Families, Parenting and Asthma

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# TABLE OF CONTENTS

Abstract 5  
Declaration 6  
Copyright and Ownership 7  
Acknowledgements 8  

**Paper One** 9  
Abstract 10  
Introduction 11  
Psychosocial Models of Asthma 12  
Asthma Onset 14  
  Genetics 14  
  Elements of the Environment 15  
  Socioeconomic factors and asthma 16  
Stress and its influence on paediatric asthma 17  
  Stress and burden of caring for an asthmatic child 19  
Caregiver Psychological Functioning 20  
  Depression 21  
  Anxiety 24  
Parenting Styles and Family Environments 25  
  Caregiver depression and parenting style 26  
  Parenting and Families 28  
  Family Environment 31  
The impact of asthma on the child's behavioural and emotional adjustment. 32  
  Asthma and the direction of influence on child behaviour difficulties. 33  
  Impact of behaviour problems on asthma 34  
The Model 35  
  Figure 1 36  
  Table 1 36  
Methodological Considerations 37  
Implications 37  
References 39  
Summary table of studies 49  

**Preface** 58  
References 60  

**Paper Two** 61  
Abstract 62  
Methodology 66  
  Parent advisory Group 66  
  Empirical study 67  
    Design 67  
    Participants 67  
    Materials 68  
    Advert 68  
    Triple P materials 68  
    Information sheet 69  
    Measures 69  
    The Family Background Questionnaire 69  
    Eyberg Child Behaviour Inventory 69  
    Asthma Questionnaire 69  
Procedure 70
List of Tables
Paper One
  Table 1- Summary of biopsychosocial factors influencing asthma outcomes

Paper Two
  Table 1 – Demographic characteristics of the sample
  Table 2 – Asthma characteristics of the sample
  Table 3 – Number of seminars viewed
  Table 4 – Predictors of engagement: Results from Binary Logistic Regression

List of Figures
Paper One
  Figure 1: A biopsychosocial model of asthma
Paper Two
  Figure 1: Attrition Rate for Whole Sample

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Abstract

This thesis follows the paper based format in that Papers One and Two are stand-alone papers prepared for submission for Clinical Child and Family Psychology Review and the Journal of Clinical Child and Adolescent Psychology respectively. The relevant submission guidelines are included in the appendix (Appendix 1).

Asthma is the most common childhood chronic illness affecting an estimated 1.1 million children in the UK. A substantial body of research has shown that asthma prevalence and morbidity rates are associated not only with physiological factors but also with environmental and psychosocial factors. Identifying modifiable psychosocial variables involved in the expression and outcome of asthma in children enables identification of how and where interventions could be targeted. Two papers are presented in this thesis, which aims at contribute to research in this area followed by a critical evaluation of the research process, relevance and implications of the presented papers.

Paper One is a review of the literature highlighting the biopsychosocial variables involved in the onset and development of childhood asthma. A model is proposed which aims at demonstrate the bidirectional influence of many variables thought to be involved in paediatric asthma expression. One significant area within the literature highlights the extent to which behaviour problems are elevated in asthmatic children. The prognosis for children who develop significant behaviour difficulties is poor.

Research has shown that the quality of parenting a child receives has a significant impact on both the child’s well-being and development. Literature included in Paper One highlights the relationship between asthma and parenting. Caregivers of asthmatic children have been shown to be more hostile and critical compared with caregivers of non-asthmatic children.

Intervening early with families to promote warm, consistent and positive parenting is considered one of the most effective ways to treat behaviour difficulties. Parent training programmes have emerged as the most efficacious method of intervening with and treating child behaviour difficulties and enhancing parenting skills. In spite of their demonstrated effectiveness, engagement with programmes is often poor. As a result researchers have developed self-directed and web-based interventions. Despite their apparent benefits, uptake and continued engagement remains low.

Paper Two aimed at examine whether providing asthma specific information enhanced engagement with a Triple P web-based intervention and identify any pre-treatment variables that predicted engagement. The final section, the Critical Evaluation, aimed at place the research in the wider context, consider the findings from both papers, highlight additional and unexpected outcomes and discuss the implications for future studies and limitations of the thesis.
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Onset and development of paediatric asthma: a review of the biopsychosocial variables involved
Abstract

Objective: To present an overview of the biopsychosocial variables involved in the onset and development of childhood asthma.

Method: Published reviews and empirical studies were critically reviewed to identify research findings in order to highlight the psychosocial variables associated with paediatric asthma.

