) and consistently employed more positive problem solving Regulation than the other three cluster groups. EDA scoring profiles were similar for cases 48, 90 and 20 who displayed similarities in their profile of reactivity across Tasks 1 and 2 for both Peaks per minute and Amplitude. EDA patterns for cases 39 and 112 were quite different from the other central cases. Case 39 showed Peaks per minute reactivity during Task 1 only and case 112 had elevated scores for Amplitude but low for Peaks per minute measures.

By contrast, the five central cases of the Maladaptive group were consistently seen to express negative emotionality. ERICA scores for this cluster were the lowest of the four groups and these low scores are reflected in the five central cases. However, some variability in the pattern of scores was seen across the five participants, with case 52 producing higher total ERICA scores of 59 and case 34 producing the lowest (44). The Maladaptive group is distinguished by its high SDQ scores for classroom emotion and behavioural problems, however the

pattern of variation between the five central cases is indicative of the wide range of behavioural problems this group manifest in class. Out of the five cases, only cases 55 and 52 achieved scores that met the criteria (see section 3.8.1.2) for 'borderline' Total Difficulties. Case 34 had the lowest score, allocated across two subscales (Inattention/Hyperactivity and Peer problems). Case 52 had the highest score, allocated across all four problem subscales (Emotional, Conduct, Inattention/ Hyperactivity and Peer problems). All five cases received scores for Inattention/Hyperactivity symptoms. The Maladaptive group has the lowest scores for Regulation due to their tendency to employ negative unhelpful or avoidant regulatory strategies. EDA scores were similar for four out of five central cases. Compared to the other four cases, Amplitude scores for participant 52 were higher during Task 2.

The pattern distinguishing the Reactive group from the three other groups is the positive values for Amplitude. As can be seen in Figure 4.13, all five central cases have positive scores for Amplitude during both tasks, although notable individual differences can be seen in the strength of this reactivity. For instance, case 113 has particularly high scores on these measures compared to case 52. Participants within this group were observed to express little emotion and this was the case for four out of five cases whose PEminusNE scores demonstrated their emotional neutrality (medium group) with the remaining case (54) displaying a tendency for negative emotional expression. All of the five central cases in the Reactive group achieved 'normal' scores for classroom behavioural problems although the SDQ Problem scores displayed in Figure 4.13 show distinct variation in the types of behaviours reported by their teachers.

The Distracted cluster is notable for its member's use of Distraction strategies during the construction tasks, exemplified here by the scores of the five central cases during LEGO construction (Figure 4.14). Overall, this group were reported as one of the more Prosocial groups (though not as high scoring as the Adaptive group, see Figure 4.6) and within the five central cases there seems to be considerable differences with cases 89 and 61 scoring only 5, but case 83 with scores of 10 on the Prosocial subscale of the SDQ. This group had high scores for Inattention/Hyperactivity (although overall, these scores were not as high as the Maladaptive group, see Figure 4.7) and these scores are reflected in the SDQ

Problem scores of the five central cases (Figure 4.14). Only one case (89) achieved scores that met the criteria for 'borderline' Total Problems (see section 3.8.1.2). Compared to the other three groups, members of the Distracted cluster were found to be particularly physiologically sensitive to the competitive nature of Task 2, this is consistently reflected in the PPMT2 scores for each of the five central cases (Figure 4.14).

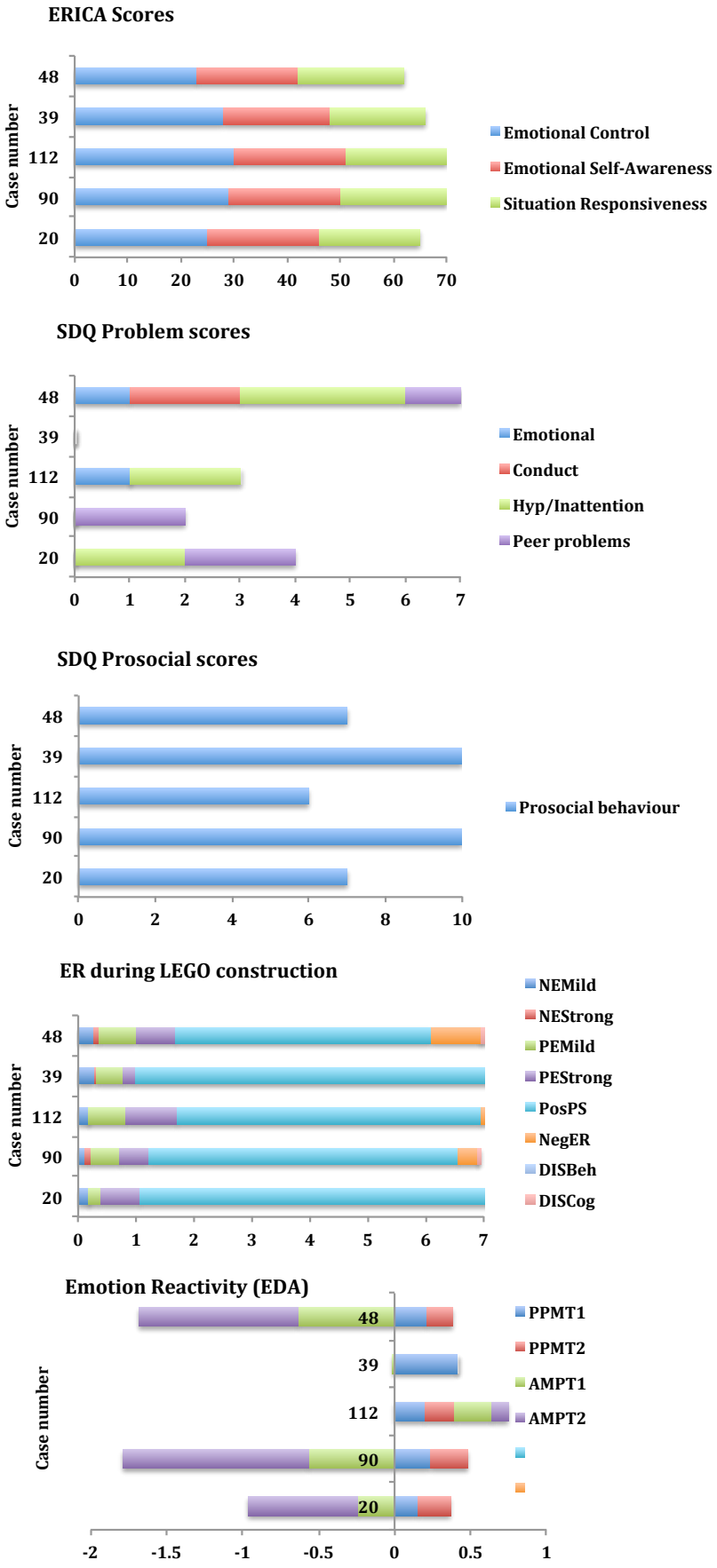

Figure 4.11: Scores for five central cases of the *Adaptive* cluster group

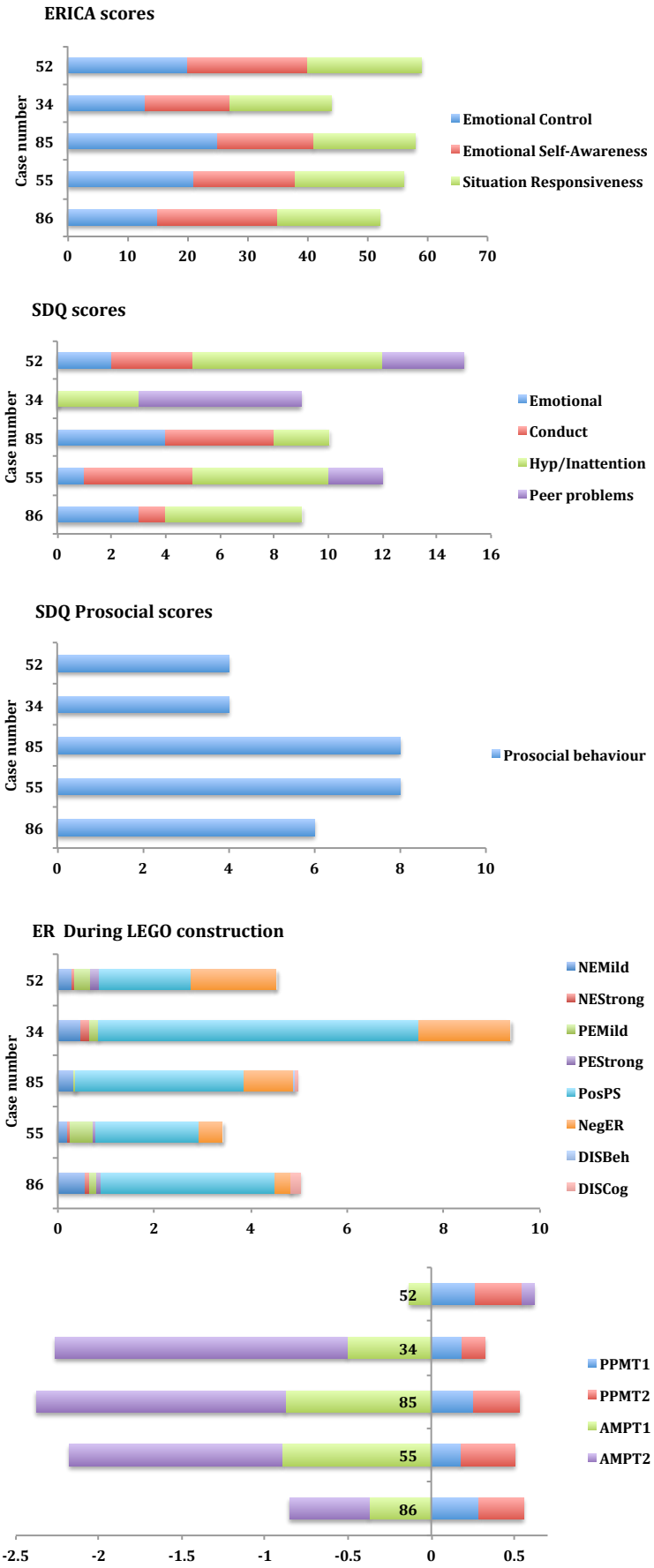

Figure 4.12: Scores for five central cases of the *Maladaptive* cluster group

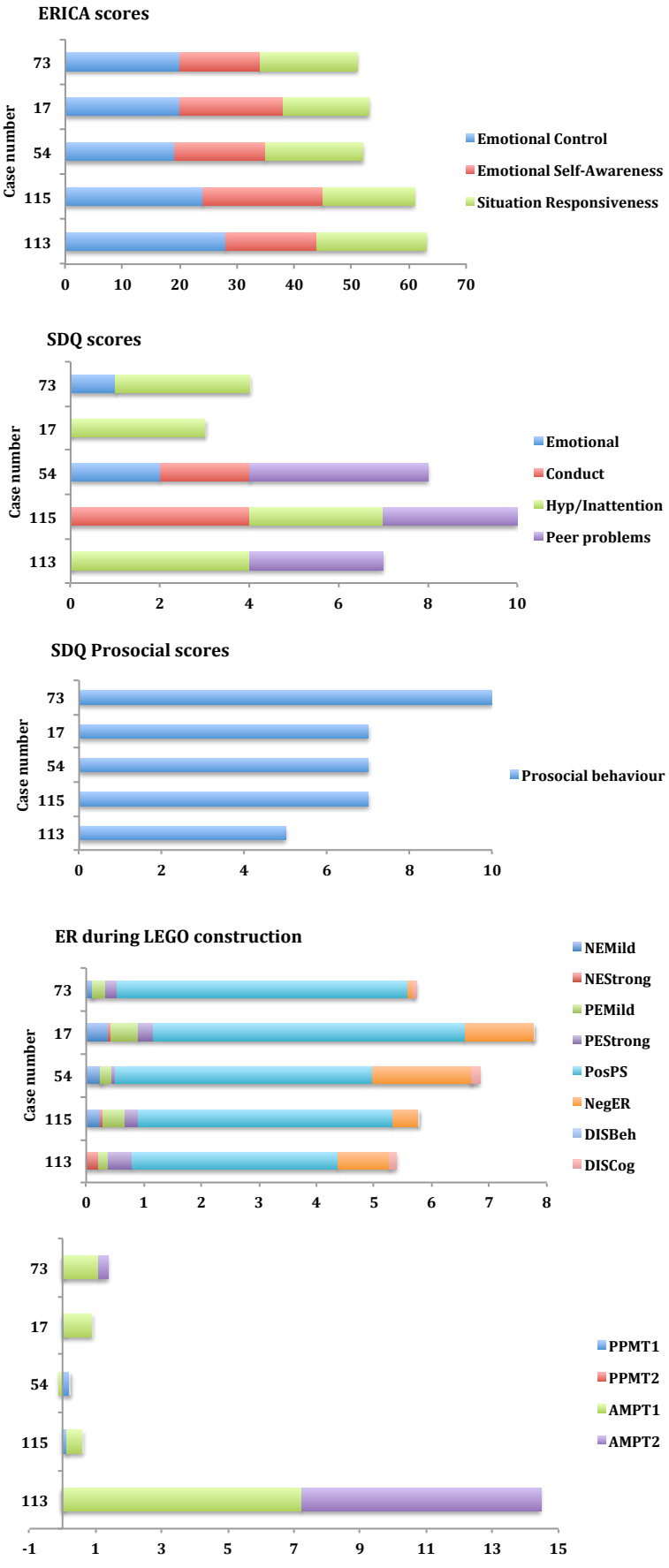

Figure 4.13: Scores for five central cases of the *Reactive* cluster group

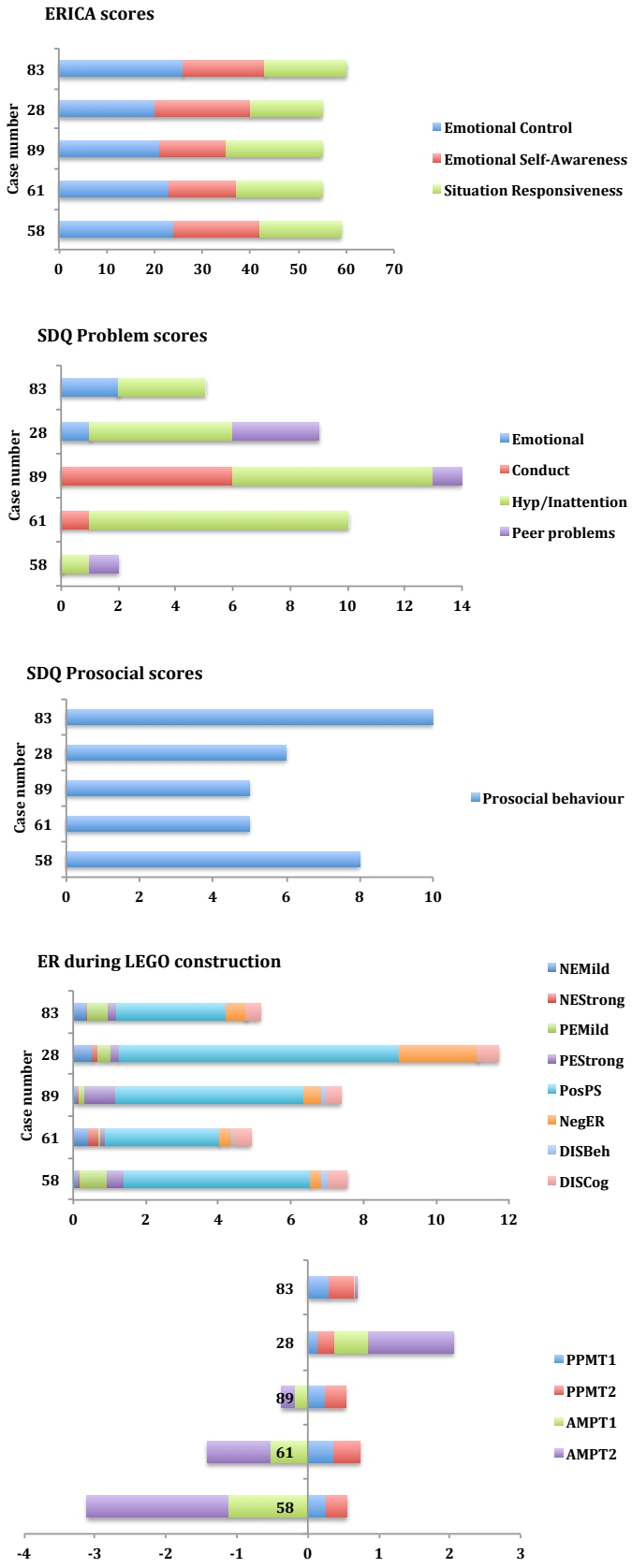

Figure 4.14: Scores for five central cases of the *Distracted* cluster group

4.2.9 Summary of this section

Whereas the earlier examination of scores across measures served to reinforce patterns of behaviours that vary between cluster groups, examination of the central cases has served to highlight those variables upon which the central cases are consistent. Although many of the behavioural patterns within the four cluster groups are consistent, as we have seen there are some clear within-cluster differences. Most notable are the differences in behavioural problems between clusters. It would seem that an SDQ Total Problems score only provides a general indication of classroom behavioural problems and further analysis is required to understand the emotion regulatory patterns of specific difficulties for each group. To explore these differences, in the remaining analysis we will consider the individual differences in classroom behavioural problems and across gender as well as considering any interactions between these sub groups. It is to this discussion that we turn to in the next section of the analysis of results.

4.3 RQ2: What patterns of emotion reactivity and regulation exist in children with behavioural difficulties in the middle years classroom?

This section raises the question about the emotion regulation tendencies of students with classroom emotional or behavioural difficulties. The findings provide confirmation of existing research in community samples (reviewed in Chapter Two), whilst also revealing possible explanations for the patterns of behavioural and physiological responses underlying student behaviour.

Participants were grouped according to their scores on the Strength and Difficulties questionnaire (SDQ), as described in section 4.1.1. Students whose scores fell into either the 'Serious' or 'Borderline' categories of Total Difficulties (n=33) were placed into one group. For the purposes of this discussion, this group is referred to as the *'Problem'* group. The remaining group is referred to as the *'Normal'* group (n=95) in respect of the behaviours its members typically displayed in the classroom.

4.3.1 Classroom behavioural problems: descriptives and group differences

An initial chi-square test of independence was run to assess whether gender (male or female) was related to SDQ group (Normal or Problem) as shown in Table 4.22. There was no significant association between gender and SDQ group $X^2(1)=1.96$, $p=.16$ suggesting that based on this sample, there is no significant bias towards males or females.

Table 4.22: Contingency table showing numbers of males and females in SDQ groups

	SDQ Normal group	SDQ Problem group	Total
Male	50	22	72
Female	45	11	56
	95	33	128

Group mean scores, standard deviations and ranges for each of the measures employed in this study are presented and described in Table 4.23. Homogeneity of variance was calculated using Levene's test and differences between group means were calculated using independent sample T-tests.

Group averages for gender, age, FSM and SEN were similar with no significant differences between Problem and Normal group members. Table 4.23 shows that Problem group scores were lower across all three ERICA subscales with significant differences revealed between group averages for Emotional Control (Problem M=21.36, SD=5.81; Normal M=25.16, SD=4.82), $t(126)=3.69$, $p<.001$, $r=.31$ and ERICA total scores (Problem M=56, SD=8.61, Normal M=61.56, SD=7.30), $t(126)=3.59$, $p<.001$, $r=.30$. Given the method (described above) in which participants were separated into each of the two SDQ groups, it is unsurprising that the average scores for each of the SDQ subscales are significantly different between Problem and Normal group members. Prosocial scores were lower for the Problem group (M=6.06, SD=2.25) than the Normal group (M=7.64, SD=2.27), $t(126)=3.36$, $p=.001$, $r=.28$. Emotional symptoms were greater for the Problem group (M=4.14, SD=2.66) than the Normal group (M=0.82, SD=1.14), $t(36.16)=$, $p<.001$, $r=57$. Conduct problems were higher for

Problem (M=2.7, SD=1.83) than Normal (M=0.54, SD=1.01) group members, $t(38.98)=-6.45$, $p<.001$, $r=.52$.

Table 4.23: SDQ Group Means, Standard Deviations, Ranges and T-test significance values

		Problem group				Normal group				
		n =	**mean**	**SD**	**Range**	**n =**	**mean**	**SD**	**Range**	***p*=**
	Gender	33	1.330	.479	-	95	1.470	.502	-	.164
	Age	33	8.988	.838	7.9-10.5	95	9.193	.791	5.4-10.7	.209
	FSM	28	.179	.390	-	86	.128	.336	-	.507
	SEN	33	.182	.392	-	93	.075	.265	-	.085
ERICA	EC	33	21.36	5.81	7-35	95	25.16	4.82	13-35	**.000**
ERICA	ESA	33	17.79	3.10	12-24	95	18.82	2.63	13-25	.066
ERICA	SR	33	16.85	2.56	11-20	95	17.58	1.72	13-20	.069
ERICA	ERICA Total	33	56.00	8.61	31-78	95	61.56	7.30	44-80	**.000**
SDQ	ProSocial	33	6.06	2.55	0-10	95	7.64	2.27	2-10	**.001**
SDQ	Emotional	33	4.15	2.66	0-10	95	0.82	1.14	0-4	**.000**
SDQ	Conduct	33	2.70	1.83	0-6	95	0.54	1.01	0-4	**.000**
SDQ	Inatt/Hype	33	6.06	2.05	2-10	95	2.24	2.36	0-9	**.000**
SDQ	PeerProb	33	2.61	2.15	0-8	95	0.83	1.11	0-6	**.000**
ER during LEGO construction	NE_Mild	32	0.22	0.21	0-1.12	92	0.27	0.18	0-0.82	.051
ER during LEGO construction	NE_Strong	32	0.09	0.12	0-0.45	92	0.12	0.15	0-0.76	.530
ER during LEGO construction	PE_Mild	32	0.42	0.39	0.05-1.82	92	0.51	0.43	0-1.99	.452
ER during LEGO construction	PE_Strong	32	0.20	0.19	0-0.86	92	0.35	0.44	0-3.06	**.016**
ER during LEGO construction	PEminusNE	32	0.36	0.53	-0.48-1.82	92	0.50	0.76	-0.52-3.18	.223
ER during LEGO construction	PosPS	32	4.13	2.37	0.64-9.91	92	5.24	2.08	1.26-10.29	**.014**
ER during LEGO construction	NegER	32	0.63	0.50	0.03-1.76	92	0.75	0.63	0-3.06	.329
ER during LEGO construction	DIS_Beh	32	0.04	0.10	0-0.5	92	0.04	0.10	0-0.61	.958
ER during LEGO construction	DIS_Cog	32	0.14	0.20	0-0.95	92	0.19	0.40	0-3.12	.882
Emotion reactivity (EDA)	PPM_T1	25	0.25	0.19	0-0.99	68	0.20	0.10	0-0.41	.540
Emotion reactivity (EDA)	PPM_T2	25	0.23	0.20	0-0.95	68	0.16	0.13	0-3.78	**.039**
Emotion reactivity (EDA)	AMP_T1	25	-0.28	1.71	-7.18-1.6	68	0.52	2.69	-1.65-14.81	.709
Emotion reactivity (EDA)	AMP_T2	25	0.87	4.92	-6.93-17.02	68	0.52	3.25	-2.27-14.81	.828
Emotion reactivity (EDA)	AUC_T1	25	-754.69	1650.83	-6958-1501	68	-684.93	978.19	-2823-1754	.501
Emotion reactivity (EDA)	AUC_T2	25	-253.39	542.18	-2460-609.8	68	-150.31	239.46	-925.9-449.7	.854

FSM: Free School Meals, **SEN:** Special Educational Need, **EC**: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **NE**: Negative Emotion Expression, **PE:** Positive Emotion Expression; **PosPs**: Positive Problem Solving ER, **NegER**=Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distractions, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2

Inattention /Hyperactivity scores were higher for the Problem (M=6.06, SD=2.05) than the Normal (M=2.24, SD=2.36) group members, $t(126)=-8.29$, $p<.001$, $r=.59$.