Results: Asthma onset results from a series of complex interactions between genes and the environment. The course of childhood asthma is influenced by numerous biopsychosocial variables. Stress plays a significant role in mediating asthma symptoms exacerbation. Consequently, stress is linked with poorer child and caregiver psychological well-being and family functioning.

Conclusions: Biological, environmental, psychological and social factors influence, often reciprocally, the onset and course of paediatric asthma.

Keywords: asthma, children, families, biopsychosocial, behavioural difficulties
Introduction

Asthma is the most common childhood chronic illness (National Heart, Lung and Blood Institute, 2007). In past decades, incidence of paediatric asthma have risen dramatically (Halfon & Newacheck, 2010; van Cleave, Gortmaker, & Perrin, 2010). Asthma is a chronic inflammatory disease of the airways characterised by acute episodes of wheezing, coughing and shortness of breath. In addition to physical symptoms, paediatric asthma has been associated with elevated psychosocial difficulties (Collins et al., 2008). In light of high prevalence rates and the significant costs to children, their families and communities, many researchers have examined factors that influence the onset, development and progression of asthma in children.

The aim of this narrative review of the literature was to highlight the way in which biological, psychological and social factors (referred to in the review as biopsychosocial factors) interact and influence the onset and development of paediatric asthma. The review concludes by proposing an interactive model of asthma which integrates biopsychosocial variables (Figure 1). In order to build the model, relevant literature in a number of areas is examined. First, the onset of asthma is discussed by way of genetics and environmental triggers. Then, the relationship between stress (in both children and caregivers) and asthma is discussed, followed by the influence of caregiver psychological functioning. Consequently, the role of parenting styles and the family environment on asthma are presented. Finally, child behaviour problems, both internalising and externalising difficulties are considered.

Taken together the review and model aim to facilitate an understanding of the multifactorial nature of asthma and the reciprocal nature of many of the biopsychosocial variables influencing asthma expression. Particular emphasis is placed on psychosocial factors throughout the review. Implications for future research
are considered at the end of the review. It is acknowledged the model may not reflect the pathway for every child with asthma.

The review was limited to papers published in English and included review articles and empirical studies but not discussion papers. Research conducted within the last 15 years was the primary focus although a small number of earlier seminal references were included. A number of methods were used to identify papers included in this review. Computerised searches were completed using Web of Knowledge (MEDLINE; National Library of Medicine, Washington, DC) with combinations of nine pertinent keywords (Asthma, child*, behaviour problems, parenting, psychopathology, adjustment, stress, family, family environment). Review articles were searched and reviewed for relevant citations. Reference sections of significant papers were searched and relevant references reviewed. Finally, additional literature was drawn on and searches made in order to develop the model and arguments presented.

**Psychosocial Models of Asthma**

For a significant period of time, etiological theories of asthma were dominated by psychosomatic models (Gregerson, 2000). The development of the Psychosomatic Family Model (Minuchin et al., 1975) advanced the field by identifying that disease activity in children could be affected by, as well as affect, the functioning of the family. The Psychosomatic Family Model had a number of limitations and as a result additional models have subsequently been proposed (e.g., Kaugars, Klinnert, & Bender, 2004; Wood et al., 2007; Wood et al., 2008). However, it is now widely recognised that asthma is influenced by biological, psychological and social factors (Kaugars, Klinnert, & Bender, 2004). The aim of this section in the review is to briefly consider some psychosocial models of asthma that have been proposed and consider some of their limitations.

In a review of the literature, Kaugars et al. (2004) demonstrated the influence of families and family characteristics on asthma expression. Kaugars et al. suggested
that family factors can impact directly on asthma outcomes and highlighted the importance of also recognising the indirect pathways of influence. The authors indicated that family factors were associated with poorer asthma management behaviour which was associated with greater asthma symptoms.

Wood and Miller (2006) proposed a biobehavioural model which demonstrated that negative family emotional climate (NFEC) predicted child depressive symptoms by way of relational insecurity with the primary caregiver. Further to this, Wood et al. (2008) conducted a laboratory based study in order to test the biobehavioural model in relation to asthma. The study found that observed NFEC predicted child depression which consequently predicted asthma severity. The study also indicated that in their sample parent-child relational security inversely predicted depressive symptoms.

Additionally, Wood et al. (2007) suggested a conceptual model which postulated NFEC influenced asthma severity through child depressive symptoms, anxiety and emotional triggering. A subsequent empirical study provided partial support for the model in that the results demonstrated NFEC was associated with depressive symptoms which were then associated, via emotional triggering, with asthma severity.

A limitation of many of the models in this area is their cross-sectional nature which does not enable bidirectional and/or temporal influences to be taken into account. Terms, such as ‘family characteristics’ and ‘NFEC’, broadly encompass a large number of psychosocial variables often without considering how variables influence each other or the potential cumulative impact of such variables on asthma expression. Environmental factors, such as allergens and infections are related to greater incidence of asthma (e.g., Klinnert et al., 2001; Sandel & Wright, 2006), but are often not integrated into the models. A more comprehensive model linking genetic, socioeconomic status (SES), family, caregiver, environmental and child factors is missing from the literature. The remainder of this review aims at re-addressing this by examining literature in such areas and consequently proposing a model.
Asthma Onset

Asthma is thought to result from complex interactions between multiple genes and the environment (Sleiman & Hakonarson, 2010). A number of different types of cells and mediators interact and result in airway inflammation and hyper-reactivity, both of which are consistently observed in individuals with asthma. The following section considers factors thought to be involved in the onset of paediatric asthma. First, literature on genetics and asthma is reviewed followed by examining research in the area of environmental factors and asthma.

Genetics.

Family studies using twin and parent-child designs suggest a genetic basis to asthma (Sears, Holdaway, Flannery, Herbison, & Silva, 1996; Steinke & Borish, 2008). However, many studies examining genetic influences acknowledge the difficulties in identifying the specific genes involved in asthma. For example, a recent review by Ober and Hoffjan (2006) determined six studies which identified 15 genes related to asthma but a further ten studies in which ten genes were identified. As a result many studies statistically assign genetic contribution without identifying specific genes but figures vary greatly between studies. For example, prevalence rates of 28% were reported by Klinnert et al. (2001) in children at genetic risk of developing asthma, whereas Steinke and Borish (2006) reported rates of 15%. The discrepancies are thought to result from variability in the methodologies and designs of studies, which are often not easily replicated. It appears that multiple genes contribute to the asthma phenotype (Sly, 2011), but the relatively low concordance rates found in family and twin studies suggest that genetics alone can not adequately explain asthma onset.
It is therefore necessary to consider the influence of the environment on paediatric asthma onset. Recently researchers have considered epigenetics as a potential explanation for the role of the environment in the expression of asthma. Epigenetics is the term used to describe changes in phenotype or gene expression by mechanisms other than modification of the underlying DNA sequence in response to environmental effects (Durham, Chou, Kirkham, & Adcock, 2010; Tremblay, 2010). The mechanism by which specific environmental factors alter gene expression and their subsequent role in the expression of asthma is undergoing significant investigation (Sly, 2011). Whilst in relative infancy within the asthma field, epigenetics potentially provide a powerful explanation for the associations observed between the environment and asthma expression.

**Elements of the environment.**

Research has identified a number of genetic predispositions that contribute to the development of asthma by way of predisposing individuals to triggers within their environment (Sly, 2011). A prospective study of children at genetic risk of developing asthma found that frequent infections during the first year was the strongest predictive risk factor for developing asthma by age three (Mrazek et al., 1999). Further, the study identified that elevated total serum IgE levels (associated with allergic sensitisation) were associated with asthma development. Elevated IgE levels contribute to the development and continued airway inflammation via reactions involved in airway inflammation. Respiratory viral infections and allergic sensitisation are thought to be examples of predisposing factors associated with the development of asthma (Sandel & Wright, 2006).

Mrazek et al. (1999) also found that parenting difficulties at three weeks of age and eczema were associated with asthma onset even after controlling for both raised IgE levels and repeated respiratory infections. This same birth cohort was followed until age eight (Klinnert et al., 2001). Three variables (elevated IgE, repeated respiratory
infections and parenting difficulties) were significantly associated with asthma at age 6-8 years. Early parenting difficulties have been identified in other studies as a risk factor in the development of asthma (e.g., Calam et al., 2003).

The design and length of time the sample were retained in Mrazek et al.’s (1999) study makes this particularly significant. The samples in Mrazek et al.’s and subsequently Klinnert et al.’s (2001) study were predominantly middle or upper class (98%) and from a white ethnic background (93%). Studies have identified differences in socio-economic factors and incidence of asthma with greater occurrence of asthma being observed among ethnic minorities and lower SES (Joseph, Ownby, Peterson, & Johnson, 2000; Miller, 2000). It is therefore important to consider the role of socioeconomic factors in the onset of asthma.