Peer problems were significantly greater for the Problem (M=2.61, SD=2.15) than the Normal (M=0.83, SD=1.11) group members, $t(38.06)=-4.54$, $p<.001$, $r=70$. For the coded emotion regulation behaviours during LEGO construction, Strong Positive Emotion Expression was significantly lower for the Problem group (M=0.20, SD=0.19), than for the Normal group members (M=0.35, SD=0.44), $t(96.84)=2.46$, $p=.16$, $r=.25$. Positive Problem Solving ER behaviours were also

observed significantly less frequently in the Problem group (M=4.13, SD=2.37) compared to the Normal group (M=5.24, SD=2.08), $t(122)=2.50$, $p=.14$, $r=.22$. For the EDA data, only one measure showed a statistically significant difference between groups; Peaks per minute during Task 2 was higher for the Problem group (M=0.23, SD=0.20) than the Normal group (M=0.16, SD=0.13), $t(91)=-2.09$, $p=.039$, $r=.21$.

4.3.2 Bivariate Correlations for SDQ Problem group

Bivariate correlations were calculated for both the SDQ Problem and Normal groups. For completeness, the correlation matrix for the Normal group is displayed in Appendix 4.2. For this section, correlations between members of the Problem group are displayed in Table 4.24. To avoid repetition (SDQ Normal group correlations reflect those of the overall sample), only significant positive or negative correlations that are distinct from the Normal group are reported.

Table 4.24: Bivariate correlations for SDQ Problem group (n=33). **Significant at the 0.01 level, *Significant at the 0.05 level

		ERICA self-report			SDQ teacher-report					ER during LEGO construction									Emotion reactivity (EDA)					
	Age	EC	ESA	SR	SDQps	SDQe	SDQc	SDQih	SDQpp	NE_Mild	NE_Strong	PE_Mild	PE_Strong	PEminusNE	PosPS	Neg_ER	DISbeh	DIScog	PPM_T1	PPM_T2	AMP_T1	AMP_T2	AUC_T1	AUC_T2
Age																								
EC	.009																							
ESA	.187	.367*																						
SR	-.013	.312	.106																					
SDQps	.072	-.082	-.066	-.094																				
SDQe	-.224	-.095	-.167	-.120	.381*																			
SDQc	.083	-.001	-.039	.177	-.586**	-.517**																		
SDQih	.152	.114	.106	-.100	-.480**	-.645**	.456**																	
SDQpp	.131	.212	.193	.074	-.275	.049	.311	-.094																
NE_Mild	-.043	-.004	.114	.172	-.129	.013	-.005	-.092	.170															
NE_Strong	.005	-.074	-.156	-.206	-.198	.443*	-.097	-.199	.155	-.017														
PE_Mild	-.109	-.408*	.085	-.180	-.060	.043	.014	-.167	.223	.336	-.096													
PE_Strong	-.206	-.321	-.045	-.140	-.065	-.113	.037	.015	-.116	.042	.036	.395*												
PEminusNE	-.171	-.419*	.034	-.204	.099	-.050	-.026	-.018	-.042	.008	-.284	.815**	.649**											
PosPS	.008	-.121	.119	.328	.082	.005	-.078	.020	.269	.348	-.054	.249	.183	.172										
Neg_ER	.043	-.019	.000	-.161	-.292	-.150	.143	.258	-.036	.272	.111	-.212	-.198	-.373*	-.272									
DISbeh	-.147	-.133	-.189	.125	.030	.074	.148	-.026	-.335	-.290	.302	-.256	.068	-.135	-.232	.015								
DIScog	-.277	.021	-.055	.072	-.021	.125	-.080	-.039	.048	-.120	.136	-.106	.254	.050	.016	-.115	.270							
PPM_T1	-.263	-.231	-.457*	-.053	-.238	-.223	.268	.346	-.134	-.054	-.044	-.247	-.137	-.163	-.244	.059	.269	.237						
PPM_T2	-.310	.220	-.372	.163	.041	.190	-.057	-.099	-.217	.488*	-.007	-.201	-.251	-.261	-.135	.251	.100	-.049	.355					
AMP_T1	.229	-.064	.366	-.080	-.273	-.260	.010	.027	.386	-.004	-.064	.069	.107	.012	.339	-.023	-.515*	.107	-.114	-.517**				
AMP_T2	.488*	-.066	-.035	-.257	-.129	-.340	.106	.413	.073	-.260	-.039	-.133	.021	-.010	-.023	-.012	-.252	.328	.141	-.404	.532*			
AUC_T1	.028	-.069	.314	.167	-.397	-.140	.145	-.180	.440*	.169	.006	.097	.001	-.082	.367	.022	-.257	.220	-.028	-.227	.808**	.114		
AUC_T2	-.141	-.028	.122	.182	-.237	-.060	-.072	-.037	.232	.073	-.005	-.095	.032	-.039	.308	.006	-.341	.436*	.146	.015	.649**	.131	.798**	

EC: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **NE**: Negative Emotion Expression, **PE:** Positive Emotion Expression; **PosPs**: Positive Problem Solving ER, **NegER**=Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distraction, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2

For the SDQ Problem group, Emotional Control correlates negatively with Mild Positive Emotion Expression (r=-.408, p=.02), and with PEminusNE (r=-.419, p=.02). These combined results suggest an inverse relationship between self-reported Emotional Control and positive emotionality for this group. Emotional Self Awareness is negatively correlated with Peaks per minute in Task 1 (r=-.457, p=.03). Surprisingly, significant SDQ inter-correlations for Emotional symptoms lie in the opposite direction to those in the Normal SDQ group, i.e. Emotional symptoms for the Problem group are positively correlated with teacher reported Prosocial behaviours (r=.381, p=.03) and negatively correlated with Conduct problems (r=-.517, p<.01) and Inattention/Hyperactivity symptoms (r=-.645, p<.01). Peer problems are positively correlated with Area under the curve during Task 1 (r=.440, p=.03). Negative ER is negatively correlated to PEminusNE (r=-.373, p=.04) suggesting an inverse relationship between unhelpful regulation strategies and positive emotionality for the Problem group. Mild Negative Emotion expression is correlated with Peaks per minute in Task 2 (r=.488, p=.02). Behavioural Distraction is negatively correlated with Amplitude during Task 1 (r=-.515, p=.01). Cognitive Distraction is positively correlated with Area under the curve in Task 2 (r=.436, p=.03).

4.3.3 Summary of this section

Consistent with prior research, the findings presented in this section suggest that children with emotional and behavioural problems are likely to have low self-confidence in their ability to effectively regulate their emotions. These findings also suggest that problematic behaviours are likely to be associated with negative emotionality and a tendency to rely on negative unhelpful or avoidant regulatory strategies. Physiologically, the problem group seem to be particularly sensitive to the competitive nature of Task 2. This was particularly the case for those participants with Peer problems. Physiological sensitivity was also apparent for those students who frequently employed distraction strategies during the construction tasks.

4.4 RQ3: How does gender influence patterns of emotion reactivity and regulation in middle childhood?

As described in Chapter Two, existing research presents a complex picture of individual differences in emotion regulation tendencies. This section provides an analysis of the differences in ER responses between males and females. In contrast to some studies Cohen (1988) no statistically significant differences in physiological responses were identified between males and females. Nevertheless, this section describes a complex picture of gender-specific ER tendencies between the central behavioural measures included in the present study.

4.4.1 Gender descriptives: similarities and differences

For males and females, mean scores, standard deviations and ranges for each of the measures employed in this study are presented and described in Table 4.25. Homogeneity of variance was calculated using Levene's test and differences between gender group means were calculated using independent sample T-tests.

Table 4.25 describes means, standard deviations, range of scores and T-test significance values for all measures split into two gender groups. Group averages for gender, age, FSM and SEN were similar with no significant differences between males and females. Total ERICA scores were similar for males (M=60.65, SD=8.02) and females (M=59.45, SD=8.01) with the only statistically significant group difference revealed for the Emotional Self Awareness subscale (Males: M=19.04, SD=2.80; Females: M=17.93, SD=2.66), $t(126)=2.28$, $p=.024$, r=.20). Prosocial scores were higher for females (M=8.14, SD=2.23) than males (M=6.53, SD=2.37), $t(126)=-3.923$, $p<.001$, $r=.33$. Scores for the Inattention/Hyperactivity scale were greater for males (M=3.89, SD=2.74) than females (M=2.38, SD=2.73), $t(126)=3.11$, $p=.002$, $r=.27$. Mild Positive Emotion Expression was more frequently observed for females (M=.60, SD=0.49) than males (M=.40, SD=0.33), $t(120)=-2.191$, $p=.030$, $r=.20$. For the computed PEminusNE variable, females (M=0.65, SD=0.81) scored more highly than males (M=0.26, SD=0.51), $t(122)=-3.282$, $p=.001$, $r=.28$. There were no statistically significant differences for gender across the electrodermal measures of emotional reactivity.

4.4.2 Bivariate Correlations

Bivariate correlations were calculated for both males and females, these are displayed in Tables 4.26 and 4.27 and described below.

4.4.2.1 Males

For the males, Age was significantly negatively correlated with Emotional symptoms (r=-.246, p=.04) and Conduct problems (r=-.235, p=.047) indicating that older male participants had fewer emotional and conduct problems than younger male participants. Age was also negatively correlated with Cognitive Distraction (r=-.270, p=.03), suggesting that younger male participants were more likely to employ Cognitive Distraction ER strategies than the older males in this sample.

Table 4.25: Gender group Means, Standard Deviations, Ranges and T-test significance values

		Males				Females				
		n =	**mean**	**SD**	**Range**	**n =**	**mean**	**SD**	**Range**	***p*=**
	Age	72	9.15	0.80	7.9-10.9	56	9.18	0.66	8-10.5	.837
	FSM	64	0.14	0.35	-	50	0.14	0.35	-	.992
	SEN	72	0.13	0.33	-	54	0.07	0.26	-	.356
ERICA	EC	72	24.21	5.42	13-35	56	24.14	5.28	7-35	.945
ERICA	ESA	72	19.04	2.80	12-25	56	17.93	2.66	12-25	**.024**
ERICA	SR	72	17.40	1.95	12-20	56	17.38	2.06	11-20	.938
ERICA	ERICA Total	72	60.65	8.02	44-80	56	59.45	8.01	31-73	.400
SDQ	Prosocial	72	6.53	2.37	1-10	56	8.14	2.23	0-10	**.000**
SDQ	Emotional	72	1.71	2.34	0-10	56	1.64	2.05	0-8	.869
SDQ	Conduct	72	1.25	1.57	0-6	56	0.89	1.58	0-6	.206
SDQ	Inatt/Hype	72	3.89	2.74	0-10	56	2.38	2.73	0-9	**.002**
SDQ	PeerProb	72	1.31	1.68	0-7	56	1.27	1.59	0-8	.898
SDQ	SDQ Total	72	8.15	5.69	0-25	56	6.18	6.17	0-24	.063
ER during LEGO construction	NE_Mild	69	0.25	0.17	0-1.12	54	0.24	0.18	0-0.82	.632
ER during LEGO construction	NE_Strong	69	0.12	0.15	0-0.76	54	0.08	0.11	0-0.45	.110
ER during LEGO construction	PE_Mild	70	0.40	0.33	0-1.82	52	0.60	0.49	0.04-1.99	**.030**
ER during LEGO construction	PE_Strong	70	0.26	0.26	1.22 - 0.26	53	0.38	0.51	0-3.06	.228
ER during LEGO construction	PEminusNE	70	0.26	0.51	-0.68-1.82	54	0.65	0.81	-0.37-3.18	**.001**
ER during LEGO construction	Pos_PS	70	4.63	2.19	0.64-10.29	54	5.36	2.17	1.81-9.56	.066
ER during LEGO construction	Neg_ER	70	0.79	0.67	0-3.06	54	0.62	0.49	0-2.01	.120
ER during LEGO construction	DIS_Beh	67	0.03	0.06	0-0.23	53	0.03	0.07	0-0.38	.476
ER during LEGO construction	DIS_Cog	69	0.17	0.23	0-1.19	53	0.14	0.27	0-1.48	.142
Emotion reactivity (EDA)	PPM_T1	54	0.22	0.10	0-0.46	39	0.19	0.10	0-0.36	.290
Emotion reactivity (EDA)	PPM_T2	54	0.19	0.17	0-0.95	39	0.16	0.13	0-0.37	.315
Emotion reactivity (EDA)	AMP_T1	51	-0.05	0.93	-1.65-1.97	39	-0.04	0.70	-1.52-1.61	.966
Emotion reactivity (EDA)	AMP_T2	49	0.63	3.99	-3.04-17.02	39	0.26	3.72	-6.93-14.81	.659
Emotion reactivity (EDA)	AUC_T1	53	-467.39	1021.28	-2546-1602	39	-812.90	875.29	-2775-1754	.095
Emotion reactivity (EDA)	AUC_T2	54	-150.75	291.99	-925.9-609.8	39	-156.71	187.98	-543-375	.906

FSM: Free School Meals, **SEN:** Special Educational Need, **EC**: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **NE**: Negative Emotion Expression, **PE:** Positive Emotion Expression; **PosPs**: Positive Problem Solving ER, **NegER**=Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distraction, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2

Emotional Control was significantly correlated with Prosocial behaviours (r=.284, p=.02) and Positive Problem Solving ER (r=.257, p=.032). Emotional Self Awareness was negatively associated with Strong Negative Emotion Expression (r=-.263, p=.029) and positively associated with Positive Problem Solving ER (r=.310, p=.009). Prosocial behaviours were significantly correlated with Positive Problem Solving ER (r=.242, p=.044) and negatively correlated with Negative ER (r=-.244, p=.04). Emotional symptoms were negatively correlated with Positive Problem Solving ER (r=-.241, p=.04) and with Peaks per minute during Task 2 (r=.287, p=.04). Inattention/Hyperactivity scores were negatively associated with Positive Problem Solving ER (r=-.320, p=.007). Negative ER was significantly correlated with both Mild (r=.333, p=.01) and Strong (r=.386, p<.01) Negative Emotion Expression. This same result is reflected in the computed variable PEminusNE which was negatively associated with Negative ER (r=-.272, p=.023). Cognitive Distraction ER was positively correlated to both Strong Positive (r=.246, p=.02) and Strong Negative (r=.279, p=.04) Emotion Expression.

There were several significant correlations between Behavioural Distraction during LEGO construction and electrodermal reactivity scores. Behavioural Distraction was positively associated with Peaks per minute during Task 1 (r=.385, p=.011). Behavioural Distraction was negatively related to Amplitude during Task 1 (r=-.507, p<.001), and Task 2 (r=-306, p=.039), and Area under the curve during Task 1 (r=-.327, p=.021) and Task 2 (r=-.398, p<.001).

4.4.2.2 Females

To avoid repetition, only significant positive or negative correlations that are distinct from the males are reported.

Participant age was a factor for female participants in respect of their electrodermal reactivity during LEGO construction tasks. Significant negative correlations are revealed for Peaks per minute in both Task 1 (r=-.330, p=.043), and Task 2 (r=-.435, p=.006) and significant positive correlations for Amplitude during both Task 1 (r=.496, p=.002) and Task 2 (r=-.419, p=.01). These combined results suggest that younger female participants were more physiologically sensitive with increased frequency of electrodermal peaks than older participants and that older participants were more likely to experience greater

Table 4.26: Bivariate correlations for males (n=72). **Significant at the 0.01 level, *Significant at the 0.05 level

		ERICA self-report			SDQ teacher-report					ER during LEGO construction									Emotion reactivity (EDA)					
	Age	EC	ESA	SR	SDQps	SDQe	SDQc	SDQih	SDQpp	NE_Mild	NE_Strong	PE_Mild	PE_Strong	PEminusNE	PosPS	Neg_ER	DISbeh	DIScog	PPM_T1	PPM_T2	AMP_T1	AMP_T2	AUC_T1	AUC_T2
Age																								
EC	.204																							
ESA	.095	.359**																						
SR	.112	.431**	.307**																					
SDQps	.073	.284*	.037	.054																				
SDQe	-.246*	-.220	-.132	-.246*	-.025																			
SDQc	-.235*	-.220	-.031	-.020	-.523**	.185																		
SDQih	-.131	-.275*	-.130	-.121	-.516**	.164	.570**																	
SDQpp	-.040	-.174	-.039	.086	-.499**	.237*	.402**	.191																
NE_Mild	.013	.103	.077	.162	-.100	-.053	-.109	.067	.154															
NE_Strong	-.080	-.044	-.263*	.050	-.053	.212	-.207	-.060	.080	.247*														
PE_Mild	-.028	-.015	.069	-.186	-.045	-.056	-.074	-.082	.068	.217	-.024													
PE_Strong	.040	.099	-.080	.165	.059	-.125	-.159	-.052	-.081	.197	.336**	.449**												
PEminusNE	-.003	-.013	.038	-.125	.106	-.122	-.086	-.098	-.132	-.167	-.218	.796**	.628**											
PosPS	.093	.257*	.310**	.426**	.242*	-.241*	-.225	-.320**	.079	.186	-.021	-.086	.071	-.086										
Neg_ER	-.122	-.107	-.110	.087	-.244*	-.037	.007	.022	.207	.333**	.386**	-.066	-.015	-.272*	.051									
DISbeh	-.026	-.159	-.228	-.012	.078	.058	.137	.087	-.147	-.195	.179	-.082	.039	.002	-.100	-.196								
DIScog	-.270*	-.099	-.197	.038	-.021	.005	-.130	.177	.080	.130	.246*	.164	.279*	.155	-.144	-.054	.309*							
PPM_T1	-.152	.016	-.230	.023	.181	-.069	.050	.231	-.207	-.012	-.020	-.186	-.150	-.166	.072	-.140	.385**	.222						
PPM_T2	-.146	.076	-.301*	-.079	.110	.287*	.027	.235	-.084	.207	-.003	-.177	-.139	-.210	-.092	.055	.137	.114	.362**					
AMP_T1	-.013	.081	.193	.075	-.154	-.083	-.016	.091	.108	.218	.161	.169	.196	.069	.088	.170	-.507**	.098	-.197	-.320*				
AMP_T2	.276	.222	.037	-.015	.005	-.142	-.124	.030	-.088	-.164	.028	-.057	.126	.081	-.146	-.045	-.306*	.044	-.141	-.406**	.570**			
AUC_T1	-.026	.102	.204	.215	-.192	-.078	.115	.184	.206	.317*	.141	.046	.095	-.099	.261	.206	-.327*	.143	-.158	-.076	.807**	.169		
AUC_T2	-.077	.199	.208	.231	-.042	-.056	-.046	.102	.066	.246	.043	-.028	.044	-.059	.196	.158	-.398**	.256	-.022	-.019	.737**	.238	.830**	

EC: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **NE**: Negative Emotion Expression, **PE:** Positive Emotion Expression; **PosPs**: Positive Problem Solving ER, **NegER**=Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distractions, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2

Table 4.27: Bivariate correlations for females (n=56). **Significant at the 0.01 level, *Significant at the 0.05 level

		ERICA self-report			SDQ teacher-report					ER during LEGO construction									Emotion reactivity (EDA)					
	Age	EC	ESA	SR	SDQps	SDQe	SDQc	SDQih	SDQpp	NE_Mild	NE_Strong	PE_Mild	PE_Strong	PEminusNE	PosPS	Neg_ER	DISbeh	DIScog	PPM_T1	PPM_T2	AMP_T1	AMP_T2	AUC_T1	AUC_T2
Age																								
EC	.237																							
ESA	.163	.584**																						
SR	-.007	.320*	.158																					
SDQps	-.127	.213	-.004	-.036																				
SDQe	-.159	-.244	-.265*	.015	-.056																			
SDQc	.166	-.293*	-.145	-.099	-.615**	.342**																		
SDQih	.201	-.263	-.207	-.081	-.485**	.408**	.562**																	
SDQpp	.077	-.178	.022	-.209	-.442**	.398**	.627**	.471**																
NE_Mild	.146	-.024	-.086	-.059	.058	-.186	-.035	-.141	-.167															
NE_Strong	.133	-.046	-.139	-.011	.055	-.126	-.118	.149	-.070	.261														
PE_Mild	.028	-.013	-.008	.107	-.009	.014	-.077	-.127	.045	.245	.022													
PE_Strong	.068	.092	.065	.062	.185	-.033	-.208	-.040	-.174	.348*	.056	.574**												
PEminusNE	-.025	-.058	.000	.121	.075	.075	-.177	-.073	-.047	-.034	-.035	.785**	.747**											
PosPS	.065	-.071	.013	.001	-.057	-.081	-.080	.120	-.036	.053	.119	.328*	.138	.100										
Neg_ER	.014	.024	.027	-.083	.072	-.222	.010	.042	-.171	.299*	.213	-.060	.130	-.149	-.182									
DISbeh	.048	-.071	-.134	.066	.169	-.061	-.137	-.225	-.245	.128	.385**	-.023	.020	.048	-.164	-.095								
DIScog	-.228	-.189	-.307*	.008	.101	.011	-.160	.024	-.100	.102	.521**	.041	-.042	.235	-.143	-.070	.384**							
PPM_T1	-.330*	-.060	-.146	.177	-.003	-.039	.086	-.042	-.035	-.031	.175	.118	.045	.088	.033	.132	-.058	.195						
PPM_T2	-.435**	-.305	-.388*	.115	-.040	.207	.087	.102	-.107	-.094	.047	.295	.082	.271	.117	.034	.045	.180	.595**					
AMP_T1	.496**	-.086	-.184	-.348*	.170	.043	.080	.205	.152	.053	.111	-.091	.082	-.081	-.174	.123	.183	-.067	.437**	-.286				
AMP_T2	.419**	.090	.001	-.197	-.063	.018	.156	.194	.176	-.132	-.065	-.129	-.117	-.118	-.149	.076	-.082	-.072	-.383*	-.330*	.406*			
AUC_T1	.136	-.226	-.333*	-.169	.106	.150	.106	.057	.013	.180	.192	.143	.214	.157	.115	.195	.046	.067	.241	.350*	.513**	-.120		
AUC_T2	.046	-.162	-.332*	-.121	.150	.042	.015	.022	-.075	.071	.254	.053	.150	.054	-.055	.096	.252	.081	.117	.306	.702**	-.134	.721**	

EC: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **NE**: Negative Emotion Expression, **PE:** Positive Emotion Expression; **PosPs**: Positive Problem Solving ER, **NegER**=Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distractions, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2

Amplitudes than younger female participants. For the ERICA self-report, there was a significant negative correlation between Emotional Control and classroom Conduct behaviours (r=-.293, p=.03). Emotional Self Awareness was negatively correlated with Emotional symptoms (r=-.265, p=.584) and with Cognitive Distraction (r=-.307, p=.03). Emotional Self Awareness was also negatively associated with Area under the curve during Task 1 (r=-.333. p=.041) and similarly for Task 2 (r=-.332, p=.041).

Situation Responsiveness was negatively associated with Amplitude during Task 1 (r=.348, p=.035). For the emotion regulation behaviours coded during LEGO construction, there was a significant positive association between Mild Negative Emotion Expression and Strong Positive Emotion Expression (r=.348, p=.011) and between Strong Negative Emotion Expression and Cognitive Distraction ER (r=.521, p<.001). Mild Positive Emotion Expression was correlated with Positive Problem Solving ER (r=.328, p=.02).

4.4.3 Summary of this section

This analysis has revealed a number of between- and within- gender differences in respect of participant age, emotion expression and physiological (EDA) reactivity. For the present study, the key findings are as follows:

- *Between gender difference*: Males were found to be more emotionally self-aware and displayed more inattentive/hyperactive behaviours in class than females. Females were more prosocial in class and displayed more positive emotionality during the construction tasks than males.
- *Within-gender differences (males):* In relation to their older peers, younger males with emotional and conduct problems in class used more distraction strategies. Males that frequently employed negative ER strategies were likely to display more negative emotional expressivity. Distraction strategies were related to strong/exuberant expressions of emotion and participants that had a tendency to employ distraction strategies demonstrated increased physiological sensitivity to tasks.
- *Within-gender differences (females):* Whilst younger females were likely to show greater frequency of electrodermal activity, older females

demonstrated higher amplitudes of electrodermal activity during construction tasks. Females with emotional symptoms were less likely to be emotionally self-aware, or utilise distraction strategies during construction tasks than those females without emotional symptoms. Emotional self-awareness was also negatively associated with Area Under the curve during LEGO construction, suggesting that self-awareness may well be a protective factor for females from long duration physiological activations. Finally, reflecting a similar pattern as males, distraction strategies were related to strong negative emotion expressions.

The final analysis of this section sought to reveal any interactions between gender and classroom behavioural problems. A two-way ANOVA was conducted to examine the effect of gender and SDQ problems across the key measures under investigation but no significant main interaction effects were found.

4.5 RQ4: To what extent does the analysis of individual cases enhance the understanding of participants' emotion regulation tendencies?

The aim of this section is to enrich the understanding of the behavioural profile for each of the four groups described in section 4.2.7 by including detailed descriptions of the interactional exchanges observed between participants during the two LEGO construction tasks. Eight cases were selected for in-depth analysis and thick descriptions of participant interactions and their corresponding behaviours are included below.

4.5.1 Identification of eight cases

Two cases were selected from each of the *Adaptive, Maladaptive, Reactive* and *Distracted* groups. The cases were identified from the table of Cluster coefficients in Appendix 4.1. The male and female participants closest to the cluster centroid were selected for each group, with the exception of the *Distracted* group for which, due to difficulties with the audio, the second most central female was selected. The two LEGO construction tasks were the focus of the present analysis. Table 4.28 provides background data for all eight cases. All names have been anonymised.

4.5.2 Individual scores

Table 4.28 provides the scores for the eight participants across all background, questionnaire, behavioural observations and physiological measures. As the duration of the recorded sessions varied considerably (ranging from 15 – 40 minutes), rates of behavioural observations were calculated for each case (as explained in section 4.1).

Table 4.28: Background data, task outcomes and scores across all measures for eight cases

		Adaptive		Maladaptive		Reactive		Distracted	
Background	**Participant**	**Ibrahim**	**Yolanda**	**Ryan**	**Caitlin**	**Monty**	**Carly**	**Hugo**	**Jasmine**
	School	Berkshire	Hertfordshire	Hertfordshire	Hertfordshire	Cheshire	Berkshire	Cheshire	Cheshire
	Year group	4	4	3	3	4	4	4	3
	Age	9.9	9.3	8.2	8.8	9.3	9.8	9.2	8.6
	Gender	Male	Female	Male	Female	Male	Female	Male	Female
	FSM	No	No	Yes	No	No	No	No	No
	SEN	None	None	None	None	None	None	None	None
	Task 1	15m, 50s	15m, 36s	18m, 52s	18m, 52s	Incomplete	Incomplete	17m, 7s	Incomplete
	Task 2	Won	Lost	Lost	Won	Lost	Lost	Lost	Lost
ERICA	**Emotional Control**	25	29	15	23	19	20	24	28
	Emotion Self-Awareness	21	21	20	20	16	18	18	18
	Situation Responsiveness	19	20	17	18	17	15	17	19
	ERICA total	65	70	52	61	52	53	59	65
SDQ	**Prosocial**	7	10	6	4	7	7	8	6
	Emotional problems	0	0	3	0	2	0	0	0
	Conduct problems	0	0	1	3	2	0	0	0
	Hyperactivity/Inattention	2	0	5	3	0	3	1	1
	Peer problems	2	2	0	2	4	0	1	1
	SDQ Total	4	2	9	8	8	3	2	2
ER during LEGO construction	**NE_Mild**	0.17	0.11	0.57	0.49	0.25	0.39	0.15	0.27
	NE_Strong	0.00	0.11	0.08	0.04	0.00	0.04	0.05	0.05
	PE_Mild	0.22	0.50	0.16	0.86	0.20	0.47	0.73	0.22
	PE_Strong	0.67	0.50	0.08	0.16	0.05	0.27	0.48	0.11
	Positive PS	6.71	5.34	3.61	4.19	4.47	5.41	5.13	4.22
	Neg ER	0.17	0.33	0.33	1.89	1.72	1.18	0.29	0.33
	Distraction (Beh)	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.08
	Distraction (Cog)	0.00	0.06	0.21	0.00	0.15	0.00	0.53	0.55
	PEminusNE	0.72	0.78	-0.41	0.00	0.00	0.31	1.01	0.01
Electrodermal activity (EDA)	**PPM T1**	0.16	0.24	0.29	0.21	0.19	0.05	0.26	0.26
	PPM T2	0.21	0.24	0.27	0.24	0.00	0.00	0.30	0.00
	AMP T1	-0.24	-0.57	-0.37	0.41	-0.10	0.83	-1.12	-0.33
	AMP T2	-0.72	-1.22	-0.48	0.31	0.00	0.00	-1.99	0.00
	AUC T1	-364.40	-632.90	-512.20	1129.00	-1118.00	-535.10	-1148.00	-2775.00
	AUC T2	-132.80	-217.00	-108.80	131.20	-388.00	-79.27	-389.70	-251.60

FSM: Free school meals; **SEN**: Special educational Need; **Task 1**: Duration to complete construction of selected LEGO model; **Task 2:** The winner built the tallest tower; **PPM:** Peaks per minute; **AMP:** Amplitude; **AUC:** Area under the curve.

4.5.3 Identifying behaviours within the Adaptive group

As described in section 4.2.7.1, the Adaptive group showed greater confidence in their ability to self-regulate their emotion. They were able to control their emotions in response to challenge and in a way that was appropriate to the context. They were sensitive to other people's feelings and were socially competent in the classroom. Individuals within this group frequently demonstrated strong positive emotion and were skilled at initiating and

responding with positive ER strategies conducive to problem solving. The two cases selected here to exemplify these behaviours are Ibrahim and Yolanda. As can be seen in Table 4.28, total ERICA scores for both cases are greater than the other six cases in this sub-sample. Demonstrated in their positive scores for the computed PEminusNE variable, both cases consistently expressed more positive than negative emotion. Ibrahim was observed to use more Positive Problem Solving strategies than any other case in this group. The following excerpts exemplify some of the above-mentioned behaviours illustrating the interactive dynamics during the LEGO construction tasks.

Table 4.29: Ibrahim- an example of positive problem solving ER responses in Task 1 (0.43 – 0.49)

Turn	Dialogue (I: Ibrahim / P: Partner)	Code
1	P: Wait! We haven't finish that bit (points to picture in manual)	PosPS
2	P: Oh yeah we have	PosPS
3	I: (looks down at the manual and smiles) Yeah	MildPE
4	I: Then put it on the sides (points at the picture in the manual)	PosPS
5	I: Here (points to show where to place the piece on the model)	PosPS
6	P: 'Like that?' (holds up the LEGO model for I to see)	PosPS
7	I: 'No, not like that. Like this. Here.' (places the LEGO piece in position on the model)	PosPS
8	I: Like that, I think	PosPS
9	P: Oh, yeah, yeh (fixes the piece in place)	PosPS
10	I: (picks up a piece and passes it to P) Then do it the other side as well	PosPS
11	P: (fixes the piece in place) Next (looks at the manual)	PosPS

PosPs: Positive Problem Solving ER, **PE:** Positive Emotion Expression

4.5.3.1 Ibrahim

Table 4.29 presents an excerpt of dialogue sustained between Ibrahim and his partner during the LEGO construction Task 1 (for a detailed description of Task 1, see section 3.8.1.4). For the purposes of this discussion, each conversational turn is numbered in the first column. The dialogue and behavioural descriptions (in brackets) are presented in the central column of the table and codes are assigned in the third column (for full coding scheme see Table 3.4). In this excerpt, Ibrahim was in the role of the engineer. The LEGO manual was open on the table in front of him. He has just passed a piece of LEGO to his partner. Ibrahim's partner (P) is in the role of the constructor and is building the LEGO helicopter model piece by piece. He is holding a piece of LEGO in his hand.

The exchange described in Table 4.29 took place within the first minutes of Task 1. The pair had just begun to build. The excerpt illustrates how well Ibrahim was guiding the constructor, taking care to provide detailed, helpful instructions combined with pointing gestures to support his partner in the goal of model construction. In turn 6, his partner appeals for support and Ibrahim responds sensitively, acknowledging and redirecting his partner by placing the piece in the correct space on the model (turn 7). He seems careful not to take over the role of constructor and to allow his partner to continue building. Ibrahim provides detailed, frequent positive instructions and feedback, although at times he also demonstrates his own uncertainty (turn 8: "*Like that, I think*"). This may have served to support a feeling of joint collaboration between the construction partners.

Table 4.30: Ibrahim- an example of positive emotion expression in Task 1 (4.34 – 4.48)

Turn	Dialogue (I: Ibrahim / P: Partner)	Code
1	I: Then you have to start building this (points to next page)	PosPS
2	P: No, here! (points to previous page)	MildNE
3	P: Look, slow down! (shakes his hand from side to side)	StrongNE PosPS
4	I: (takes a closer look at the manual) (smiles) Oh yeah (laughs)	MildPE PosPS StrongPE
5	I: (looks back at the manual, picks up the next piece of LEGO, passes it to P and smiles)	PosPS MildPE
6	P: Next page	PosPS

PosPs: Positive Problem Solving ER, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression

The next two excerpts illustrate Ibrahim's tendency to express positive emotion. Table 4.30 describes a brief exchange, in which a moment of emotional tension has arisen between the pair during their collaboration (Task 1). The pair are working quickly through the steps of the LEGO instruction manual to build the model. In turn 2, P appeals for Ibrahim to slow down: '*look, slow down!*' with an accompanying sudden hand gesture. P appears frustrated. Ibrahim's initial response to this is to smile, he then acknowledges P's frustration with his response "*oh yeah,*" and then he laughs. He continues to smile as he provides the next piece of LEGO to his partner. In this moment of tension, Ibrahim acknowledges P's negative emotion and laughs at his own mistake (turn 4). In

this way he skilfully neutralises P's negative emotional response. P immediately confirms he is ready to move on to the next step (turn 6).

Table 4.31: Ibrahim- an example of positive emotion expression in Task 2 (16:43-18.04)

Turn	Dialogue (I: Ibrahim / P: Partner / R: Researcher)	Code
1	P: I'm thrashing you	NegUR
2	I: (continues building, smiles)	MildPE
3	I: (Ibrahim's LEGO tower suddenly falls and breaks) (smiles)	MildPE
4	P: Ahh!	MildNE
5	I: (smiles)	MildPE
6	P: Ahh!	MildNE
7	P: Mah-ah (he catches his tower as it topples)	MildNE
8	P: (drops several pieces) Oh-o	MildNE
9	P: keep still	PosPS
10	P: (drops several pieces) Oh-o	MildNE
11	I: (continues building, smiles)	MildPE
12	I: (drops a piece)	
13	P: (notices Ibrahim's tower is taller than his) what the…	
14	I: (laughs)	StrongPE
15	R: (timer goes off) There you go, time's up!	
16	P: wow, you thrashed me	
17	I: (smiles, laughs, looks up at the researcher, then looks down)	StrongPE
18	R: well done!	
19	I: (gestures at the height of his tower)…made a huge one (laughs)	StrongPE

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression

The excerpt described in Table 4.31 provides another example of Ibrahim's positive emotion expression. In this second task, the children are competing to build the tallest LEGO tower (see section 3.8.1.4 for full description). Initially, P builds more rapidly but experiences some difficulties and although it is a close competition, at the end it is Ibrahim who wins.

In turn 1, P points out that Ibrahim is losing: '*I'm thrashing you.'* Although this is a negative statement, Ibrahim's response is to smile and to continue with the task. Soon after he faces a frustrating moment as the tower that he is building suddenly falls over and breaks (turn 3). Once again, his response is to smile. In contrast, P verbalises his negative emotions with several exhalations and short utterances of frustration (turns 4, 6, 7, 10 and 13). At the end of the task, Ibrahim seems to enjoy his victory, expressed through smiles and laughter.

4.5.3.2 Yolanda

Yolanda initially appears to be less confident at the building task than her partner (P) who works rapidly (demonstrated in the time it takes the pair to complete the model; refer to Table 4.28). Yolanda works methodically but doesn't always keep up with her partner's pace, and at times he attempts to rush her, often by taking over the task of construction. In excerpt 4.32 a mistake has been identified with construction and the pair spend time trying to understand what has gone wrong. Yolanda identified their error and they go back to fix it which involves removing a number of LEGO pieces and adding in parts they missed. P has been unable to remove a small piece and in turn 1 he asks if Yolanda can do it. She is unable to remove it easily either but realises that if she deconstructs part of the model, the piece will be more easily accessible (turn 6). Sensitive to the time pressure they are under, P seems more keen to continue building than fix the problem and he tells her it "*doesn't matter*" (turn 7). This interaction is accompanied by an expression of mild negative emotion (a shake of the head). Yolanda perseveres with the sub-goal of fixing the problem and when she is successful, P congratulates her: "*well done*."

Table 4.32: Yolanda- an example of positive problem solving under peer pressure in Task 1 (10.18 – 10.35)

Turn	Dialogue (Y: Yolanda / P: Partner)	Code
1	P: And then, can we take this off? (tries to remove a LEGO piece)	PosPS
2	Y: Yeah	PosPS
3	P: (is unable to remove the piece) Gotta try and take that yellow thing (points) off	PosPS
4	Y: Yeah (tries to remove the same piece)	PosPS
5	P: Done it?	PosPS
6	Y: I think I have to take that bit off (deconstructs some of the build)	PosPS
7	P: Doesn't matter (shakes his head)	MildNE
8	Y: (prises apart the two pieces of LEGO) There	PosPS
9	P: Well done	PosPS

PosPs: Positive Problem Solving ER, **NE:** Negative Emotion Expression

The excerpt in Table 4.33 demonstrates Yolanda's tendency to use positive emotion regulation strategies in the face of the negative emotional responses of her construction partner. In this excerpt P has three separate moments of negative emotion expression during the LEGO construction challenge (turns 4, 13 and 24). In turn 4, P bangs his fist on the table. Yolanda acknowledges his frustration "*that's confusing,*" and turns to the manual to figure out the problem.

She identifies the mistake they have made, points it out in both the manual and on the model they have built and then gives clear instructions to rectify the problem "we need to add one more blue!" which is accompanied by positive emotion. Yolanda's positive problem solving responses are repeated in response the negative emotion P expresses in turn 13 and 24, each time looking to the manual for guidance and then providing directions for her partner.

Table 4.33: Yolanda- an example of positive problem solving under peer pressure in Task 1 (10.49 – 12.01)

Turn	Dialogue (Y: Yolanda/ P: Partner / R: Researcher)	Code
1	P: Ok, have we done this bit? (points)	PosPS
2	Y: Yeah. We've done that bit	PosPS
3	P: (turns the page) So now we're onto fourteen, fifteen (takes the model and passes Y the manual)	PosPS
4	P: Ok, so. We need to (bangs a piece of LEGO on the table) mwah!	StrongNE
5	Y: That's confusing	MildNE
6	P: Mmm, that is very confusing	MildNE
7	Y: (counts the number of blocks shown in the manual)	PosPS
8	Y: Oh we need to (counts the blocks on their model), one, two…	PosPS
9	P: Yeah fine	PosPS
10	Y: (sits up) We need to add one more blue!	StrongPE PosPS
11	P: Ok (removes a piece), oh I took that off handily, and very quickly	PosPS
12	P: Ok, so we need to work out how to do that	PosPS
13	P: Oh! Ha ha (searches for a LEGO piece on the table), woh, yeah that is confusing!	StrongPE StrongNE
14	Y: Confusing (smiles) (studies the manual)	MildPE
15	P: Hmmm (looks around)	MildNE
16	Y: (sharp intake of breath) We need to put another layer on top	StrongPE PosPS
17	P: Do we? (looks at the manual)	PosPS
18	Y: Like that (points at the manual) but smaller	PosPS
19	Y: (looks again at the manual), Yeah, three…stuff…	PosPS
20	P: But we haven't got any threes	PosPS
21	Y: Erm, no we need to put three like that (points at the manual)	PosPS
22	P: Oh! There's a four there!	StrongPE
23	Y: Four	PosPE
24	P: So…huh (shoulders drop, sits down)	MildNE
25	Y: It needs to be smaller. So like (demonstrates where to place the piece on the roof of the model), that one	PosPS
26	P: I think that, there (stands up) yep	PosPS
27	P: That definitely goes there, well done	PosPS
28	Y: then two more	PosPS

PosPs: Positive Problem Solving ER, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression

4.5.4 Identifying behaviours within the Maladaptive group

As described in section 4.2.7.2, the Maladaptive group had a tendency to employ negative, unhelpful ER strategies during LEGO construction. They had low self-confidence in their own emotion regulation abilities, few prosocial behaviours and were likely to display emotion and behavioural problems in class. This group

were generally emotionally un-expressive but when emotion was expressed, it was likely to be in a negative direction. The two cases selected here to exemplify these behaviours are Ryan and Caitlin. As can be seen in Table 4.28, Prosocial scores for this pair are the lowest of the eight. Caitlin used more Negative ER strategies and Ryan expressed more negative emotion during the tasks than any other case within this sub-sample. The excerpts of dialogue between the two participants (Tables 4.34 to 4.37) exemplify some of these behaviours.

Table 4.34: Ryan- an example of negative emotion expression in Task 1 (9.56-11.08)

Turn	Dialogue (R: Ryan/ P: Partner)	Code
1	P: Turn it around.	PosPS
2	P: Turn it around.	PosPS
3	P: Turn the whole thing around (turning gesture with her finger)	PosPS
4	R: (turns the model)	
5	P: No. No, the, upside down (gestures) turn around	PosPS
6	R: (drops model on the table and a piece falls off) Oh no! (tries to reattach the piece)	MildNE
7	P: (leans in and takes hold of it with both her hands)	NegUR
8	P: Just stick it on there (takes the model in both hands pulls it towards herself)	PosPS NegUR
9	R: Charlotte! It broke!	StrongNE
10	R: Keeps on breaking!	StrongNE
11	P: Ok so turn it like that, put that there and that there (pushes model back towards R)	PosPS
12	P: Ok?	PosPS
13	R: Yep (picks up the model)	PosPS
14	R: Oh Charlotte! The thing's fell off.	StrongNE
15	P: Put it back on!	PosPS
16	R: I can't find it!	StrongNE
17	P: Yep. What you can't find? This?	PosPS
18	R: No Charlotte, look! (picks up a piece)	MildNE
19	P: So this piece (goes to attach a piece)	
20	R: Charlotte, no don't put it on yet, look. That's not the right bit.	PosPS
21	P: Yes it is	
22	R: No it isn't. This is. You've got to take this off (demonstrates)	PosPS
23	P: No, look. Wait, look (points at the manual)	PosPS
24	P: (he looks at the manual) Achhhh!	MildNE
25	P: See?	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **NE:** Negative Emotion Expression

4.5.4.1 Ryan

Ryan is in the role of constructor. His partner (P), the 'engineer' is holding the manual and providing him with the LEGO pieces and directions. Ryan seems easily disappointed when things go wrong with the construction task. Throughout the tasks, he frequently expressed negative emotion and did not

often activate many positive strategies to ensure partner collaboration in support of their construction goal. An excerpt of these behaviours is described in Table 4.34. In turn 6, he has dropped the model onto the table and expresses disappointment: '*Oh no*!' His partner then leans in and forcibly removes the model from his hands, pushing Ryan's hand away. This behaviour was coded as Negative Unhelpful Response as it demonstrates a desire to dominate the construction process whilst assigned to the role of engineer. Ryan's response (turn 9) is to cry out: '*Charlotte! It broke!*' He continued to verbalise this frustration in turn 10 but takes no positive steps to redirect her behaviour towards the roles they were initially assigned. In turns 20 a disagreement arises between the pair, Ryan is initially not prepared to acknowledge his partner's redirection and he disagrees with her until she eventually shows him the mistake in the instruction manual. Once he sees this (turn 24), he expressed his frustration: '*Achhh!*' By the end of this task, Ryan's participation is minimal and his partner is dominating both the role of engineer and constructor.

Table 4.35: Ryan- an example of negative emotion expression in Task 2 (20.57 – 22.58)

Turn	Dialogue (R: Ryan/ P: Partner)	
1	P: Ha ha ha ha (building tower)	StrongPE
2	P: (drops a LEGO piece) Aaah!	StrongNE
3	R: (searches for a LEGO piece) Oh no, I lost…	MildNE
4	P: I took pieces that are already together (laughs)	StrongPE
5	R: I'm trying to beat…oh man!	PosPS MildNE
6	P: I'm going to give the tower a little ladder. Ah, maybe not	PosPS
7	R: Mine keeps falling apart!	StrongNE
8	P: Press hard!	PosPS
9	P: Ooo, Orange!	MildPE
10	P: I'm gonna beat you.	NegUR
11	P: Erm, Ryan, Look how high mine is? I'm gonna beat you.	NegUR
12	R: It's hard because my pieces won't stick together	StrongNE
13	P: Press hard! It's because I'm taking the small pieces and your taking the big pieces	PosPS
14	R: Ahh! Can't stick it on	StrongNE
15	P: It's hard.	PosPS
16	R: Oh, I can't find the pieces I need	StrongNE
17	R: I don't want mine to fall down so that's why I'm doing it kind've slowly and shaking.	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression

The excerpt described in Table 4.35 illustrates Ryan's negativity during the second LEGO construction task. He is competing against his partner to build the tallest tower. His commentary, during the challenge, is characterised by negative

emotion expression (turns 3, 5, 7, 12, 14, 16). In contrast, his partner tries to encourage him to '*Press hard'* (turns 8 and 13) and she also empathises with the difficulties he is experiencing: *'It's hard.'* At the end of this task, Ryan loses to his partner who has built the tallest tower.

4.5.4.2 Caitlin

In the excerpts described in Tables 4.36 and 4.37, Caitlin has taken on the role of 'engineer' whist her partner is the model 'constructor.' However, as the duration of the task extends, she begins to take control of the construction task whilst also managing the instruction manual. In this way, she makes it difficult for her partner to participate. The events described in Table 4.36 are the initial moments where Caitlin begins to dominate the construction task.