**Socioeconomic factors and asthma.**

Observational studies have demonstrated that children living in inner city areas with greater exposure to allergens and pollutants have more severe asthma symptoms than their peers (Sandel & Wright, 2006). Likewise exposure to tobacco smoke, particularly maternal smoking, has been demonstrated to alter lung functioning and is associated with asthma symptoms (Victorino & Gauthier, 2009). Poor housing conditions have been associated with increased incidence of paediatric asthma (Suglia, Duarte, Sandel, & Wright, 2009). Nikiéma, Spencer, and Séguin (2010) found that relative poverty during a child’s early life significantly increases the likelihood the child will experience asthma attacks. Levels of allergens, pollutants and irritants are elevated in inner city areas and in poorer quality housing. It is perhaps unsurprising therefore that asthma is observed more frequently in children living in such environments.

A number of studies examining the association between the environment and asthma have been retrospective in their design and relied on caretaker report, thereby increasing the risk of reporter bias. Moreover, the presence of parental asthma is
often not controlled for, hence it is unclear to what extent environmental variables may correlate or interact with genetic risk factors. The heterogeneity observed in the design of the studies is worth considering because it may impact upon the findings.

Emotional factors within an individual’s environment can also trigger symptoms of asthma. Suglia et al. (2009) demonstrated how levels of domestic violence in the home were associated with asthma onset. Increased exposure to violence has been shown to predict increased asthma symptoms in children in other studies (e.g., Wright et al., 2004). Sandel and Wright (2006) proposed that emotional reactions mediate the pathway between adverse living conditions and childhood asthma. Emotional reactions, particularly stress, have been increasingly investigated as a possible mediator between environmental factors and asthma (Sandel & Wright, 2006; Suglia et al., 2009; Wright, 2005; Chida, Hamer, & Steptoe, 2008). The section immediately following aims at considering the role of stress in paediatric asthma.

**Stress and its influence on paediatric asthma**

Stress can result from major discrete events or as a result of exposure to frequent difficulties and challenges experienced over a prolonged period of time (Israel, Farquhar, Schulz, James, & Parker, 2002). Likewise children can experience stress directly following a stressful event and indirectly via their caregiver (Sandel & Wright, 2002). Children experiencing stress also experience disturbed balance in their immune regulatory systems (Wright, 2008). Such defensive responses to stress are vital in the short term but may result in long term damage if activated frequently (Wright, 2008). Stress has been associated with an exacerbation of asthma symptoms in children (Klinnert et al., 2001). Evidence indicates that chronic stress may irreversibly affect neurobiological pathways significantly increasing the likelihood the child will experience asthma symptoms into adulthood (Wright, 2008).

Literature attempting to decipher the direction of the relationship between stress and asthma symptoms indicate stressful situations appear prior to the exacerbation of
symptoms (e.g., Klinnert et al., 2001; Sandberg et al., 2000; Wright et al., 2002). For example, caregivers who retrospectively reported feeling more stressed in the previous month noted more wheeze related symptoms in their infant in the following two months (Wright, Cohn, Carey, Weiss, & Gold, 2002). Caregivers’ perception of stress early on in the infant’s life (up to three months old) has been significantly linked with repeated infant wheeze even when factors associated with stress and wheeze (such as parental wheeze) are controlled for (Wright et al., 2002). Caution is advised given the single informant design in Wright et al.’s study.

Experiencing multiple or prolonged chronic stressors appears to exacerbate asthma symptoms further (Sandberg et al., 2000; Suglia et al., 2009). Sandberg et al. (2000) revealed children who experienced stressful life events were at an increased risk of asthma attacks in the subsequent weeks. The prospective design of the study conducted over a prolonged period of time (18 months) increased the validity of Sandberg et al.’s findings.

Sandberg et al.’s (2000) study included a small group (n=20) who experienced significantly more long term adversities compared with the remainder of the sample. The types of adversities between the two groups were similar but the children experiencing chronic adversity were on average five times more likely to live in poor quality housing, have a caregiver with significant difficulties and have difficulties at home and at school. Sandberg et al. reported that children in the chronic adversity group experienced acute asthma symptoms almost immediately following a negative life event, whereas a delay was noted among the remaining participants. Whilst the small number of participants included in this subgroup was too small to draw firm conclusions, this finding, based on prospective work, is significant within the body of research.