Table 4.36: Caitlin- an example of negative unhelpful responding in Task 1 (7.13 – 8.03)

Turn	Dialogue (C: Caitlin/ P: Partner)	Code
1	C: Yeah, there	PosPS
2	C: And that goes on top (places piece in correct position but doesn't fix in place)	PosPS
3	P: (building) Where does it go on top? It won't fit on top	PosPS
4	C: (takes the model and the LEGO piece from him and fixes it in place) (smiles)	NegUR MildPE
5	P: Oh there (takes hold of the model)	PosPS
6	C: That (holds up the LEGO piece) goes there (takes hold of the model and fixes it in place) (smiles)	PosPS NegUR MildPE
7	C: Kind of (removes a piece) oh, it's that piece (fixes another piece in place)	NegUR
8	C: Laughs (holds hands up)	MildPE
9	C: Okay, the next one is the one, this one (shakes a piece that rattles)	NegUR
10	P: Is it open?	PosPS
11	C: Yeah. No. Oh yeah, it's supposed to be open (takes the model from Ps hands and fixes the piece in place)	NegUR
12	P: Do you want me to do it?	PosPS
13	C: Let's first keep them closed (puts the model down and turns back to the manual)	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **PE**: Positive Emotion Expression, **NE:** Negative Emotion Expression

It begins with her giving clear instructions to her partner, demonstrating (in turn 2) where to place the piece. In this example, she allows him to fix it in the correct place. P asks for clarification in turn 3, at which cue she picks the model up off the table, takes the LEGO piece out of his hands and fixes it in place. In turn 6, she gives verbal instructions for where to put the next LEGO piece, but instead of explaining to P where to put it, she fixed it in place herself: '*That, goes there*.' From this point on, many more observations of this Negative Unhelpful Response

behaviour for Caitlin were coded (e.g. turns 7 and 11). In turn 12 her partner appeals for her to allow him to continue with the construction task: '*Do you want me to do it?*' and in turn 13 she responds by putting the model back down on the table in front of him and returns to her role as engineer. Despite this momentary generosity, this tendency to control the construction task continues, despite her partner's requests that she modify her behaviour to allow his participation.

Table 4.37: Caitlin- an example of negative unhelpful responding in Task 1 (17.03-18.09)

Turn	Dialogue (C: Caitlin/ P: Partner)	Code
1	C: This has to go on there (fixes a piece in place)	NegUR
2	C: That goes over there (fixes another piece in place)	NegUR
3	C: (checks the manual) Ss..yeah,...yup (turns the page)	PosPS
4	C: Propeller (looks around the table for the part)	PosPS
5	P: The..	
6	C: This (picks up the piece)	PosPS
7	P: We need that 'cos (reaches out to take the part from her hand)	NegUR
8	P: No come on, let me do it. I can do this.	PosPS
9	C: Err, we need these thingies (picks up two pieces)	PosPS
10	C: Put them on there (passes them to P). Good.	PosPS
11	P: (holding the pieces in front of him) What shall I do now?	PosPS
12	C: No (takes them out of his hands and places them in front of her)	NegUR
13	C: Ah! (drops a piece), Uh oh.	StrongNE
14	P: (to researcher) How long do we have left?	DisCog
15	C: At least we get to play with Lego!	PosPS
16	C: There (continues building)	NegUR
17	C: Now we add these to here (picks up two pieces)	PosPS
18	P: To each other?	PosPS
19	P: Caitlin, let me add one? (reaches out to take a piece from her hands)	PosPS
20	P: I'll add these ones	PosPS
21	C: She places the model on the table in front of him	PosPS
22	C: Then you add this, right middle top (picks up a piece, leans over and fixes it in place)	NegUR

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **NE:** Negative Emotion Expression, **DisCog:** Cognitive Distraction ER

Table 4.37 provides a further description of Caitlin's tendency to dominate the task. In this example, Caitlin is sitting down with both the manual and the LEGO model on the table in front of her, which is near to completion. She is constructing the LEGO model piece by piece, whilst her partner stands by her side watching her work. In turn 5, her partner seems to hesitate: '*The…*' Then in turn 7 he steps in, initially removing the piece from her hand and then (turn 8) he makes a strong appeal: '*No, come on, let me do it? I can do this.*' She doesn't immediately respond, but in turn 10 she places the LEGO pieces in front of her partner, inviting him to participate in the construction. In turn 11 he asks for clarification: '*What shall I do now?*' Her response is to take back control of the construction task. She removes

the pieces from his hand and once again, places them in front of her. At this point, her partner turns to the researcher to ask '*How long do we have left?*' It seems he has had enough. He makes one more appeal to her in turn 19: '*Caitlin, let me add one*?' which she responds to by once again placing the model on the table in front of him. Such controlling behaviours, exemplified by Caitlin, are frequently observed within Maladaptive group members during the collaborative LEGO construction Task 1.

4.5.5 Identifying behaviours within the Reactive group

Described in section 4.2.7.3, the behavioural profile that characterises Reactive group members was based on the distinct physiological patterns of its members recorded during the LEGO task rather than any overt behavioural tendencies that could be easily identified during observations and qualitatively described. Nevertheless, in addition to their shared physiological response patterns, this group was also found to have few prosocial behaviours, low emotionality and they were reported as inattentive/hyperactive in class. In the LEGO construction tasks, Reactive group members frequently employed negative unhelpful or avoidant strategies. The two cases selected here to exemplify these behaviours are Monty and Carly. Both cases had low ERICA scores (Table 4.28) and their combined scores show they employed the most number of Negative ER strategies than any other pair within this sub-sample of eight. The following excerpts attempt to illustrate the presence and absence of some of these behaviours.

4.5.5.1 Monty

As described in Table 4.38, of the eight case studies, Monty had the highest score for Negative ER behaviours, due to his tendency to dominate both the construction and engineering roles during the collaborative Task 1. Examples of such behaviours have already been described in the previous section 4.5.4.2. To avoid repetition, the excerpts presented in Tables 4.38 and 4.39 demonstrate Monty's behavioural responses at two specific moments of challenge. The first moment of challenge is described in Table 4.38.

Table 4.38: Monty- an example of distraction strategies in Task 1 (8.17-9.25)

Turn	Dialogue (M: Monty/ P: Partner / R: Researcher)	Code
1	P: Right, yellows (collects pieces)	PosPS
2	M: Wait	PosPS
3	P: Two of these	NegUR
4	M: Wait, I need another one of them (holds up a yellow piece)	PosPS
5	M: (Looks up towards the video camera, then to the researcher and then back down to the model) Errrm..	DisCog
6	M: (picks up a yellow piece and fixes it in place)	
7	M: Erm (looks around the room)	DisCog
8	M: (to the researcher) We need another one of them (holds up a yellow piece)	PosPS
9	R: You do, you're right. Can you manage without it?	
10	P: Yeah	
11	M: Er, yeah. We can	
12	M: No we can't, we need it.	PosPS
13	P: Nope	PosPS
14	M: Number thirteen (looking at the manual)	PosPS
15	R: Right, put that one on instead (points). Do you think you can figure out what to do?	
16	M: Erm	
17	R: You might have to go a little freestyle.	
18	M: What?	PosPS
19	M: Yep, freestyle	
20	M: Freestyle!	DisCog
21	P: Now blue (picks up a blue piece)	PosPS
22	M: Oh no we do need it, we do need it	PosPS
23	M: Yep, we do need another one of them. Literally.	PosPS
24	M: Need!	StrongNE
25	M: (Taps on the table, looks up and around the room)	DisBeh DisCog
26	R: We don't have one. See how you go.	
27	M: Erh	
28	P: We could see?	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **NE:** Negative Emotion Expression, **DisBeh:** Behavioural Distraction, **DisCog:** Cognitive Distraction

At turn 4, Monty has discovered there is a LEGO piece missing: '*Wait, I need another one of them'* (he holds up a yellow piece). In the next turn (5) he is seen shifting his attention away from the construction task. First he looks up at the video camera, then he looks towards the researcher, after which he begins to verbalise his uncertainty: '*Errrm…*' He repeats this in turn 7, and in turn 8 he appeals to the researcher for support: '*We need another one of them.*' The researcher asks whether he can manage without it and he responds positively: '*Er, yeah, we can.'* However, he changes his mind in turn 12: '*No we can't, we need it.*' The researcher points out an alternative LEGO piece on the table that could be used instead (the substitute piece is a different colour and slightly bigger). His response to this seems accepting at first but in turn 22 he reverts back: '*Oh no we do need it, we need it.*' He emphasises: '*Yep, we do need another one. Literally*' (turn 23), 'Need!' (turn 24). These words are expressed with increasing emphasis

and emotion and immediately after (turn 25) he begins tapping repeatedly on the table and looking around the room.

Table 4.39: Monty- an example of distraction strategies in Task 2 (19.21 – 19.38)

Turn	Dialogue (M: Monty/ P: Partner / R: Researcher)	Code
1	M: Erm…	
2	M: (stands up and repeatedly taps the pile of LEGO on the table)	DisBeh
3	P: Right	PosPS
4	R: You've had one minute, you have one minute left	
5	P: One minute left	PosPS
6	M: (drops a piece), oh, oop	MildNE
7	M: Erm, d, d, d, d, d, d, d, d, d, derrr	DisCog
8	P: I'm just rushing!	MildPE

PosPs: Positive Problem Solving ER, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **DisBeh:** Behavioural Distraction, **DisCog:** Cognitive Distraction

Such distraction or repetitious behaviour can be seen again in the brief excerpt described in Table 4.39. In this second moment of challenge the pair are competing to build the tallest tower in Task 2. Monty is seemingly searching for a particular LEGO piece to add to his tower (turn 2). He has stood up and is repeatedly tapping the LEGO bricks on the table. In Turn 7, he produces a repetitious sound: '*Erm, d, d, d, d, d, d, d, d, d, derrr*.' It seems likely that Monty employs these repetitive behaviours and verbalisations as a means to distract himself from the challenge of the competitive task.

4.5.5.2 Carly

In some contrast to Monty's behaviour, Carly displayed good problem solving strategies throughout the construction task and in general, interacts helpfully with her partner. She is able to challenge her partner at times and appears relaxed when doing so. Carly's behaviour is remarkable for its absence of emotionality during moments of challenge or once a particular challenge has been overcome successfully. In the excerpt described in Table 4.40 Carly is in the role of engineer and her partner is constructing the model. The pair has noticed a problem that arose as a result of the missing LEGO piece.

Table 4.40: Carly- an example of low-emotionality in Task 1 (13.45-14:35)

Turn	Dialogue (C: Carly/ P: Partner)	Code
1	P: Oh, I know why we need the yellow bit!	StrongPE
2	P: Urgent (smiles)	MildPE
3	C: (ignores) (places piece on the model)	NegUR
4	P: Now we do need…no we can't…we're gonna have to see how we do (attempts to fix a piece in place)	PosPS
5	P: Yep We did need that yellow bit, otherwise we can't put that one like that	PosPS
6	C: Why don't we just do this, like that and then…	PosPS
7	P: Ok. Right just put that one on there.	PosPS
8	C: No	PosPS
9	P: No! It's not gonna work	StrongNE
10	P: How did they put it on? (looks back to the manual)	PosPS
11	C: Maybe we might need one more?	PosPS
12	P: Oh!	StrongPE
13	C: 'Cos that one's not even. Is it?	PosPS
14	P: Oh! We forgot to put another blue bit on!	StrongPE
15	C: No that one's fine, that one was fine	PosPS
16	P: Was it?	PosPS
17	C: Yeah. It's just this one	PosPS
18	P: No, this one needs another blue bit now. Ok, right this should work. Yes it does.	PosPS
19	C: Ok. Now we need that bit to go there.	PosPS
20	C: (Sighs)	MildPE

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression

In turn one, P identifies the issue and she appears excited: '*Oh I know why we need the yellow bit*!' She then smiles. There is no verbal or behavioural acknowledgement from Carly who fixes a piece onto the LEGO model. They discuss a possible work-around (turns 4 to 8) but discover this does not solve the construction problem and they are unable to continue to the next stage. In response to this, P expresses her upset: '*No! It's not gonna work.*' Once again, there is no outward emotional response from Carly. In turn 11, Carly discovers the mistake they have made and makes a productive suggestion: '*Maybe we might need one more*.' Her partner responds positively in turns 12 and 14: '*Oh!*' *'Oh! We forgot to put another blue bit on*!' She expresses her excitement during the identification of a solution to the problem. Throughout this excerpt Carly remains outwardly emotionally un-expressive until turn 20 when she sighs. If Carly was experiencing increased emotional or physiological arousal during this challenge, her exhalation at the moment when the solution is identified is the only outward clue.

Throughout the collaborative construction tasks the pair had several difficulties and were unable to complete the task. This must have been frustrating for both participants, but their individual emotional responses were very different. Carly's

emotional reactions were infrequent and usually non-verbal (e.g. turn 3, Table 4.41). By contrast, her partner frequently expressed both negative emotion (when faced with a challenge) and positive emotion (when obstacles were overcome). The contrasting emotional responses between Carly and her partner serve as a useful illustration of the absence of emotionality that was identified as a common behavioural characteristic for members of the Reactive group.

Table 4.41: Carly- an example of non-verbal negative emotion expression in Task 1 (17.43-18:10)

Turn	Dialogue (C: Carly/ P: Partner)	Code
1	C: We need it to go there, but we can't…	PosPS
2	P: Oh, I know a good idea!	StrongPE
3	C: (Body drops, head in hand)	MildNE
4	P: If we put…	
5	C: Why don't we put it like this (stand up to demonstrate)	PosPS
6	P: Just do that, like that	PosPS
7	C: Yeah, just put that on there, and that on there and then (looks back at the manual)	PosPS

PosPs: Positive Problem Solving ER, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **DisBeh:** Behavioural Distraction, **DisCog:** Cognitive Distraction

4.5.6 Identifying behaviours within the Distracted group

The Distracted cluster group displayed high frequencies of cognitive & behavioural distraction. The effect of this behaviour was often that the collaborative LEGO construction task was incomplete, as observed for both pairs in which the two cases participated, described in sections 4.5.6.1 and 4.5.6.2 to follow. As well as a failure to complete the construction task, in each case, the distracted behaviours had an impact on the construction partner. The two cases selected here to exemplify these behaviours are Hugo and Jasmine. As can be seen in Table 4.28, their scores for Cognitive and Behavioural Distraction were greater than all of the other cases in this sub-sample. In the excerpts that follow, examples of distracted behaviours are described as well as a discussion of each partner's response behaviours.

4.5.6.1 Hugo

In the excerpt presented in Table 4.42, Hugo is in the role of engineer. At the beginning of the observation he is focused on the joint construction task,

frequently giving his partner helpful directions. During the second minute (turn 14) Hugo becomes distracted and turns his attention away from the LEGO manual and starts to look around the room. His partner seems aware of his change in attention, she drops the volume of her voice to a whisper: '*Hugo, where do they go?*' This is an effective strategy that immediately re-engages him in the task. Hugo responds by returning his attention to the manual and then directing her appropriately (turn 17): '*On the top*.'

Table 4.42: Hugo- An example of distracted behaviour in Task 1 (1.00 – 1.38)

Turn	Dialogue (H: Hugo/ P: Partner)	Code
1	H: (studying the manual) The four	PosPS
2	P: One of them. Yeah.	PosPS
3	H: Is that in line with the other one? (looking at the manual)	PosPS
4	P: Yeah, it's not on the line	PosPS
5	H: Yes (passes the piece) on that line	PosPS
6	P: On that line then	PosPS
7	H: Yeah, like that	PosPS
8	P: Yeah	PosPS
9	P: Quick next page! (reaches over and turns the page of the manual)	NegUR
10	H: Then it's these two greens	PosPS
11	P: No it's them ones	PosPS
12	H: Yeah	PosPS
13	P: Two greys, we need two blacks	PosPS
14	H: (Stands up, sits down, looks up and around the room)	DisCog
15	P: Wait, two of these	PosPS
16	P: (whispers) Hugo, were do they go?	PosPS
17	H: (Looks back to the manual, points) On the top	PosPS
18	P: Like that?	PosPS
19	H: Yeah	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **DisCog:** Cognitive Distraction

This pattern is again exemplified in Table 4.43. In turn 4, Hugo is observed looking around the room and then to the sensor on his wrist. His partner drops the volume of her voice to a whisper and asks for his advice (turn 5): '*Where's the other two-bit go?*' Hugo doesn't immediately respond so she repeats her request in turn 6: '*Where's the other two?*' She is attempting to re-engage his attention in the task.

In Table 4.43 we begin to see the consequences of Hugo's lack of focus. A mistake has been made with the construction and his partner realises this in turn 9. She uses the whispering voice again to criticise Hugo for being '*dead slow*' (turns 11 and 12). He seems to be aware of this: '*I know.*' In turn 20, she makes a stronger

appeal for his help: '*We're going wrong…please?*' at which point he turns back to the manual and re-engages in the task.

Table 4.43: Hugo- An example of distracted behaviour in Task 1 (3.29-4.24)

Turn	Dialogue (H: Hugo/ P: Partner)	Code
1	H: That one goes at the end (points to the position on the model)	PosPS
2	P: Erm (checks the manual), two of them	PosPS
3	P: Wait, that doesn't go there yet	PosPS
4	H: (looks away and at the piece of LEGO in his hand, looks around the room, then to the sensor on his wrist, turns his wrist forwards and back)	DisCog DisBeh
5	P: (whispers) Where's the other two-bit?	PosPS
6	P: (whispers) Where's the other two?	PosPS
7	H: (looks back to the manual)	
8	P: There's one 'two-er' missing	PosPS
9	P: No wait, done it wrong (laughs)	PosPS
10	H: (Looking away)	DisCog
11	P: (whispers) Hugh you're dead slow	NegUR
12	H: (looking away)	DisCog
13	P: (whispering) You're dead slow	NegUR
14	H: What?	
15	P: (whispers) You're dead slow	NegUR
16	H: I know (smiles)	PosPS MildPE
17	H: (Stands up and looks over to where the researcher is sitting) We're on 3 minutes	DisCog
18	P: Already? (looking at the manual whilst building)	
19	H: (Looks away, smiles)	DisCog
20	P: (whispers) We're going wrong… please	PosPS
21	H: (looks back to the manual)	

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **DisBeh:** Behavioural Distraction, **DisCog:** Cognitive Distraction

It is possible that Hugo disengages from the task as a result of his partner's tendency to dominate the activity. Equally, it is possible that her tendency to take control is a direct consequence of his distracted behaviour, which not only slows down the construction process but may have also contributed to the errors that were made. P often attempts to re-engage Hugo in the construction task using positive strategies such as seeking clarification (turn 18, Table 4.42): '*Like that?*' This suggests that she would prefer to be sharing the goal but perhaps has taken overall control as a result of his distractibility, in order to increase the chances of successful task-completion.

4.5.6.2 Jasmine

Described in the three excerpts that follow, evidence of Distraction can clearly be seen in the case of Jasmine. This partnership experienced several difficulties with the construction task and Jasmine in particular struggled both to provide instructions for her partner and to follow instructions. Her tendency to disengage

from the task almost certainly did not support this process. In Table 4.44 she has encountered a problem with the model-construction. In turns 1 and 3 she appeals to her partner for help by asking her to take over the construction: '*No you do it.*' In turn 4, she is distracted by the timer. Her partner encourages her (turn 6) to continue building the LEGO model '*Come on! Get moving*.' Jasmine repeats her request for help in turn 7: '*Can you do this bit? Can you put them in?*' At this third request her partner takes over the construction process. In this excerpt, lasting just over one minute, distraction behaviours were observed for Jasmine, eight times (turns 4, 11, 12, 14, 18, 20, 22, 24). In turn 5, Jasmine's distracted comment regarding the timer leads to the distraction of her partner: '*Seven minutes*!'

Table 4.44: Jasmine- an example of distracted behaviour in Task 1 (7.36-8.45)

Turn	Dialogue (J: Jasmine / P: Partner / R: Researcher)	Code
1	J: You do that then	PosPS
2	R: Yes why don't you swap?	
3	J: No, you do it	PosPS
4	J: (sharp exhalation, points at the clock) (smiles)	StrongPE DisCog MildPE
5	P: Seven minutes! (laughs)	StrongPE
6	P: Come on! Get moving (smiles)	PosPS MildPE
7	J: Can you do this bit? Can you put them in? (passes the model to P)	PosPS
8	P: Euurr (stands up and take the model from J)	PosPS
9	J: This keeps…this isn't going in? (holding up a LEGO piece)	MildNE
10	P: It will, it will!	PosPS
11	J: (Looking around the room) It'll just break	DisCog NegUR
12	J: (stands up to look at something across the table)	DisBeh
13	P: Wait, unless we…	PosPS
14	J: (looking towards the researcher) Is the timer going up?	DisCog
15	P: Then that has to go in	PosPS
16	J: (Looks back at the model)	
17	P: Look. Yeah, it goes on it.	PosPS
18	J: (Stands up and shifts her chair, looks behind her)	DisCog
19	P: It's probably supposed to be quite wobbly then	
20	J: (looks at the video, then away from the video)	DisCog
21	P: Isn't it?	PosPS
22	J: (looks down to the sensor on her wrist)	DisCog
23	P: Trying to get this thing in	PosPS
24	J: (looking at her wrist, and her fingers as she moves them)	DisBeh
25	J: (looks back at her partner)	
26	P: This isn't going in	PosPS
27	J: (tries to take the model from P)	NegUR
28	P: Wait (pulls away)	PosPS
29	J: (to the researcher) The green bit's not going in	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **PE:** Positive Emotion Expression, **NE:** Negative Emotion Expression, **DisBeh:** Behavioural Distraction, **DisCog:** Cognitive Distraction

This pattern can be observed later on in the construction task (Table 4.45). Jasmine is now in the role of engineer whilst her partner is constructing the LEGO model. In turn 3 she is '*wondering how Numeracy's going.*' This leads to her partner's response '*Oh yeah, we've missed it, Yay*!' Eventually, as illustrated in the excerpt in Table 4.46, her partner becomes frustrated and begins to express her negative feelings (turn 6): '*Wait!*' (exhales). Jasmine is asking the researcher non-relevant questions about the alternative LEGO model (turn 4 and 8). In turn 9, her partner becomes visibly upset '*We've lost an instruction!*' At this externalisation of frustration, Jasmine turns her attention back towards the task (turn 10) and offers support to her partner: '*No, we're on this bit.*'

Table 4.45: Jasmine- An example of distracted behaviour in Task 1(17.25–17.39)

Turn	(Dialogue (J: Jasmine / P: Partner)	Code
1	P: You put that bit in	PosPS
2	J: No that was already there when we got it, so	PosPS
3	J: wonder how Numeracy's going (looking around the room)	DisCog
4	P: Oh yeah, we've missed it	DisCog
5	P: Yey! (laughs)	DisCog

PosPs: Positive Problem Solving ER, **DisCog:** Cognitive Distraction

Table 4.46: Jasmine- the consequences of distracted behaviour in Task 1 (19.05- 19.29)

Turn	Dialogue (J: Jasmine / P: Partner)	Code
1	P: Right, so where does this bit go?	
2	J: (Looking around the room)	DisCog
3	P: (leaving over to see the manual) It goes in there (points) It goes there	PosPS
4	J: (to the researcher) Where did the house go? Where's the house gone?	DisCog
5	R: It's in here	
6	P: Wait! (checks the manual again, fixes the piece in place) (exhales)	PosPS MildNE
7	P: Wait!	PosPS
8	J: (to the researcher) What, do you break it up?	DisCog
9	P: We've lost an instruction! (picks up the manual from P and puts it in front of herself)	StrongNE NegUR
10	J: (turning back to the manual) No we're on this bit (pointing)	PosPS

PosPs: Positive Problem Solving ER, **NegUR:** Negative Unhelpful ER Response, **NE:** Negative Emotion Expression, **DisCog:** Cognitive Distraction

4.5.7 Chapter summary

The aim of this section was to explore the extent to which these eight cases enhance understanding of the behavioural patterns representative of those identified by the Cluster Analysis in section 4.2.7. The analysis of these exemplary cases has not only confirmed these findings but has also provided additional

insight into the behavioural profiles of group members. These observations have shown the following group characteristics:

- *Adaptive*: Ibrahim and Yolanda demonstrated great sensitivity to the emotional experiences of their partners, providing frequent acknowledgement of their emotions and support towards their joint goal of completing the model construction. Yolanda remains focused on this goal despite the pressure that her partner applied. In addition to the many positive regulation strategies they employed during the construction tasks, both cases frequently expressed their positive emotion, even during moments of tension, or in the face of criticism.
- *Maladaptive*: Ryan and Caitlin have both demonstrated an absence of positive problem strategies during the collaborative construction task, their behaviour has revealed a lack of sensitivity to their partner in respect of their joint goal. Ryan's emotionality was generally negative, overtly expressing his disappointment and frustrations as a result of the challenges presented to him from both the task and his partner's controlling behaviour. Caitlin's behaviour demonstrated her difficulty with collaboration and tendencies towards dominating the construction task.
- *Reactive:* Monty demonstrated a tendency to take control of the construction task and in moments of particular challenge he displayed repetitive behaviours and verbal utterances. He also revealed an inflexibility to adapt the task when necessary. In contrast to her partner, Carly revealed little emotionality, or perhaps this could be described as a tendency to control and disguise her emotions. Rather than any shared, observable behavioural characteristic, underlying the complex pattern of behavioural responses demonstrated by these two cases, was the hidden physiological sensitivity that identified these group members as distinct from the other groups.
- *Distracted:* As was clearly seen in the cases of Hugo and Jasmine, distractibility leads to difficulties with task-completion. The problems observed in these examples arose from the slow pace of construction (despite the pressure of time to complete the model) as well as from the number of errors made during the construction process. In both cases,

these difficulties had negative consequences for the construction partner. Negative, frustrated feelings and even criticisms were externalised by their partners towards both Hugo and Jasmine.

This chapter has described the final stage of analysis undertaken in the present study. The analysis described in this thesis began at the overall sample level in which the findings revealed limited evidence of strong linear patterns between the key variables of interest. However, distinct patterns of behaviour were identified using Cluster Analysis. Discriminant Function Analysis revealed the underlying dimensions that distinguish between the four groups. Descriptions of eight individual cases have provided qualitative descriptions and support for the distinct patterns of behaviour that were quantitatively determined, as well as revealing some of the complex individual differences in emotional regulation and response tendencies.

The next chapter presents the discussions of these findings, summarising the main findings of the study in relation to the existing body of research literature; highlighting the contributions of this study and the wider implications for educational practice, as well as acknowledging its limitations and exploring future directions for research in this area.

5 Discussion

5.1 Introduction

The current thesis has presented a framework for better understanding the hidden factors that influence children's emotions and behaviours typically on display in the classroom. Throughout this thesis, children's affective arousal and behavioural responses have been examined as a combined indicator of their emotion regulation tendencies, comprising of physiological reactivity and strategic behaviours during challenging situations. This has proved to be a fruitful methodology for examining the relationship between children's emotion regulation and their classroom behaviour.

The purpose of this chapter is to a) acknowledge the methodological limitations of this research as well as its contributions to the fields of psychology and education, b) summarise and discuss the findings emerging from the present study and c) to discuss the implications of this study for future research and practice.

The chapter is structured into three sections. The first section (5.2) addresses the limitations in terms of the design of the study and analysis of data as well as the unforeseen issues that emerged whilst the study was being conducted. The second section (5.3) summarises the study's main findings in respect of the central research questions under investigation. These findings will be discussed in relation to the existing body of literature on emotion regulation and childhood

emotion and behavioural problems. The third section (5.4) discusses the theoretical, methodological and empirical contributions of this research and the final section (5.5) provides implications of the study for future research and also for education practice. This chapter concludes with a final summary of the thesis.

5.2 Limitations of the study

While this research has produced some interesting and useful findings, it is important to acknowledge the limitations of this enquiry. This section describes a series of limitations in respect of the design of the study and the analysis of data reported in the previous chapter. A number of issues emerged while the study was being carried out, and these are also summarised below.

5.2.1 Limitations of the methodology

Three limitations, related to the methodology selected for this study, will be discussed in this sub-section. The first limitation concerns the difficulties with accurately observing specific regulatory strategies, the second relates to the collapsing of categories based on SDQ scores and the third limitation is regarding the ambulatory device used to measure electrodermal data.

The naturalistic setting of this study presents a tension for the researcher between the ecological requirement to assess behaviours in-situated context and the controlled conditions that can be more carefully manipulated in laboratory settings. For the present study, problems arose with the identification of specific behaviours through observation and coding. The methods employed here did not allow for robust coding of certain regulatory strategies such as cognitive reappraisal and suppression (often internal cognitive processes), without the risk of incorporating a substantial degree of researcher speculation and inference. In an experimental paradigm, participants are usually presented with an emotional stimulus and given instructions to activate a particular strategy (e.g. reappraisal). In the present study, cognitive reappraisal was included within a broader behavioural category of positive problem solving emotion regulation. As previously described, this code included a range of examples of positive, co-operative behaviours. Without alternative measurement techniques outside of

the scope of this thesis, suppression was another strategy that could not be accurately identified from observation. As such, in the current design, the 'absence of emotion expression,' was taken as an indicator of expressive suppression, particularly in circumstances where there was an associated presence of emotional symptoms and physiological reactivity.

A second limitation of this study concerned the nature of the sample in respect of their behavioural problems. Due to the small numbers of children identified with scores in the 'serious' category of SDQ emotional and behavioural problems, these children were combined into one group with children whose total problems scores placed them in the 'borderline' category (e.g. Andreason, Zametkin, Guo, Baldwin, & Cohen, 1994; Happaney et al., 2004). It is likely that a group with higher average scores for emotional and behavioural difficulties would have produced different patterns of regulatory behaviours. However, given the numbers of children with serious Total Problems in the present study, the smaller group lacked the statistical power required for the analysis undertaken. Thus, in order to compare group differences, it was necessary to combine the two groups for analysis.

One more methodological limitation of the present study concerned the Affectiva Q-Sensor ambulatory device. Despite the range of new technologies now available (e.g. Empatica Embrace), the use of ambulatory recording devices in emotion research is still relatively uncommon and concerns have been raised regarding the lower amplitudes recorded on the wrist in relation to the conventional palmar regions. Several studies have started to explore electrodermal activity in locations such as the feet, wrist and ankle and differences have been found in the magnitude of activity in each location (R. Goodman, 1997). This work shows that despite lower amplitudes on the wrist, the EDA signal is still discernable and shows clear skin conductance responses to stimuli. Although finger measurements are traditionally employed in laboratory studies, the naturalistic setting of the present study did not allow for such methodologies to be effectively employed.

As such the data collected and described for the current thesis has demonstrated there are opportunities for ambulatory devices that can detect emotional responsivity in applied settings.

5.2.2 Limitations of the analysis

This sub-section summarises the limitations in respect of data analysis. The first limitation relates to the reliability of the coding scheme. As previously described, behavioural codes had to be collapsed for analytical purposes as the frequencies of certain codes were limited (e.g. negative avoidance). Grouping related categories was considered an appropriate approximation of the complex behaviours observed in this study. However, combining behaviours reduces the opportunity to identify subtle variations across behaviours and individuals that could provide additional insight into their regulatory profiles.

As previously described, the challenge for each participant in completing the co-operative tasks was, to a greater or lesser extent, influenced by their construction partner. In respect of the construction of the LEGO model, a partner could be a co-operative and helpful contributor or conversely a disruptive and unhelpful antagonist. In studies interested in the nature of the social interaction between individuals, the influence of the partner may be statistically evaluated via round robin procedures which permit the assessment of the effects of dyadic relationships.

Each day in school, children are required to engage in socially challenging situations to achieve a particular goal. In the present study, the co-operative challenge was included in the design as a context-appropriate method in which to provoke social challenge and emotional arousal within each participant. This study was interested in the emotional response tendencies of the individual and since the dyadic relationship was not the central focus of enquiry, it was decided not to apply these additional statistical analyses of dyadic-data.

Another potential limitation of the analysis employed in this study was the use of multiple comparisons. It is understood that when conducting multiple comparisons, the chances of finding a significant result considerably increases (Type I error). However, if a test is too conservative, it is likely to lack statistical power and the probability of a Type II error will increase. One way to control the Type I error is to perform a multiple comparison procedure which also minimises the substantial loss in power. Bonferroni and Tukey tests both control the Type I error rate very well but are both conservative tests.

For the correlational analyses previously described, Bonferroni correction would have reduced the statistical significance level to alpha/n, with alpha = 0.05 and n = the number of variables tested (Miller, 1966). For the present study, significant *P* values would have been reduced to 0.002. Few of the correlations in this study achieved such a low significance value and the concern, in taking such steps to avoiding false positives, was that important inter-variable relationships would be overlooked. As such, it was decided not to use this method for the preliminary analysis of correlational relationships.

In the subsequent inter-group analysis a more cautious approach was taken. Where group sizes were equal, Tukey's test was selected and in circumstances where group sizes were unequal the Games-Howell procedure was used. It is important to acknowledge that by including these tests we have increased the probability of a Type II error. However, such statistical caution is recommended in order to increase the trustworthiness of these findings.

Finally, the limitations in terms of the observed clusters must be acknowledge in respect of their replicability and generalisation to wider and more diverse samples. It is quite possible that certain patterns of children's emotion regulation profiles were not recognised or identified by the cluster analysis procedure. For example, in the original K-means analysis, six clusters were identified, two of which were excluded from the final solution due to their small sample size. It is possible that these represent outliers within the data, equally they may represent distinct patterns of ER profiles that would become apparent with a larger overall sample size. In order to apply the four clusters to a clinical sample or wider population, replication of this study would need to be considered with a broader sample and with different age groups, ethnic origins and geographic cultures.

5.2.3 Issues emerging during the study

Three unexpected issues arose during the data collection and analysis phases of this research. Firstly, during administration of the child self-report, the wording of item 7 ('*I have angry outbursts*;' see Appendix 3.2) at times required clarification, particularly for the younger participants involved in this study. When this question arose, the researcher explained the meaning of 'outburst' as: '*a sudden bursting out or explosion of angry feelings.'* This same question arose

several times in different schools. Given this, it seems a minor modification is required to this instrument for future research with children of this age range. In the present study, given the correspondence of self-report data with teacher-reports (for example, children rated as prosocial by their teachers scored highly on emotion regulation self-report) it was felt that this issue was resolved during the data collection process and had a limited impact on the overall findings.

The second issue that arose during data collection was as a result of the weather. All data collection took place during June or July, i.e. in mild or warm temperatures. However, in one school, the temperatures over the three days of data collection were consistently around 30 degrees centigrade, approximately 5 or 6 degrees higher than they had been in the other schools where conditions were cooler. It is unclear what impact this might have had on the electrodermal data, although some researchers have found interaction effects with season in relation to gender, suggesting that females may be more responsive to environmental conditions than males (van Dooren & Janssen, 2012). This concern was addressed through the analytical process previously described in which a baseline was calculated for each participant and subtracted in order to average-out any differences.

The remaining issue that arose was during data analysis. Given the prevalence of reported inattention and hyperactivity symptoms in this sample, it was felt that a measure that more accurately identifies the different subtypes of attention/hyperactivity would have been of benefit to the analysis and findings. One reported weakness of the SDQ is that whilst it is a good screener for the combined symptoms of inattention and hyperactivity, it lacks the sensitivity to identify subtypes (Venables & Mitchell, 1996). Given the wide range of inattention/hyperactivity scores across children in all four cluster profiles, it would be beneficial to compare ER behaviours with subgroups of either inattentive behaviour, hyperactive behaviour or a combination. To achieve this sub-grouping, a more sensitive screening measure would have been necessary.

Despite the limitations described above, a number of relevant findings have been revealed from the present research enquiry and these are discussed in the next section.

5.3 Summary and discussion of findings

The following section reviews the main findings emerging from the study with reference to relevant research from prior research. Four main sets of findings have emerged from the current thesis. Firstly, it was found that children's behavioural and affective responses could be meaningfully assessed during two challenging collaborative and competitive tasks and these patterns of responding could be grouped into four distinct behavioural profiles. These general patterns of classroom behaviour, emotional reactivity and regulation are discussed in section 5.3.1, together with an in-depth examination of the four subgroups revealed through Cluster Analysis. Section 5.3.2 describes how children's behavioural and affective response patterns could be meaningfully related to measures of classroom emotional and behavioural difficulties. The third section (5.3.3) considers individual differences in respect of gender and the fourth and final section (5.3.4) considers the contribution of the case studies to these findings, for understanding the complex nature of individual behaviours.

Previous research has suggested that children's emotion regulation tendencies are best described in terms of complex patterns of behaviour involving combinations of emotion reactivity and strategy employment. The first main aim of the present study was to investigate patterns of emotion reactivity and regulation amongst Primary school-aged children on two LEGO construction tasks and compare these observed behaviours with general emotion and behavioural tendencies as reported by the child participant and their teacher. The children's physiological and behavioural responses were analysed according to the schedule derived from the literature and previously described. In an attempt to identify patterns within the children's responses, correlations between questionnaire items, observations and physiological data were examined. The correlations were predominantly positive and in the middle range, revealing a number of inter-relations both within- and between- measures. The first to be discussed here are the correspondences between child self-reports of emotion regulation tendencies and teacher-reports of child behaviour in class. Although important, this point does not address the research questions previously listed and as such, will be discussed first.

Perspectives on the value of self-report in emotion research diverge with some authors suggesting self-reports provide useful corroboration of converging measures (Ullebo, Posserud, Heiervang, Gillberg, & Obel, 2011), such as those employed in the present study. Others (e.g. Durbin, 2010), assert that self-reports of strategy-use may not correspond to actual student behaviour. The findings in the present thesis reveal overall levels of agreement between child and teacher reports with higher ERICA total scores correlating significantly with lower SDQ total problems scores. Of all three self-report subscales, children reported the highest levels of emotional control, which includes items that reflect the reporter's ability to manage negative emotion or inappropriate emotional displays according to the context (e.g. Veenman, 2011). Emotional control was positively associated to classroom prosocial behaviour and negatively related to all four classroom problem behaviours (Emotional, Conduct, Inattention/Hyperactivity and Peer problems), supporting the theoretical understanding from past literature that points to emotional control as being central to the adaptive regulation of ones behaviour according to context. One further significant inter-correlation between the two questionnaire measures was the negative relationship identified between children's emotional self-awareness and emotional symptoms observed by their teachers. This finding is in line with available empirical evidence proposing that emotional self-awareness is negatively related to emotional symptoms (MacDermott et al., 2010) and supports the documented theoretical understanding of the importance of emotional self-awareness competency for social and emotional well-being (J. Zeman et al., 2002).

No significant associations were found between the ERICA Situation Responsiveness subscale and the SDQ. Of the three ERICA subscales, children reported the lowest scores for Situation Responsiveness that reflects items of social understanding and social sensitivity (e.g. J. Zeman et al., 2006). Given the socially orientated nature of these items, it would have been reasonable to expect a positive relationship with prosocial behaviour but no such significant association was found in the present study. In relation to the two other subscales of the ERICA self-report, the range of scores (reported in Table 4.2) for the

Situation Responsiveness subscale was the smallest. This limitation could explain the absence of significant findings.

In line with prior research (MacDermott et al., 2010) the present study provides converging evidence from child and teacher suggesting that competent emotion regulation is important for the demands required of appropriate social and learning behaviours in school and in doing so, responds to the methodological question previously raised on the value of child self-report measures. Efforts to assess and identify childhood emotion and behavioural difficulties require the use of multiple assessment sources that traditionally have revealed little agreement between adult and child informants (Greenberg et al., 1995; Jacobs & Gross, 2014). As far as this author is aware, no other studies have used the ERICA child self-report inventory in conjunction with the teacher SDQ. The findings from the present study indicate that overall, the teacher's categorisation of emotion and behavioural strengths and difficulties in school context is very much consistent with the children's self-report of their emotion regulation abilities. Whilst neither self- nor teacher-report on its own goes far enough to reveal the specific emotion regulatory response tendencies of children with emotion and behavioural difficulties at school, this finding has utility for future researchers and practitioners interested in identifying children with particular emotion regulation tendencies in relation to their classroom behaviours.

5.3.1 RQ1: What patterns exist in middle childhood between classroom behaviour, emotion reactivity and emotion regulation?

A number of significant relationships were revealed between classroom behaviours, physiological reactivity and the ER strategies observed during the two LEGO construction tasks. As previously described, these correlations were predominantly in the middle range suggesting that the relationships were not straightforwardly linear, and justifying the cluster analysis reported above. This section is separated into two sub-sections. The first (5.3.1.1) summarises and discusses the important correlational findings, at the overall level, in relation to previous research. The second sub-section (5.3.1.2) then discusses in turn, each of the four behavioural profiles revealed by the cluster analysis.

5.3.1.1 Overall correlational relationships between classroom behaviour, emotion reactivity and emotion regulation.

The correlational findings discussed in this section are discussed in turn by: a) classroom emotional and behavioural problems, b) emotion expressivity and c) physiological reactivity. Findings for each are initially described in respect of how they support previous research literature, followed by a discussion and interpretation of any unexpected findings in light of the current research question.

Teachers reported scores on four different classroom behavioural problems, these were: emotional, conduct, inattention/hyperactivity and peer problems. In the current thesis, inattention and hyperactivity was the most common behavioural problem, with more than 14% of the current sample reported as having serious or clinical levels of symptoms. Interestingly, none of these children had received a formal, clinical diagnosis for attention deficit/hyperactivity disorder (ADHD). In line with existing theoretical and clinical understanding of inattention and hyperactivity, the current study found significant correlations between inattention/hyperactivity symptoms and conduct problems and whilst still significant, to a lesser extent with emotional symptoms. These results are in accord with prior research in community samples that found a high degree of symptom overlap between inattention/hyperactivity, disruptive behaviour and anxiety disorders (Kolko & Kazdin, 1993). Corresponding with the work of (Barkley, 2006), the present study also found a significant correlation between inattention/hyperactivity and peer problems, suggesting that children with inattention and hyperactivity symptoms have difficulties in their relationships with their peers.

The present study was interested in the specific strategies employed by children with classroom emotional and behavioural problems. In respect of this goal, one relevant finding was that children with inattention/hyperactivity were more likely to use cognitive distraction ER strategies (e.g. staring out of the window or at an irrelevant distractor). An increased susceptibility to distraction is one of the behavioural diagnostic criteria of ADHD and so for children with high scores for inattention/hyperactivity symptoms in the current study, the frequent or

habitual use of distraction as a strategy to regulate emotions is consistent with clinical expectations.

In respect of the underlying physiological indicators of inattention/hyperactivity, a positive significant association was found with EDA during the competitive LEGO construction task 2. Emotionally speaking there was perhaps more at stake during task 2 due to its competitive nature. As such, it may have required increased attention and behavioural regulation, requiring additional cognitive effort and which may come at a physiological cost for children who struggle to concentrate Walcott and Landau (2004).

No significant relationship was found between inattention/hyperactivity and behavioural distraction ER strategies (e.g. fiddling with an object unrelated to the construction task). This was perhaps due to the low frequency of behavioural distraction events observed during LEGO constructions. However, it is also possible that the reported symptoms for this sample are consistent with the diagnostic description for mental restlessness in attention (Frith & Allen, 1983), rather than the physical restlessness that is attributed to hyperactive behaviours. The diagnostic criteria for the inattentive-type of ADHD include developmentally inappropriate levels of distractibility, poor sustained attention and difficulties organising and finishing activities (Palmer & Finger, 2001). A tendency towards inattention could explain the association with cognitive distraction strategies observed during the LEGO construction tasks, rather than the behavioural distraction strategies that might be expected from children with higher levels of hyperactive symptoms.

In studies assessing the psychometric properties of the Strength and Difficulties Questionnaire the Emotional symptoms subscale is convincingly connected to anxiety and depression in childhood (American Psychiatric Association, 2013) and found to be a reasonably sensitive method for detecting anxiety disorders in both clinical and community samples (R. Goodman, 2001). In the present study, children with high scores for emotional symptoms were observed to frequently employ negative avoidant strategies, indicating a tendency to use avoidant behavioural strategies such as withdrawing from the task or refusing to participate in the LEGO construction collaboration. This corresponds with

previous studies that find experiential avoidance to be a risk factor for anxiety and depression (R. Goodman et al., 2000).

Emotional symptoms were also found to correspond with elevated physiological arousal during the competitive LEGO construction task. In the research literature, experiential avoidance is often related to suppression and previous studies find increased somatic reactivity (as measured by skin conductance) in adults asked to suppress negative emotions in laboratory conditions with authors suggesting that such heightened physiological responding is a result of the simultaneous activation of subcortical emotion centres alongside higher order inhibitory structures (Aldao et al., 2010). This previous research might explain the correspondence between emotional symptoms and elevated EDA in the present study. Namely, that for children with emotional symptoms, regulating their emotions in circumstances where they are under the pressure of time and competing head to head with a peer, leads to significantly increased levels of electrodermal reactivity.

Conduct, or disruptive behaviour scores were the lowest of the four behavioural problems reported in the present study. In addition to the symptom overlap with inattention/hyperactivity reported above, conduct problems were also significantly associated with peer problems. This corresponds with previous findings that show children with conduct problems struggle to respond to social cues or misinterpret social information (Gross, 1998a) making relational difficulties with peers more likely. The significant negative correlation with strong positive emotion expression during LEGO construction provides reinforcement of prior research indicating that children with conduct problems exhibit less positive emotion expression (Crick & Dodge, 1996).

The present study found conduct problems were negatively associated with positive problem solving strategies observed during the two LEGO construction tasks suggesting that children with conduct problems are unlikely to be able to recruit a range of positive ER strategies in situations of challenge or stress and as such, may benefit from support or intervention to develop more adaptive ER strategies.

In contrast to expectation from prior studies (Roy et al., 2013), no significant relationships were found between conduct problems and decreased physiological reactivity in either LEGO task. Given the numbers of children with conduct problems in the present sample, it is possible that the small sample size can explain these results. However, an alternative explanation is suggested from other authors investigating SNS activity in community samples. For example, (e.g. Posthumus et al., 2009) tested the moderating role of cortisol and SNS activity in a non-clinical sample of children with externalising symptoms and found no such relationship and despite the well-established link between externalising behaviour with under-arousal in adults and adolescents, there are inconsistent findings for young children El-Sheikh, Erath, Buckhalt, Granger, and Mize (2008).

There was a wide range of emotional expressivity demonstrated by the children in the present study with significant differences found between three groups of low, medium and high positive emotionality. Reinforcing this was the finding that participants expressing more negative emotion were also more likely to express more positive emotion. Previous studies have suggested that the undisguised emotion expressions of infancy are soon learned to be modulated as even children of pre-school age (Lorber, 2004) are shown as able to regulate emotion according to the rules of the social context. As demonstrated in the current study, in middle childhood some children are more likely to exercise more regulatory control over their expressive emotions than others.

Previous authors have suggested there is an optimal level of emotional expressivity and that both over-regulation and under-regulation of expressivity reflect atypicality in ER (Cole, 1986; Eisenberg, Fabes, Nyman, Bernzweig, & Pinuelas, 1994). Yet this understanding is derived from prior research concerned with the expression (and regulation) of *negative* emotion, in respect of emotion and behavioural disorders, and has traditionally been less interested in understanding the role of *positive* emotions and their impact. The current study was interested in children's expression of both positive and negative emotion and found that strong positive emotion expression was significantly correlated with prosocial behaviour, suggesting that social competence is related to positive emotionality. In line with the finding of Cole (Cole et al., 1996), negative emotional expression was positively related to negative unhelpful strategies,

suggesting that the children employing obstructive and unhelpful ER strategies in a collaborative task are likely to express more negative affect. As has been proposed above, experiential avoidance is often noted as a feature of childhood emotion and behaviour disorder due to its ineffectiveness at reducing negative emotions and physiological arousal in the long term (1994). In the current study, strong negative emotion expression was significantly correlated with negative avoidance ER strategies, supporting previous work that finds experiential avoidance mediates negative emotions, such as distress, that contribute to anxiety disorders (Braet et al., 2014). Strong negative emotion expression was also significantly related to both behavioural and cognitive distraction strategies, indicating a tendency for these children to deploy distraction strategies as a means to decrease unwanted negative emotion (Kashdan et al., 2006). This correlation raises the question, discussed in the literature review above, regarding the timing of activation for attentional deployment strategies. If activated in advance of an elicited emotion, this particular distraction event would be classified as antecedent-focused. If activated later, it would be seen as response-focused and would thus be considered less effective in the down-regulation of negative emotion arousal since the emotional response is already be underway (Op't Eynde et al., 2007). Further enquiry using sensitive temporal methodologies would be required to assess whether the distraction strategies employed in the present paradigm could be classified as antecedent strategies or response-focused and deployed as a means to decrease the negative emotional response already underway.

In respect of emotional expressivity, a final question was raised regarding the significant relationship between strong positive emotion expression and cognitive distraction strategies. This finding is in contrast with the literature from positive psychology and research into emotional well-being which proposes that positive emotions, including high-arousal positive emotions, support attentional focus (Gross, 1998a). One possible explanation for the findings of the current study is that distraction strategies were used by this sample as a means to dampen positive emotion by engaging in activities and thoughts unrelated to the concurrent LEGO construction task (Derryberry & Tucker, 1994; Frijda, 1986a) in order to reach the goal of task completion. Gross and John (Quoidbach, Berry,

Hansenne, & Mikolajczak, 2010) showed that a tendency to suppress positive emotions in such a way is negatively associated with positive emotionality, life satisfaction and psychological well-being.

The remaining findings to be discussed in this sub-section are concerned with participant's physiological reactivity during the two LEGO construction tasks.

Peaks per minute (2003) during the competitive construction task were *negatively* related to age. Conversely, amplitude in both tasks was *positively* related to age. These conflicting results suggest that younger children are more physiologically reactive in respect of amplitude (perhaps indicative of greater levels of effortful control required for younger children) but less reactive in terms of non-specific spontaneous fluctuations (NsSFs). The nature of these results present a picture somewhat consistent with historical literature that shows conflicting results in the analysis of age differences in sympathetic nervous system reactivity of children (also referred to as non-specific spontaneous fluctuations in skin conductance; Boucsein, 2012). Given that no hypotheses regarding age differences were proposed for the current study, no further conclusions are drawn from these paradoxical findings.

As explained previously, the measure of Area under the EDA curve provides an indication of physiological recovery time. A higher AUC score is an indication of slower recovery. In the collaborative task, Area under the curve was negatively related to prosocial behaviour and positively related to both negative emotion expression (mild) and negative unhelpful ER strategies. These combined findings show that children who were slower to recover physiologically to the challenges presented during the collaborative LEGO construction task were less likely to demonstrate prosocial behaviours in the classroom. They were more likely to express mild negative emotionality and also to employ unhelpful emotion regulation strategies during peer-to-peer collaboration activities. In prior studies employing skin conductance measurement methods, slow recovery EDA responding is an indicator of lessened sweat gland activity (e.g. Aiello, Nicosia, & Thompson, 1979; Wenger & Ellington, 1943). In empirical studies, hypo-reactivity is a well-established risk factor in individuals with antisocial behaviour and externalising disorders (or electrodermal hypo-reactivity; Fowles, 1993). This previous work supports the interpretation of the current findings that

indicate slow EDA recovery was present alongside the combined factors of negative emotion expression and unhelpful regulatory behaviours.

As has been discussed, a good number of overall relationships have emerged in the current thesis, largely supporting the findings observed by previous work. To briefly summarise, these were:

- Evidence of overlapping symptoms of inattention/hyperactivity, conduct, emotional and peer problems in school.
- Inattentive/hyperactive children relied upon cognitive distraction strategies to regulate their emotions. Children with emotional symptoms had a tendency to use negative avoidant strategies and those with conduct problems were less likely to express positive emotion or use adaptive problem solving ER strategies.
- A wide range of emotional expressivity can be observed in 7-9 year olds. Prosocial children were more emotionally positive whilst negative emotionality was related to distraction, unhelpful and avoidant emotion regulation.
- In general, physiological reactivity was more likely during the competitive than collaborative task for children with inattention/hyperactivity and emotional problems.
- Children that were slow to recover physiologically, were less prosocial, expressed more negative emotionality and employed unhelpful emotion regulation during collaboration.

These patterns provide validation of the measures employed in the current study. In particular, the correspondence between child self-report of beliefs about emotion regulation with teacher report on classroom emotion and behaviours. Additionally, the physiological methods previously confined to laboratory settings have shown some utility when employed in the naturalistic setting of the classroom, converging with data from screening questionnaires and observations of behaviours displayed during the construction tasks. The pattern of inter-relationships revealed was not straightforwardly linear, suggesting that analysis by clustering was particularly appropriate.

5.3.1.2 Profiling sub-types of classroom behaviour, emotional reactivity and emotion regulation

The cluster analysis produced valuable data in respect of the main aims of this research. To clarify, these were: a) to consider the observable and hidden factors that influence the typical emotional and behavioural responses on display in the classroom, and b) to identify children who may be at risk of developing greater emotional and behavioural difficulties at school, and for whom support and intervention would likely be beneficial. Thus the present study used a person-centred cluster analysis approach to classify children into optimal grouping categories based on common behavioural presentation. The results of the cluster analysis supported the hypothesis that individual differences in the form of subtypes of emotion regulation tendencies would be identified and co-occur with classroom behaviour problems.

Figure 5.1 provides a visualisation of the variables (scores are standardised) that were included in the cluster analysis and is presented here to support the discussion. Nine variables were originally entered into the analysis and are colour coded to distinguish between questionnaire, observation and physiological variables. Data for one variable (Area under the curve) was excluded due to its lack of significant contribution to the analysis.

It is important to acknowledge that caution is required in the interpretation of groups defined by cluster analysis as clustering may be dominated by variables with large values and regardless of the metric used, different cluster analysis methods will form different results. Nevertheless, it was encouraging to find that one of the clusters contained the majority of participants with serious/clinical behavioural problems, thus agreeing closely with the clinical classification as defined by the Strength and Difficulties Questionnaire (J. Zeman et al., 2002).

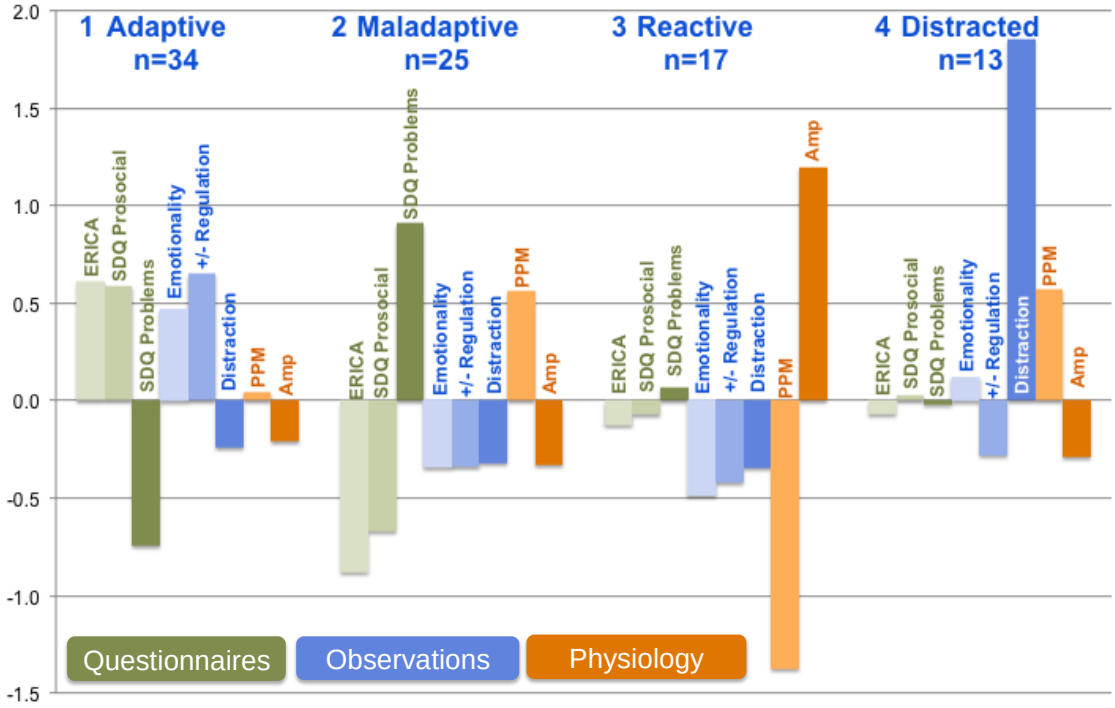

Figure 5.1: Standardised scores across four cluster groups

Cluster 1 (Adaptive) contained children with the highest scores for prosocial classroom behaviours and the lowest scores for emotional and behavioural problems. This group reported high levels of self-confidence in their ability to regulate their emotions. Largely made up of 9-10 year olds, this group had the most children eligible for Free School Meals. As explained previously, FSM is a measure of low parental income (R. Goodman et al., 2000) and is often used as a proxy measure for socio-economic status in social policy and research. The proportion of children in this cluster eligible for FSM is entirely equivalent to the national prevalence of pupils in UK schools entitled to Free School Meals (Gorard, 2012) and in respect of this suggests therefore, this group is very much representative of the general population.

With regards to their use of emotion regulation strategies, this group were more likely to express positive emotionality than negative emotionality. They also expressed more emotionality overall than the three other clusters, regularly demonstrating expressions of both positive emotions (e.g. smiling or laughing) and negative emotions (frowning or venting frustration). As described by (Belot & James, 2011), this group were evidently able to honestly express their negative

emotions without concern of risk to the peer relationship nor of denying the emotional experience.

In line with Fonagy et al. (1991), when seen to occur alongside the adaptive nature of the ER strategies recruited, the positive emotionality displayed by members of this group can be viewed as a personal resource they draw upon during the stress or challenge of the concurrent construction task. This is consistent with the 'broaden and build' idea Fredrickson (1998) described in the literature review. Individuals within this Adaptive cluster group were observed to consistently employ a wide range of positive problem solving ER strategies during the collaborative LEGO construction task. These strategies consisted of behaviours and initiatives that would frequently neutralise potentially emotion-eliciting situations, decrease potential negative outcomes and increase the potential for positive outcomes. For example, these children provided frequent and clear directions to their construction partners, they corrected their own actions or those of their partner, all the while offering reassurance and support when required. Together, such strategies are described as antecedent ER strategies (Fredrickson, 1998), i.e. deployed in advance of the activation of a negative emotion. Studies with young people have found the short-term, affective consequences of antecedent strategies are associated with better psychological adjustment (Gross, 1998a) suggesting that future outcomes for this group are positive.

The emotion regulatory profile of Cluster 2 (Maladaptive) is strongly contrasted to the Adaptive group described above. This group received the lowest scores for prosocial behaviours and had more children in the SDQ problem group than all of the other groups. Interestingly, despite their maladaptive ER profile, only one third of this group scored in the normal range for classroom emotional and behavioural problems. Consistent with the findings of (Compas, 2006), this group used significantly fewer positive problem solving ER strategies than the Adaptive cluster group, confirming the expectation of the current study that emotion regulation is an important process when examining the development of childhood emotion and behavioural problems and that children in this group are characterised by their use of maladaptive ER strategies in school context. Unsurprisingly, and in line with Braet et al. (2014), given their infrequent use of

positive strategies, this group were found to have significantly more relationship difficulties with peers.

A predominantly male group, the Maladaptive group expressed little emotionality overall and the least amount of positive emotionality across groups. This pattern is somewhat reflective of recent research interested in gender differences in emotion expressivity that finds boys less likely to express positive emotion than girls Gross et al. (2006). Emotion expression is important for healthy development and an accumulating body of research evidence suggests that where individuals are limited in their range of expressed emotions - such as indicated by the children in this group - or have the tendency to express particular emotions to the exclusion of others, there is a greater likelihood of compromised socio-emotional functioning and an increased risk for developing psychological problems (Chaplin & Aldao, 2013).

The behavioural problem most frequently reported for this cluster group was inattention/hyperactivity. Children who have difficulties controlling their attention and impulses are likely to experience difficulties in school. They talk more in class, have trouble waiting their turn, interrupt conversations and often struggle to respond appropriately to others (Chaplin & Cole, 2005; Keenan, 2000; Zahn-Waxler, Shirtcliff, & Marceau, 2008). Their behaviour can be unpredictable, leading to interpersonal problems with family members, teachers and peers (Zentall, 2006). Unsurprisingly, when faced with such difficulties, children may develop low self-esteem and this is found to be more likely in children with co-occurring depression and anxiety symptoms (Barkley, 2014) such as those measured by the emotional symptoms subscale in the current study. Self-esteem was not measured in this research, however children did provide a report on their self-perceptions of their emotional regulation abilities. These scores showed that the Maladaptive group had the lowest self-perceptions of their own ER abilities of all cluster groups.

Emotional symptoms were also found to be significantly higher in the Maladaptive cluster that the three other groups. Co-occurrence of inattention and hyperactivity symptoms with affective, anxiety and conduct problems is well established and in clinical studies, up to two thirds of children with ADHD have at least one other psychiatric diagnosis (Bussing, Zima, & Perwien, 2000). Most

commonly, ADHD is found to co-occur with externalising symptoms such as oppositional defiance or conduct disorders and so there is a relative absence of literature to explain the present finding of overlapping emotional and behavioural symptoms found within cluster 2. However, (Cantwell, 1996) report the overall prevalence of ADHD co-occurrence with anxiety and depression symptoms to be between 10 and 20 percent and some studies find that more females than males have co-occurring ADHD with emotional problems Goldman, Genel, Bezman, and Slanetz (1998). Thus the findings of this, predominantly male group are somewhat contradictory to this prior research. One possible explanation is that much of the research conducted on co-occurrence of childhood mental health disorders is performed on children with a narrowly defined clinical diagnosis whereas the children in this study represented a non-clinical sample with a range of emotional and behavioural problems. Additional research, with a focus on overlapping symptoms in a larger community sample is required to ascertain the levels of anxiety in respect of inattentive behaviours observed in non-clinical samples.

The Maladaptive group had higher levels of spontaneous EDA reactivity across both tasks, compared to the Adaptive group. However, perhaps due to the considerable physiological heterogeneity recorded across individuals within this group, contrary to expectation, this difference did not reach significance.

Taken together, these findings provide grounds for the possible explanation that difficulties controlling attention and hyperactivity, may have been related to the symptoms of anxiety and depression in this group. These symptoms were present alongside little personal confidence in their own ability to manage their emotional regulatory responses appropriately.

The behavioural profile of cluster 3 (Reactive) shared several similarities with cluster 2 described above. These included: few prosocial behaviours; difficulties with inattention/hyperactivity in class; low self-perceptions of emotional self-awareness and emotional self-regulation. In respect of their strategic behaviours during the LEGO construction tasks, this group demonstrated the least amount of emotional expressivity of all the other groups, with low scores for positive emotion expression. In addition, there was a significant absence of positive problem solving ER strategies observed from Reactive group members and they

also used fewer cognitive and behavioural distraction strategies than any other group during the tasks. These findings suggest a lack of strategic flexibility that is an important prerequisite for effective emotion regulation (Cuffe, Moore, & McKeown, 2005).

The distinct feature of this group was their extreme scores for physiological reactivity. Compared to the other groups, the reactive cluster had the highest levels of EDA Amplitudes. This was especially the case during the second, competitive construction task. As has been described, EDA hyper-reactivity is linked to sensitivity to negative emotions, a desire to avoid negative consequences and the additional demands of suppressing emotionally expressive behaviour (Zimmermann, Maier, Winter, & Grossmann, 2001). However, in respect of prior research evidence, the interpretation of EDA findings for this group is not straightforward. Compared to the other cluster groups, these children demonstrate very little change (few spontaneous fluctuations) in skin conductivity, particularly during the competitive construction task. Yet, the amplitude (or magnitude) of this response is significantly greater than all other cluster group members suggesting a particular sensitivity to specific events during the competitive LEGO construction tasks. In prior research, measures of spontaneous phasic fluctuations in EDA are usually correlated with magnitude (Blair, 2003), whereas a significant *negative* correlation was found between these two EDA measures in the present cluster group. As has been described, electrodermal activity reflects many underlying processes that include attention, arousal, anxiety and stimulus intensity. Magnitude of skin conductance response is thought to be influenced by the number of underlying processes involved in a task (Sequeira, Hot, Silvert, & Delplanque, 2009). In other words, the more demanding the attention required for a task the larger the skin conductance response will be. For group members of the Reactive cluster, the extreme amplitude scores seem to represent the increase in task demand of the challenging situation in which they are required to compete against a peer and in a limited time, in order to build the tallest LEGO tower. In studies using competitive task stimuli, an increase in physiological response is anticipated during such tasks. However, the question remains for the present study as to why this group reacted particularly strongly in comparison to children in the other

clusters who undertook the same task. Prior research measuring EDA during competition suggests that significant changes in skin conductance amplitude is found in participants with anxiety problems (Frith & Allen, 1983) and it is suggested elsewhere that the experience of anxiety alerts an individual to a threat to their goal (Adolph, Schlosser, Hawighorst, & Pause, 2010), perhaps reflected in underlying elevated physiological responses of the Reactive group. For anxious individuals, this may explain the physiological changes observed here.

A related finding for this group that might support this reasoning comes from the behavioural observations showing they used few cognitive and behavioural distraction strategies, suggesting that they recruited additional physiological resources in order to remain task-focused.

An outstanding question for this group from a clinical perspective is whether their physiological response patterns could be considered as adaptive or maladaptive. In the school context, children that are able to stay on task and are able to ignore irrelevant distractions, as observed during the LEGO tasks, may be perceived as engaged or successfully learning new skills and information. However, the hidden indices of EDA sensitivity for this group suggest there may be a physiological cost to their attention. Given the methods of data capture in the present study an accurate assessment of expressive suppression cannot be made. However, the physiological evidence, combined with absence of emotional expression within this group suggests that expressive suppression may well have been a factor in the pattern of behaviour described. Suppression is well known to decrease emotion expressivity and has been repeatedly associated with an increased sympathetic activation in negative emotion-eliciting contests (Power & Dalgleish, 2015). Ever since it has been understood that emotion generation is linked to arousal of the autonomic nervous system, mounting theoretical and clinical evidence considers the influence of emotion regulation competencies on physical health and finds that the inhibition of emotion expression is robustly linked to physical illness (Gross, 1998a; Gross & Levenson, 1993). With this in mind, it seems likely that the behavioural profile of the Reactive cluster is maladaptive over the long term and with additional screening, its members would benefit from targeted intervention and support to develop more positive, adaptive ER behaviours.

Of all four groups, cluster 4 (Distracted) contained the most members registered with Special Educational Needs. The most remarkable feature of the members of this cluster was their consistent use of cognitive and behavioural distraction ER strategies during the construction tasks. This group had high scores for inattention/hyperactivity behaviours in class, with symptoms of one third of the children in this group falling within the serious/borderline range according to their teachers. There were several similarities between cluster 4 and the Adaptive cluster 1. This group had lower scores (compared to clusters 2 and 3) for the three other classroom behavioural difficulties, i.e. emotional, conduct and peer problems. They were generally prosocial and frequently expressed both negative and positive emotions. This group differed from cluster 1 in respect of the strategic choices they made during the construction tasks. They used fewer positive problem solving strategies than cluster 1 and they had a tendency to rely on cognitive distraction strategies. These may be perceived as maladaptive in the classroom context and perhaps are reflected in the teacher's perception of these children as being inattentive/hyperactive.

Members of this cluster group were predominantly male. Recent research examining children's developing self-representations of ER strategy effectiveness suggests that as children progress through the middle years of childhood, they become increasingly aware of the effectiveness of cognitive strategies and that boys in particular are more likely to endorse cognitive distraction than girls (Blair, 2003).

As described in the literature review above, there is an on going debate in the field as to whether cognitive distraction is an adaptive or maladaptive strategy. The opportunity presented here allows for a consideration of this question within the context of the classroom situation. Similar to the every day classroom context, the experimental situation of the current study did not provide participants with an opportunity to change the physical circumstances of their situation. As is also often the case in teacher-led classroom tasks, there was an explicit expectation during the observation that the children would complete the construction task. In terms of the goals of the task, the children were allowed little freedom to modify or select an alternative. Therefore, the possibilities for strategy selection were narrowed. In circumstances where it is not possible to modify one's situation,

distraction is thought to be one of the most common and useful forms of attentional deployment strategies (Waters & Thompson, 2016). During the LEGO construction tasks, there were many moments of frustration experienced by the children, sometimes due to the inherent challenge of building the model, at other times as a result of the social challenge required to effectively collaborate. Although not examined in the present study, the influence of social partner will have been a factor on the selection of a particular ER strategy. Often, the behaviour of the LEGO construction partner acted as a causal agent in the child's frustration. This is a common feature of anger-elicitation circumstances and also a particular challenge for managing the emotional consequence. We know from prior research that children are less likely to use venting strategies towards a peer (Gross, 2014) and in such situations, as in the present study, a child may be unable to down-regulate the unwanted emotion through seeking support from the partner. Thus the positive strategic choices for regulating the emotional response were limited. Given this perspective, the selection of distraction strategies from a theoretical perspective seems as though it might be beneficial. However, in the school context, a child that has a tendency to become distracted during moments of challenge or stress is one that may struggle to remain focused or engaged in a work assignment and may be perceived as inattentive by peers and teachers.

One further point to be considered for the Distracted group is their low scores for emotional control and situation responsiveness, indicating a lack of self-confidence in their own ability to effectively regulate emotions, particularly in relation to cluster 1. It seems likely that the impact of over-reliance on distraction strategies for this group in the school context may have led to low self-confidence and this group would likely benefit from developing a broader range of strategies in order to help manage their frustrations and complete tasks without the need to disengage.

The findings of the cluster analysis can be summarised as follows:

- Adaptive children were prosocial, had self-confidence in their ability to regulate their emotions, frequently expressed their emotions and used a range of positive strategies to regulate their emotions.

- The Maladaptive group were predominantly male and had significant problems relating to their peers. They displayed a range of emotion and behavioural problems in class (in particular: inattention/hyperactivity and emotional symptoms) and had little self-confidence in their ability to regulate their emotions. During observations, they used few positive regulatory strategies and expressed little emotionality.
- The children who were most physiological Reactive expressed very little emotion. They had low self-confidence in emotional self-regulation and displayed inattentive/hyperactive symptoms in school.
- The Distracted group were generally prosocial and emotionally expressive. They relied upon both cognitive and behavioural distraction strategies to regulate their emotions. They displayed inattentive/hyperactive symptoms in school and had little self-confidence in their emotional control and self-awareness.

Discriminant Function Analysis of the 4 clusters revealed that each group appeared to have a distinct ER profile (although detailed analysis of the individual 'central cases' within clusters revealed some variations within group members). The different patterns of emotion regulation responses revealed by the clusters were principally differentiated by emotion expressivity and physiological reactivity. Of the children with high scores for inattention/hyperactivity symptoms there appeared to be three profile variations identified demonstrating a range of physiological and strategic adaptivity.

5.3.2 RQ2: What patterns of emotion reactivity and regulation exist in children with behavioural difficulties in the middle years classroom?

The second main aim of this thesis was to examine the emotion regulatory tendencies of children identified by their teachers as having emotion and behavioural difficulties. Emotion regulation is an important process in the development of adult psychopathology (Fabes & Eisenberg, 1992) and disturbances in emotion regulation are now recognised as a common feature

across mental health disorders (Berking & Wupperman, 2012). Therefore, understanding ER processes in children is an important step in identifying and supporting those at risk of developing greater difficulties.

As has been described, based on teacher reported SDQ scores, children were classified into three groups: 1) serious difficulties, 2) borderline difficulties and 3) normal behaviour. Groups 1 and 2 were combined, producing 'problem' and 'normal' groups that were then compared using t-tests. Correlational analyses were then performed to consider ER strategic behavioural patterns of children within the problem group. These findings are discussed below.

Children in both groups were observed to use a range of positive and negative ER strategies with small differences across gender, age, Free School Meal eligibility and Special Educational Need. The expression of strong positive emotion was significantly more present in the normal group compared to the problem group. This is in line with studies that suggest positive emotion expression is absent in children with conduct problems (American Psychiatric Association, 2013) and that expressive suppression is associated with anxiety (Roy et al., 2013). This finding provides reinforcement of the earlier discussion regarding the role of positive emotionality in adaptive functioning and in particular in a context where a range of positive strategic choices were useful for managing the emotions elicited during the observed tasks.

(Suveg et al., 2008) suggest that emotion regulation is trans-diagnostically related to the emotion and behavioural problems. In the current study, positive problem solving ER strategies were most often observed across the whole sample. In line with Kring and Sloan (2009), children with emotional, inattention/hyperactivity, conduct and peer problems were significantly less likely to use these positive and adaptive strategies than children without such problems.

Differences were found between self-perceptions of emotion regulation for both problem and normal groups reinforcing the suggestion discussed above, that children's self-reports can provide important understanding of how children think about their emotion regulation. Children with emotional and behavioural problems had significantly less confidence in their ability to influence the

direction of their emotions than children in the normal group. This was particularly the case for their ability to control their negative emotions and to manage their emotional displays appropriately for the context Braet et al. (2014). Research in self-perception of emotions with samples at risk of developing emotional and behavioural disorders has been relatively limited. Children at risk for disruptive behaviour disorders have shown poorly developed understandings of the causes of emotion (MacDermott et al., 2010). In studies of anxiety or depression, girls have reported fewer problem solving strategies and boys more negative strategies (e.g. J. Zeman et al., 2002). The range of scores presented here and their relative associations with the teacher reports on classroom behaviour suggest that for this group, there was a realistic awareness of their abilities to regulate their emotions and that the children with emotional and behavioural problems had low self-confidence in their ability to regulate their own emotions appropriately.

Correlational analysis was also run for the problem group, to determine whether specific ER behaviours could be reliably associated with specific behavioural problems. Correlational analysis at the group level did not reveal very much additional information that has not already been discussed at the overall level in section 5.3.1.1, with the exception of three significant correlations in respect of children with emotional symptoms and peer problems.

For the problem group, emotional symptoms were positively associated with prosocial behaviour. This correlation is in the opposite direction to the same correlation in the overall sample (reported in Table 4.5). Emotional symptoms were also significantly related to the expression of strong negative emotions during the construction tasks. Whilst prosocial behaviour and strong negative emotion expression (venting) behaviours seem an unlikely pairing, there is precedent for these associated behaviours from prior research. In their explanation, (Garber, Braafladt, & Weiss, 1995) suggested that for some children, prosocial behaviour may be attained through the over-control or inhibition of negative emotion expression and this can lead to a build up that is released in non-constructive ways. Examples of non-constructive venting behaviours observed the present study included whining, sudden crying out or banging a hand on the table in frustration.

A significant correlation was revealed between children with peer problems and EDA Area under the curve during the collaborative LEGO task. In other words, children with peer problems were slow to recover physiologically, from emotions elicited during the task. By contrast, in the clinical literature, autonomic *underarousal* has been hypothesised to underlie antisocial patterns in children J. Zeman et al. (2002). However, these findings are derived from samples of children with high levels of aggressive behaviour and who meet the clinical criteria for Oppositional Defiance Disorder or Conduct Disorder. The levels of peer problems reported in the present study were not equivalent to clinical criteria and as such, such prior research has limited value to the present non-clinical sample. Self-control was an important requirement for co-operating and collaborating towards the joint construction goal of the LEGO construction task and it is perhaps unsurprising that for some children, such emotional and behavioural control would have required more physiological effort than others, as indicated by the slower EDA recovery times.

In summary, the analysis by behavioural problem has provided the following evidence:

- Children with high total problem scores had low self-confidence in their ability to influence the direction of their emotions, expressed little positive emotion and use few adaptive regulatory strategies.
- Emotional symptoms were related to prosocial behaviours and strong expressions of negative emotion.
- Children with peer problems were slow to recover physiologically from emotional arousal.

These findings provide limited contribution to the present thesis, specifically due to the limited information revealed regarding correspondence between the specific emotional and behavioural problems of interest to educators and emotion regulation strategic behavioural patterns. As will be discussed, this finding may in itself provide a valuable contribution to future studies concerned with emotion regulation in respect of emotion and behavioural problems in community samples.

5.3.3 RQ3: How does gender influence patterns of emotion reactivity and regulation in middle childhood.

The third main aim of this thesis was to consider whether patterns of emotion regulation tendencies could be distinguished between males and females. As has been reported, both males and females were motivated to volunteer for the study involving LEGO construction. As such, gender groups were statistically balanced allowing for group comparisons. T-tests revealed several gender differences in relation to the observed ER strategies employed and classroom behavioural problems. Group-level correlations were also performed to consider gender-specific patterns of ER strategy employment and physiological reactivity.

In line with previous findings (Posthumus et al., 2009) females were found to be significantly more prosocial and likely to express more positive emotion than males. Males were found to have significantly more inattention and hyperactive symptoms than females. In some studies, prevalence of inattention/hyperactivity symptoms for boys are 2.45 times higher than for girls (Chaplin & Aldao, 2013). However, prevalence among girls seems to be higher in community samples, possibly due to barriers in the identification and referrals for females (Polanczyk & Rohde, 2007). For the present study, it is important to acknowledge the clinical concerns regarding the lack of identification of attention deficit disorders in females. According to teacher reports, females with ADHD are known to display fewer disruptive and hyperactive behaviours but often have greater intellectual impairments than males (Staller & Faraone, 2006). The implications of this are a shared concern for both researchers and practitioners in relation to understanding and identifying affected females.

In respect of ER self-report the only significant gender difference found was with the self-awareness subscale in which males were found to be significantly more self-aware than females. Given the low to medium effect size of this difference, together with the limited available evidence on self-perceptions of emotional self-awareness in children of this age group, it was felt that interpretation of the significance of these findings provides limited contribution to the present study.

Contrary to expectation, there were no significant physiological differences found between males and females for any of the calculated EDA variables in this study. One explanation for this is that physiological data is notoriously noisy and in

respect of this, large sample sizes are required to ascertain effects, this is particularly the case for children who are likely to be more restless than adults during recording of electrodermal data. Given the amount of missing data, the analysis of electrodermal data may have lacked the statistical power necessary to detect a difference that was in fact present. Another possibility that could also be argued is that the lack of findings here relates to the age of the participants. It is known that younger children do not respond to emotion-eliciting stimuli as sensitively as older children or adults (Gaub & Carlson, 1997). As such, it is possible that physiological differences between males and females do not fully emerge until adolescence or adulthood (Fowles, 2008) and would be more distinguishable in an older sample.

Correlational analysis revealed several within-gender differences. Younger males with emotional symptoms and conduct problems were more likely to employ cognitive distraction strategies than older males. Cognitive distraction strategies were positively associated with strong/exuberant expressions of positive and negative emotions and boys that were observed to regularly employ behavioural distraction strategies demonstrated increased physiological reactivity to the collaborative construction task.

In light of the earlier discussion, these findings may help us to understand the adaptive or maladaptive nature of distraction strategies. In non-clinical studies with children, girls are found to have higher effortful control than boys and in adulthood, women report using more of almost all types of emotion regulation strategies (including reappraisal, problem solving and distraction) compared to men (Gao, Raine, Dawson, Venables, & Mednick, 2007). Maladaptive strategies are more typically observed in children and adults with emotion and behavioural problems. The present study has raised the question of whether the use of distraction as a strategy to regulate emotions is adaptive or maladaptive. In respect of gender, it appears that for boys, distraction is associated with emotional symptoms and conduct problems in class, with the un-controlled expression of emotion and with physiological sensitivity. As such, the tendency to distract oneself from the negative emotional stimulus is likely to be maladaptive in its nature, at least for the boys in the present study.

Girls with emotional symptoms were less emotionally self-aware and employed fewer distraction strategies than those with fewer emotional symptoms. Emotional self-awareness was also negatively associated with EDA Area under the curve during both collaborative and competitive tasks. These combined findings suggest that emotional self-awareness may be a protective factor for females in supporting the recovery from an emotionally eliciting event.

It is known that females have a tendency towards rumination when distressed and this is particularly the case in women with anxious or depressive symptoms (Nolen-Hoeksema, 2012). Although the data collected in the present study did not permit for the examination of such ER strategies, in light of this prior research, a tendency for the girls in this study to use fewer distraction strategies is not entirely unexpected.

The findings discussed in this sub-section can be summarised as follows:

- Females were more prosocial and generally more emotionally expressive.
- Girls with emotional symptoms were less emotionally self-aware and used few distraction strategies.
- Males had more inattentive/hyperactive symptoms in school and younger males used more cognitive distraction strategies than older males.
- Cognitive distraction was related to expressions of positive emotion for boys.

5.3.4 RQ4: To what extent does the analysis of individual cases enhance the understanding of participant's emotion regulation tendencies?

For the remaining research question of the current thesis, we return to the four sub-types of emotion regulation profiles, revealed through Cluster Analysis, in order to enrich our understanding of each of the behavioural profiles and begin to consider the applications of these findings for education practitioners and clinicians.

The two cases selected from the Adaptive cluster exemplify the behaviours of the group who were observed to express more positive emotion and employ more positive problem solving ER strategies than any other group, even during

moments of tension or confrontation. Both individuals demonstrated a sensitivity and responsiveness to the emotional experience of their partners whilst remaining focused on the joint goal of task completion.

In contrast, the maladaptive group were generally emotionally inexpressive or had a tendency to express more negative than positive emotion. In addition, they demonstrated an absence of positive problem solving strategies and in their tendency to employ negative and uncooperative ER strategies they demonstrated a lack of sensitivity to their partner and difficulties with collaboration. They had low self-perception of their ability to regulate their emotions and were likely to display a range of emotion and behavioural problems in class.

The Reactive group had high scores for inattention and hyperactivity and low scores for prosocial behaviours in class. They were observed to express very little emotionality and more often employed negative, uncooperative or avoidant strategies. Despite the shared hidden indices of physiological sensitivity of the Reactive cluster, the contribution of this analysis demonstrated a more complex picture in respect of the outward observable behaviours of this group exemplified by the two cases. One of whom displayed tense and jittery behaviour and the other, by contrast, revealed very little emotionality despite moments of challenge.

The final contribution of this analysis in respect of the Distracted group was to demonstrate the negative consequences of distraction in the current context. This was as a result of the errors made during the tasks and consequently the slower pace and often failure to complete. There were also negative social consequences for chronic use of distraction strategies that provide additional clarification of the above discussion regarding the adaptive or maladaptive nature of distraction strategies. This provides additional confirmation that in school context, an over-reliance on emotion regulation through distraction is indeed maladaptive in circumstances where task completion and social competence are both deemed as important for adaptive social functioning and academic achievement.

The contribution made by the analysis of individual cases confirms the importance for multiple methods of measurement of emotion regulatory strategies in children that when used in combination, can provide hidden indices of outward behaviours the complexity of which cannot be as accurately identified

or interpreted purely by observation or traditional screening measures for emotion and behavioural difficulties. Furthermore, this analysis has shed light on the complexity of ER behaviours in children and highlighted the inherent difficulties teachers and clinicians have with identifying emotion and behavioural problems on the basis of manifest behaviours in school.

This section has discussed the main findings of the present thesis in relation to the existing literature. The following section will discuss the methodological and empirical contributions of this research to current understanding of emotion regulation in classroom behaviours.

5.4 Contributions to the field

5.4.1 Theoretical contribution

This section considers the relevance of these findings to current theory on emotion regulation. As described, the model of ER that has most influenced the field is presented by James Gross, in which he describes five major strategic components of emotion regulation. These are categorised as either antecedent-focused (situation selection, situational modification, attentional deployment, cognitive change) or response-focused (Tamres et al., 2002). Whilst this model has provided valuable guidance, its relevance has been limited for the applied context of the current enquiry. Firstly, two of the antecedent strategies (situation selection and situation modification) require the individual to take action to change their physical and social circumstances in order to maximise the potential for an emotionally positive outcome. However, in the classroom context where tasks are set and children are given achievement targets, they are allowed very little flexibility for the selection of ER strategies and despite the negative emotions provoked by an unwelcome task or joint-collaboration with a peer they dislike, there is a requirement to remain on-task. Selecting a different task or choosing to work with a partner at one's own volition or without the permission of the class teacher would usually have negative consequences for the student in school. As such, from a theoretical perspective, it is important to acknowledge the contextual limitations upon individuals that might influence or restrict their choice of regulatory process for managing their emotions.

The frequency with which children expressed their emotions ranged enormously in the present study. For this sample, emotionality was most often observed alongside the positive strategies and prosocial behaviours of the Adaptive cluster group, suggesting that emotionality supports flexible emotion regulation, social competence and consequently, psychological well-being. From a theoretical perspective, there is very little acknowledgement of the role of emotionality in models of emotion regulation. Most research considers the relations of emotionality with social and problem behaviours and extreme emotionality in children is often considered as a symptom of externalising behaviour problems, suggesting that emotionality interferes with emotion regulation processes (Gross, 1998a, 1998b). The findings from the present thesis suggest that there is an important role for emotionality in adaptive emotional and behavioural functioning. These findings support the idea of treating emotion regulation and emotionality as related constructs (Martel & Nigg, 2006) and suggest that future research should examine the role of emotionality within theoretical models of emotion regulation.

The results of the present study also raise questions regarding the adaptive nature of distraction strategies. In Gross's model (Forslund, Brocki, Bohlin, Granqvist, & Eninger, 2016), distraction is a form of attentional deployment in which children switch their attention away from the source of emotional arousal and re-direct their attention towards an alternative aspect of a situation. Distraction is categorised as antecedent-focused (2014) and is seen as an adaptive strategy for the down-regulation of unwanted emotions (Gross, 1998a). The data collected for the present study allowed for both cognitive and behavioural distraction strategies to be observed during the construction tasks. These findings revealed a sub-group of children that relied upon cognitive distraction strategies to support the management of emotional arousal during moments of challenge. As discussed, this tendency had negative consequences for both task-completion and peer-collaboration.

Although the existing data did not permit for the examination of the timing of strategic activations to verify whether distractions were antecedent or response-focused strategies, the applied classroom-based setting does allow for the consideration of the adaptive or maladaptive nature of such behaviour. Whilst

there may have been short-term benefits (i.e. decreasing the unwanted negative emotion) of attention deployment by distraction, the longer-term costs of this particular strategy outweighed the short-term benefits of emotion regulation (Grob & Smolenski, 2005) in the present study. Given the requirement in school for social-competence and academic achievement, it seems that distraction in this context is counter-productive.

This question also speaks to the wider theoretical question of whether the same emotion regulation strategy can have distinct outcomes in different contexts, suggesting that the same strategies can be adaptive and maladaptive according to the context. Distraction strategies are theoretically relevant to both education and clinical practitioners in relation to attention deficit behaviour in school. Distraction may have its benefits, for example, children that experience symptoms of anxiety or depression may benefit from learning how to distract themselves more frequently. However, when distraction is over-used it may lead to maladaptive consequences in respect of classroom task completion or negative social consequences. On-going research would benefit from understanding how much distraction is optimal or useful and what can children do in situations, such as school, when there may be unfavourable contextual consequences to using distraction strategies to regulate emotion arousal.

5.4.2 Methodological contribution

The present research employed a multi-method approach that included screening measures of child self-report and teacher-report, observations of behaviours during two LEGO construction tasks and a physiological measure of electrodermal activity. At present, there is a lack of consensus regarding "gold standard" measures for measuring emotion regulation and this may particularly be the case for investigations that take place outside of the laboratory. This presents an obstacle for researchers seeking to contribute towards understanding emotion regulation as well as developing effective ER-focused treatments for psychopathology. As such, the methodological approach of this study extends the existing literature by combining multiple measurement methods to assess emotion regulation flexibility in school-context.

The results of this thesis have shown that the manner in which young people managed their emotional arousal within real-life situations was largely consistent with patterns of emotion regulation seen during stressful laboratory tasks. This consistency may have significant implications for emotion regulation research. Previous research has relied on participants' subjective appraisals of emotion regulation. Experimental manipulations can supplement these studies by providing a controlled setting that presents objectively controllable emotion elicitation events. In the current study, emotions were elicited 'naturally' as a result of the joint challenges of task-construction and peer-collaboration, during which physiological reactivity was recorded and regulatory strategies were observed. This multi-method approach may support future researchers in their examination of emotion reactivity and regulatory behaviours in applied settings.

The present research also attests to the potential utility of the clustering approach in identifying adaptive and maladaptive patterns of emotion regulation in children's behaviour. This approach allows researchers to identify sub-types of emotion regulatory profiles on empirical grounds, with each group displaying unique strategic patterns of ER behaviours and associated physiological tendencies. For the present research, the cluster groups derived from this approach were found to be both meaningful and distinct. Moreover, group membership derived by this method is consistent with existing theory and empirical findings. In short, this analytical approach facilitates the extension of theoretical conceptualisations of emotion regulation to the situational context of the classroom.

5.4.3 Empirical contribution

A key finding from this study was the identification of sub-types of emotion regulatory profiles in respect of classroom emotion and behavioural difficulties. The Adaptive cluster provides information on some of the protective factors against such difficulties, including the importance of positive emotionality, positive self-perceptions of emotion regulation and the ability to employ a wide range of positive regulatory strategies in the face of challenge or stress.

Previous authors have suggested that emotional self-awareness is a prerequisite for adaptive strategic behaviour (Werner & Gross, 2010). The present research

revealed a key relationship between self-perception of emotion regulatory ability and adaptive behaviour. As has been discussed, it has often been assumed that children's reports of emotional states cannot be relied upon (Zimmermann et al., 2001). In contrast, the present findings show that children can provide accurate self-assessment of the effectiveness of emotion management strategies for regulating their feelings and extends the existing literature by suggesting that such self-perceptions may be a protective factor against maladaptive emotion regulatory behaviour and associated emotional and behavioural problems.

Inattention/hyperactivity was the problematic behaviour most commonly reported in the children of the current study with 18 children (14%) presenting with serious symptoms and a further 10 children (8%) with borderline difficulties of attention and hyperactivity. It could be argued that the Strength and Difficulties Questionnaire (Veenman, 2011) is relatively blunt measure used to identify inattention and hyperactive symptoms, as such these results need to be interpreted with some caution. Nevertheless, these results are consistent with prior research suggesting that inattention and hyperactivity is now the most common problem for children in the UK classroom (R. Goodman, 1997). Although, there is some disagreement on the measurement of symptoms in the clinical literature with some authors expressing concern that a rise in the incidence of ADHD diagnosis could simply indicate an increase in teacher awareness and even suggest over-identification of inattention and hyperactive symptoms (Brown & Schoon, 2010). After all, all young children are naturally active, impulsive and easily excitable, and even excessive behaviour of this nature is usually, eventually outgrown. Other authors have suggested that ADHD is under-diagnosed in Britain (Thapar & Cooper, 2016), in some part due to the lack of training and support for education-based professionals in the identification of symptoms. In light of these conflicting arguments, it must be considered that the findings reported in the current thesis represent a genuine presence of inattention and hyperactive symptoms in class. As such, this research extends the existing literature by confirming the presence of serious levels of symptoms in a community sample for which at present there is limited acknowledgement or special education provision made to support child or teacher in class. In addition, the screening measures for emotion and behavioural difficulties used in the

present study suggest that teachers are able to recognise similar inattentive/hyperactive symptoms in class but may not see the complex picture, revealed in the present study, between identified sub-groups each with distinct patterns of emotionality, reactivity and regulatory responses. These findings raise the question of how best to identify such subgroups in school and suggest that screening measures may provide only a partial account of symptoms.

The contribution of the main research findings in connection with the existing literature discussed above has emphasised the relevance of this study whilst also arguing in favour of conducting further research in this area. The findings have demonstrated the contribution that an emotion regulation perspective has for understanding social and behavioural problems in school and provided concrete examples of sub-types of behavioural profiles that are useful for practitioners in understanding and identifying children displaying complex behaviours in their classrooms. The next two sections of this chapter discuss the implications of this study for future research and practice.

5.5 Implications for future research

Consistent with the exploratory nature of the present thesis, the findings emerging from this study suggest a number of possibilities for future research into the emotion regulation tendencies of children with emotions and behavioural difficulties. These include:

- *Further analysis of emotion regulation in childhood*: In their meta-analytic review of more than 100 studies on emotion regulation, (Sayal, Ford, & Goodman, 2010) included only 12 that were regarding children. Children may be less capable of using certain strategies and therefore more research is needed to develop models of emotion regulation that take children's development into account. One specific question raised by this thesis is regarding the role of distraction strategies in adaptive functioning and how does this change throughout development and according to education context? Another question arising from this research relates to the contextual limitations that might influence or restrict the freedom of individuals to regulate their emotions. Such an understanding will be

essential for developing models of emotion regulation for applied research.

- *The development of emotion regulation trans-diagnostic measurement tools for children:* This research calls for a shift away from diagnostic categories of emotion and behavioural disorder and a redirection towards the emotion regulation dimensions that underlie such problems. Such a focus would help to shed light on both the common underlying processes on the one hand and the unique characteristics of a particular disorder on the other. Research is required to develop appropriate measurement tools for children.
- *The role of positive emotionality*: At present, positive emotionality does not feature within current theoretical accounts of emotion regulation due to the historic concern in the clinical literature for understanding the role of negative emotions and their impact on social and emotional problems. However, this approach may hinder psychology's ability to understand how positive emotions can support the regulation of negative emotions, including how they might lead to beneficial consequences for attentional and cognitive resources. Future research should consider both the role of positive emotionality in emotion regulation and also whether positive emotions have an adaptive value from a functional perspective.
- *Identifying protective and risk factors:* This study has revealed four separate behavioural profiles or sub-types of emotion regulators each with distinct behavioural patterns of emotion response and reactivity. A logical extension of the current thesis would be to consider, through further research, the extent to which these affective and behavioural response tendencies *protect*, or conversely, put these children *at risk* for future academic, social or emotional difficulties.
- *Improving self-perception of emotion regulation*: The findings presented in this thesis have provided strong evidence that children have accurate self-perceptions of their ability to regulate their emotions. Children with emotional and behavioural difficulties were found to have low self-perceptions of their emotion control, self-awareness and situation responsiveness as measured by the Emotion Regulation Index for Children

and Adolescents Aldao et al. (2010). One of the questions for future research is whether these self-perceptions can be altered and indeed, what impact could improving scores on this, or an equivalent measure, have on children's classroom behaviours?

- *Identifying inattention, impulsivity and hyperactivity in the classroom*. NICE guidelines suggest teacher training is one of the most beneficial interventions for helping children manage attention and hyperactivity symptoms in the classroom (MacDermott et al., 2010). Through the lens of emotion regulation, the present study showed that teacher perceptions of inattention and hyperactive behaviours could be explained by a more complex picture of distinct behavioural profiles. This suggests that research is required to identify existing teacher beliefs and misconceptions in respect of recognising symptoms of inattention, impulsivity and hyperactivity in the classroom. This may provide clues for how best to support teachers in the management of such behaviour.

5.6 Implications for practice

The present research has revealed a number of findings of potential value to education practitioners. In particular, the identification of four distinct behavioural profiles (Adaptive, Maladaptive, Reactive and Distracted), each of which should be of interest to professionals that face complex child behaviours in school each day. Primary school brings about a host of social-emotional and academic challenges. Identifying children struggling with emotion and behavioural difficulties is particularly important at this stage in development and in advance of the transition from primary to secondary school where the level of academic demands increase. Behavioural problems are associated with academic problems for both boys and girls (DuPaul & Stoner, 2014) and become increasingly intractable to intervention over time. Intervening early in development appears crucial for diminishing the risk of negative outcomes.

The findings discussed here have implications for the early identification, prevention and intervention for children at risk of developing greater emotion and behavioural difficulties. Early screening allows for co-ordination of services across problem areas. Many schools already routinely administer academic

screeners to help identify children at risk for learning difficulties, including early spelling, reading and comprehension assessments. In the UK, screening for emotional or behavioural problems is unlikely to occur until problems are manifest in disruptive or inattentive behaviour. This thesis has suggested that screening by behavioural problem in this age group may be less useful than assessment of emotion regulation behaviours. Given that schools already routinely administer cognitive measures, assessments of emotionality and ER behaviours could be included alongside these assessments and administered to all children in order to help identify requirements for additional support. This form of early screening, particularly in schools working with high-risk populations, could allow schools to target children and provide early intervention services based on specific needs.

Tailoring early intervention efforts to the specific needs of children based on screening and assessments could lead to effective treatment, which would almost certainly vary according to the identified emotion regulation behavioural profile. For instance, this study has identified a particular group for which the management of negative emotions relies on the ability to cognitively or behaviourally disengage. These children are seemingly as likely to be male as female. Such children have many symptoms of inattention and hyperactivity but are unlikely to receive a formal diagnosis of ADHD. It is doubtful that such children would receive recognition or support for their particular needs whilst their difficulties and disruptions can place an enormous burden on teachers required to manage distracted or distracting behaviour in class. Yet schools are in a good position to offer cost-effective interventions that could encourage children to become less dependent on distraction strategies and develop a wider range of positive and adaptive ER strategies whilst also improving young people's awareness of their emotional experience and developing self-confidence in their ability to regulate their own emotions.

From a public health perspective, whilst it is important to know who is at greatest risk for future mental health problems and whether early indicators predict future problems, it is equally important to understand the factors that might protect against the development of later emotional and behavioural difficulties. The shared characteristics of children in the current study who were identified as

adaptive emotion regulators were: 1) positive self-perception of emotion regulatory abilities, and 2) positive emotionality.

Holding a positive self-regard in respect of emotion regulation relies upon emotional self-awareness or the ability to think consciously about oneself in respect of one's emotional experience. Leary & Gohar (2014) propose that self-conscious awareness of emotions has a direct impact on our ability to manage our emotional experience and that minimising unwanted emotions promotes subjective well-being and facilitates effective behaviour. The findings of the present study attest to this and suggest that children with emotional and behavioural difficulties would benefit from support to develop greater understanding and self-awareness of their emotional experiences as well as learning alternative positive problem solving or cognitive change strategies, that might support optimal management of the emotions elicited in school context.

In the current thesis, positive emotionality has been described as a personal resource on which children can draw upon during times of stress or challenge. Positive emotionality co-occurred alongside positive regulation of self and others and for the adaptive group, was deployed to neutralise potentially negative emotional situations. By contrast, both positive expression and positive regulation was absent in children with emotional and behavioural problems suggesting that these children may benefit from specific interventions designed to encourage the expression of their emotions. Encouraging emotion expressiveness has been associated with positive outcomes such as peer acceptance and prosocial behaviour (Phillips & Power, 2007) and may benefit children with a tendency to suppress or disguise their negative expressions of emotion.

Finally, these findings have strong implications for the training of teachers, suggesting that from the outset, education professionals should have some understanding of emotion regulation and the potential that such a perspective can provide for informal and formal opportunities to identify children in need of acquiring more adaptive behaviours for the social and academic demands of school.

5.7 Final summary

The aims of the present study were to determine the extent to which an emotion regulation perspective would identify patterns of emotion regulation tendencies in the middle years of primary school and to identify individuals with emotional or behavioural problems that may benefit from early intervention or support. The findings emerging from this study indicate that these two goals were satisfactorily met with the identification of four distinct cluster groups each with distinct patterns of affective and behavioural responding.

The focus of prior research into emotion and behavioural problems in school has typically been to consider the impact of such difficulties on academic achievement. From the perspective of both research and practice, children who meet the clinical thresholds for anxiety, depression, ADHD or conduct disorder are likely to receive support in and outside of school. However, as has been suggested by the findings presented above, for many children, symptoms are not easily identifiable. Those with borderline problems, or who can easily disguise their emotional difficulties, may be overlooked in school. The current thesis has identified subtypes of emotion regulatory behaviours that do not directly correspond with traditional measures of emotion and behaviour difficulties used to identify clinical disorders. This raises concerns regarding the numbers of children with maladaptive behaviours that go unnoticed by professionals working with them in school. It is hoped that future research will build upon these findings, to yield greater insight into patterns of emotion dysregulation in the classroom with a view to identifying children at risk of developing greater difficulties.

As has been seen in the present study, Cluster Analysis has advantages over variable-level analysis such as regression and factor analysis. Rather than grouping similar items and variables, person-centred analysis provides a way of grouping individuals into subtypes based on shared characteristics that distinguish members of one subtype from another. If these shared characteristics represent a range of well-defined subgroups, the resulting classification could characterise children by the nature and complexity of their behavioural presentation, providing useful information for practitioners working with young people. Furthermore, the predictive validity of these subgroups can be tested by

investigating their longitudinal association with negative academic and behavioural outcomes. This, in turn, could provide important information toward identifying appropriate preventative and intervention strategies.

Using an emotion regulation framework, the current thesis has shed light on some of the hidden physiological and behavioural factors that influence the emotional and behavioural responses typically on display in the applied context of the classroom. This work builds on the existing knowledge base regarding emotions in learning contexts by providing understanding of how emotions are regulated in such contexts and in particular, for how adaptive and maladaptive patterns of emotion regulation are manifest in observable classroom behaviours.

This project is one of few investigations into emotion regulation in the applied setting of the classroom. As far as we are aware, this is also the only study to include a measure of electrodermal activity in children whilst they are working in collaboration with peers in the school context. Through the course of this thesis, limitations regarding the available theoretical models of emotion regulation for applied research have been identified, including the role of emotion expression in adaptive functioning. It is hoped that this research will inform the design of future enquiry and in turn, support the refining of theoretical models for emotion regulation in applied research.

From the personal perspective of this author, the work involved in the development of this thesis has brought about much sought-after understanding regarding the complexity of emotions and behaviours in class. In my role as teacher and trainer, I have the opportunity to disseminate these findings in a way that I hope is relevant to other practitioners facing the daily challenge of supporting children in school with emotional and behavioural difficulties.

Having shed light, through this work, on some of the complexity underpinning different patterns of regulatory behaviour in class, in my next steps I will consider the evidence for how best to support Primary aged children in raising their self-awareness of their own emotional experiences. In my future research, I hope to consider the available intervention support for young people who would benefit from developing positive strategies to manage difficult emotions in ways

that could enhance their social experiences and psychological wellbeing into adulthood.

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APPENDICES

APPENDIX 3.1: STRENGTHS AND DIFFICULTIES QUESTIONNAIRE

Child's name:…… **Date of birth**:……

Ethnicity:…….. **Free School Meals:** Yes ☐ No ☐ **SEN:** Yes ☐ No ☐

SEN provision (if any):……

Please tick the box for each item, answering all items as best you can, even if you are not absolutely certain or the item seems daft! Please base your answers on the basis of the child's behaviour over the last 6 months.

	Not True	Somewhat True	Certainly True
Considerate of other people's feelings	☐	☐	☐
Restless, overactive, cannot stay still for long	☐	☐	☐
Often complains of headaches, stomach-aches or sickness	☐	☐	☐
Shares readily with other children (treats, toys, pencils etc.)	☐	☐	☐
Often has temper tantrums or hot tempers	☐	☐	☐
Rather solitary, tends to play alone	☐	☐	☐
Generally obedient, usually does what adults request	☐	☐	☐
Many worries, often seems worried	☐	☐	☐
Helpful if someone is hurt, upset or feeling ill	☐	☐	☐
Constantly fidgeting or squirming	☐	☐	☐
Has at least one good friend	☐	☐	☐
Often fights with other children or bullies them	☐	☐	☐
Often unhappy, down-hearted or tearful	☐	☐	☐
Generally liked by other children	☐	☐	☐
Easily distracted, concentration wanders	☐	☐	☐
Nervous or clingy in new situations, easily loses confidence	☐	☐	☐
Kind to younger children	☐	☐	☐
Often lies or cheats	☐	☐	☐
Picked on or bullied by other children	☐	☐	☐
Often volunteers to help others (parents, teachers, other children)	☐	☐	☐
Thinks things out before acting	☐	☐	☐
Steals from home, school or elsewhere	☐	☐	☐
Gets on better with adults than with other children	☐	☐	☐
Many fears, easily scared	☐	☐	☐
Sees tasks through to the end, good attention span	☐	☐	☐

Thank you SO much for your help!

Lysandra

APPENDIX 3.2: EMOTION REGULATION CHECKLIST FOR CHILDREN AND ADOLESCENTS

Below are a number of statements. Please read each statement and then circle the choice that seems **most true for you**. Do not spend too much time on any one item. Remember, this is not a test. There are no right or wrong answers. We really want to know what you think.

1. I am a happy person	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
2. When adults are friendly to me, I am friendly to them	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
3. I handle it well when things change or I have to try something new	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
4. When I get upset, I can get over it quickly	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
5. When things don't go my way I get upset easily	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
6. When other kids are friendly to me, I am friendly to them	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
7. I have angry outbursts	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
8. I enjoy seeing others hurt or upset	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
9. I can be disruptive at the wrong times	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
10. I get angry when adults tell me what I can and cannot do	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
11. I am a sad person	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
12. I have trouble waiting for something I want	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
13. I am quiet and shy, and I don't show my feelings	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
14. I do things without thinking about them first	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
15. When others are upset, I become sad or concerned for them	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree
16. I annoy others by not minding my own business	Strongly Disagree	Disagree	Half and Half	Agree	Strongly Agree

APPENDIX 3.3: PARENTAL CONSENT FORM

UNIVERSITY OF CAMBRIDGE

Faculty of Education,
184 Hills Road,
Cambridge CB2 8PQ

Dear Parent,

Year 3 and 4 LEGO club

My name is Lysandra Sinclaire-Harding and I am a qualified Primary School teacher and student at the University of Cambridge, investigating communication and problem solving in 6 to 9 year olds using LEGO construction toys. I have been invited by [head teacher name] to conduct my fieldwork with [school name] Year 3 and 4 pupils during the last week of this summer term. From my research I hope to gain a better understanding of the social and emotional aspects involved in learning.

I will be coming into school to introduce myself and explain the LEGO activity to the children who will be given a chance to volunteer and ask questions. In groups of 2 or 3, pupils will be invited to build a model using LEGO construction toys. To help with the writing of my report, the activity will be video recorded and as an additional option, the children will be asked if they are willing to wear a wrist sensor during the activity, which picks up small changes of temperature on the surface of the skin. Children very much enjoy the activity, which gives them a chance to relax and play with friends in a productive way.

If you are happy for your son or daughter to take part, I would be grateful if you could sign and return the attached slip by Wednesday 11th July.

Many thanks for taking the time to read this letter and for your help. If you would like to know more about the project, you are welcome to contact me directly by email or telephone.

Lysandra Sinclaire-Harding

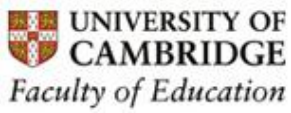
----------✂----------

I give permission for my son/daughter …….. to take part in LEGO club.

- I understand that all recorded information is confidential and no names will be used in the report.
- I understand that if my son/daughter does not want to take part, he/she is free to withdraw at any point.

Signed (Parent): …….. Date: ……

APPENDIX 3.4: PARTICIPANT CONSENT FORM



Project Title: Communication and interaction in 6 to 9 year olds
Researcher: Ms L. Sinclaire-Harding

		Please tick box
1.	I confirm that I understand I will be observed and will be interviewed by the researcher. I have had the opportunity to ask questions.	☐
2.	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.	☐
3.	I agree to take part in the above study.	☐

		Please tick box **Yes**	**No**
4.	I agree to being audio recorded	☐	☐
5.	I agree to being video recorded	☐	☐
6.	I agree to the use of anonymised quotes in publications	☐	☐
7.	I agree to the use of anonomysed video footage at academic conferences	☐	☐

_____

Choose your own pseudonym!

_____ _____ _____

Name of Participant Date Signature

_____ _____ _____

Name of Researcher Date Signature

APPENDIX 4.1: AGGLOMERATION SCHEDULE

Cluster combined					Stage Cluster First Appears			Cluster combined					Stage Cluster First Appears		
Stage	Cluster 1	Cluster 2	Coefficients	% change	Cluster 1	Cluster 2	Next Stage	Stage	Cluster 1	Cluster 2	Coefficients	% change	Cluster 1	Cluster 2	Next Stage
1	38	95	0.19		0	0	32	45	44	113	79.64	4%	0	0	51
2	55	85	0.60	222%	0	0	13	46	37	111	82.52	4%	0	0	54
3	40	43	1.04	74%	0	0	5	47	32	83	85.44	4%	29	0	60
4	80	103	1.59	53%	0	0	20	48	17	54	88.40	3%	11	39	67
5	40	41	2.23	41%	3	0	44	49	3	61	91.37	3%	34	16	56
6	20	112	3.29	47%	0	0	27	50	8	34	94.75	4%	0	0	58
7	28	89	4.41	34%	0	0	56	51	7	44	98.41	4%	25	45	65
8	70	76	5.56	26%	0	0	27	52	98	101	102.22	4%	10	0	60
9	36	81	6.76	22%	0	0	42	53	72	100	106.84	5%	33	28	70
10	98	99	8.02	19%	0	0	52	54	37	58	111.84	5%	46	21	79
11	17	24	9.30	16%	0	0	48	55	20	48	117.01	5%	27	36	78
12	39	90	10.62	14%	0	0	41	56	3	28	122.52	5%	49	7	72
13	55	67	11.95	13%	2	0	26	57	39	78	128.06	5%	41	20	62
14	54	115	13.30	11%	0	0	39	58	8	46	133.67	4%	50	0	66
15	124	126	14.74	11%	0	0	31	59	21	74	139.35	4%	24	43	71
16	61	86	16.17	10%	0	0	49	60	32	98	145.14	4%	47	52	81
17	23	26	17.76	10%	0	0	35	61	23	27	150.97	4%	35	0	73
18	48	87	19.39	9%	0	0	36	62	36	39	157.00	4%	42	57	70
19	57	96	21.04	8%	0	0	32	63	4	68	163.23	4%	22	0	72
20	78	80	22.71	8%	0	4	57	64	123	127	169.56	4%	0	0	75
21	58	71	24.40	7%	0	0	54	65	7	12	176.08	4%	51	40	76
22	4	52	26.14	7%	0	0	63	66	8	55	182.66	4%	58	26	69
23	6	114	27.90	7%	0	0	30	67	17	120	189.76	4%	48	0	74
24	21	49	29.71	6%	0	0	59	68	13	66	197.68	4%	0	0	79
25	7	33	31.54	6%	0	0	51	69	8	35	206.96	5%	66	0	77
26	55	84	33.51	6%	13	0	66	70	36	72	216.82	5%	62	53	81
27	20	70	35.55	6%	6	8	55	71	5	21	226.95	5%	0	59	83
28	100	104	37.61	6%	0	0	53	72	3	4	238.03	5%	56	63	80
29	32	97	39.68	6%	0	0	47	73	23	38	250.03	5%	61	38	85
30	2	6	41.87	6%	0	23	74	74	2	17	262.10	5%	30	67	76
31	124	128	44.08	5%	15	0	75	75	123	124	276.04	5%	64	31	86
32	38	57	46.32	5%	1	19	38	76	2	7	290.54	5%	74	65	86
33	72	102	48.61	5%	0	0	53	77	8	82	306.47	5%	69	0	80
34	3	53	50.92	5%	0	0	49	78	20	29	324.29	6%	55	44	82
35	23	25	53.26	5%	17	0	61	79	13	37	343.18	6%	68	54	84
36	48	75	55.71	5%	18	0	55	80	3	8	363.23	6%	72	77	83
37	29	42	58.19	4%	0	0	44	81	32	36	386.95	7%	60	70	82
38	38	47	60.71	4%	32	0	73	82	20	32	413.29	7%	78	81	85
39	54	73	63.32	4%	14	0	48	83	3	5	439.85	6%	80	71	84
40	12	121	65.96	4%	0	0	65	84	3	13	481.19	9%	83	79	87
41	39	79	68.63	4%	12	0	57	85	20	23	523.65	9%	82	73	88
42	36	69	71.30	4%	9	0	62	86	2	123	576.26	10%	76	75	87
43	74	77	73.99	4%	0	0	59	87	2	3	660.38	15%	86	84	88
44	29	40	76.77	4%	37	5	78	88	2	20	776.53	18%	87	85	0

APPENDIX 4.2: BIVARIATE CORRELATIONS FOR SDQ 'NORMAL' GROUP

n=95 **Significant at the 0.01 level, *Significant at the 0.05 level

		ERICA self-report			SDQ teacher-report					ER during LEGO construction									Emotion reactivity (EDA)					
	Age	EC	ESA	SR	SDQps	SDQe	SDQc	SDQih	SDQpp	NE_Mild	NE_Strong	PE_Mild	PE_Strong	PEminusN	PosPS	Neg_ER	DISbeh	DIScog	PPM_T1	PPM_T2	AMP_T1	AMP_T2	AUC_T1	AUC_T2
Age																								
EC	.262*																							
ESA	.085	.446**																						
SR	.079	.381**	.286**																					
SDQps	-.120	.277**	-.114	-.004																				
SDQe	-.078	.027	-.036	.053	.078																			
SDQc	-.023	-.142	.125	-.058	-.486**	.131																		
SDQih	.107	-.171	-.043	.041	-.494**	.016	.303**																	
SDQpp	.034	-.228*	-.010	.007	-.476**	-.134	.282**	.097																
NE_Mild	.120	-.007	-.053	-.025	-.082	.022	.063	.158	.079															
NE_Strong	.000	-.066	-.219*	.126	-.042	.054	-.183	.191	.022	.306**														
PE_Mild	.056	.132	-.061	.014	.061	.004	-.132	-.133	.012	.179	-.015													
PE_Strong	.116	.138	-.063	.151	.153	.121	-.190	.034	-.041	.279**	.209*	.567**												
PEminusNE	.033	.038	-.081	.055	.172	.129	-.183	-.139	-.043	-.138	-.138	.799**	.708**											
PosPS	.091	.142	.121	.125	.122	-.105	-.066	-.076	.074	.005	.006	.085	.067	.002										
Neg_ER	-.142	-.118	-.066	.082	-.182	.013	.088	.123	.245*	.313**	.404**	-.057	.047	-.216*	-.017									
DISbeh	.078	-.127	-.175	-.027	.112	-.020	-.011	-.015	-.144	.004	.234*	.005	.016	.041	-.098	-.200								
DIScog	-.207	-.205	-.273**	.007	-.031	-.042	-.178	.271**	.011	.178	.405**	.139	.109	.160	-.237*	-.019	.362**							
PPM_T1	-.194	.103	-.035	.204	.219	-.048	-.069	.057	-.188	.010	.100	.014	-.036	-.027	.180	-.055	.175	.220						
PPM_T2	-.169	-.069	-.231	-.005	.108	.140	-.093	.192	-.170	.007	.062	.132	.066	.116	.120	-.023	.110	.283*	.507**					
AMP_T1	.130	.092	-.063	-.062	.063	.067	-.028	.168	-.067	.216	.231	.059	.168	.007	-.122	.225	-.148	-.005	-.351**	-.196				
AMP_T2	.256*	.330**	.076	.058	.024	.120	-.127	-.022	-.040	-.104	.029	-.080	.000	-.041	-.229	.011	-.188	-.126	-.472**	-.370**	.595**			
AUC_T1	.032	.040	-.044	.057	-.048	.015	.109	.281*	-.020	.302*	.238	.038	.170	.000	.146	.283*	-.153	.094	.009	.249*	.652**	.044		
AUC_T2	-.003	.141	.010	.069	.092	.010	.013	.165	-.079	.227	.128	.037	.090	-.011	.035	.193	-.135	.077	-.034	.113	.771**	.134	.782**	

EC: Emotional Control, **ESA**: Emotional Self Awareness, **SR**: Situational Responsiveness, **SDQps**: Prosocial behaviour, **SDQe**: Emotional, **SDQc**: Conduct, **SDQih**: Inattention/Hyperactivity, **SDQpp**: Peer problems, **NE**: Negative Emotion Expression, **PE:** Positive Emotion Expression; **PosPs**: Positive Problem Solving ER, **NegER**: Negative Unhelpful/Avoidance Regulation, **DISbeh**: Behavioural distraction, **DIScog**: Cognitive distraction, **PPM**: Peaks per minute, **AMP**: Amplitude, **AUC**: Area under the EDA curve, **T1**: Task 1, **T2**: Task 2