As mentioned previously, children experiencing psychosocial stressors, such as domestic violence, are more likely to display exacerbated asthma symptoms. Additionally it is posited that asthma symptoms themselves could serve as a chronic
stressor for the child. Therefore, the role of stress in paediatric asthma expression is an important one. Although the direct pathway between stress and asthma is currently not well understood, an association exists between the two. Animal studies have highlighted the relationship between stress and illness. Whilst studies examining the role of asthma and childhood stress are in their relative infancy, results indicate stress may impact via a similar pathway (Sandel & Wright, 2006).

**Stress and burden of caring for an asthmatic child.**

Providing 20 or more hours of care a week for an ill family member increases the likelihood a carer will experience stress (Hirst, 2005). Grant et al. (1999) conducted a large survey of school children and reported that over 40% of those with diagnosed asthma experienced sleep disturbances of more than 1-2 nights per week and 86% had an acute care visit in the past 12 months (Grant et al., 1999). Currently asthma accounts for the greatest percentage of General Practitioner (GP) and hospital visits in young children (Morawska, Stelzer, & Burgess, 2008).

Caregivers of asthmatic children are required to take much of the responsibility for the management of asthma in young children, which can include regular monitoring of symptoms, appropriate use of medication and regular cleaning to remove allergens (Fiese, Winter, Anbar, Howell, & Poltrock, 2008). Caring for an asthmatic child and managing the daily demands of the symptoms can be categorised as a burden and life stressor for caregivers (Fiese et al., 2002; Shalowitz, Berry, Quinn, & Wolf, 2001). Caregiver burden negatively impacts upon the caregiver and child.

Caregiver burden has been associated with non-compliance with asthma medication regimes in children. Consequently, this has been linked with increased hospital admissions and Accident and Emergency (A&E) visits (Rand, 2002). Increased hospital admissions and contact with medical professionals are likely to increase caregivers’ perceptions of asthma related burden, places additional strain on familial
resources, and acts as a further stressor for the child and caregiver (McQuaid et al., 2005; Fiese, Wamboldt, & Anbar, 2005).

Burden reduces caregivers’ ability to provide warm, responsive care (Wamboldt, Wamboldt, Gavin, & McTaggart, 2001). In Sandberg et al.’s (2000) study, the ‘chronic adversity stress’ group reportedly received poorer quality parenting. It is hypothesised that the chronic stress experienced by the child in Sandberg et al.’s study was also experienced by the caregiver, seemingly reducing the quality of parenting they were able to provide, and their ability to buffer children from adverse experiences.

Receiving poor quality parenting acts as an additional stressor for the child (Wamboldt et al., 2001) which, in turn, is likely to result in further exacerbation of asthma symptoms.

Studies have demonstrated that the onset of asthma is seen significantly more frequently in children who experience stressors in their environment (Shalowitz et al., 2006) and it is proposed that caregiver functioning could mediate this pathway (Klinnert et al., 1994).

**Caregiver Psychological Functioning**

Two comprehensive reviews of the literature (Celano, 2006; Kaugars et al., 2004) highlighted that asthma symptoms are exacerbated and poorer outcomes observed when caregiver psychological functioning is reduced. Caregiver psychological functioning influences the overall functioning of the family (Kaugars et al., 2004). This section aims at reviewing the literature examining caregiver psychological functioning and the link with childhood asthma. This is done by considering influences on caregiver psychological functioning with an emphasis on the impact of depressive symptomatology.

**Depression.**
Depression is one of the most prevalent psychiatric illnesses, particularly in females of childbearing age (Burke, 2003). Maternal depressive symptoms present during a child’s early life have adverse consequences on the psychological adjustment of the child (Lovejoy, Graczyk, O’Hare, & Neuman, 2000; Shalowitz et al., 2001). A number of sociodemographic factors, such as social support, ethnicity and household income, have been linked with higher prevalence of depression and are considered life stressors (Heneghan, Silver, Bauman, Westbrook, & Stein, 1998; Kub et al., 2009). A significant association exists between experiencing life stressors and depressive symptoms (Shalowitz et al., 2006).

A number of variables considered life stressors and therefore risk factors in the development of depression have also been associated with greater incidence of asthma in children (e.g., Joseph et al., 2000; Miller, 2000; Sandel & Wright, 2006). An association exists between caregiver depression and paediatric asthma (Suglia, Ryan, Laden, Dockery, & Wright, 2008; Wright, 2006). Shalowitz et al. (2006) reported that caregivers experiencing greater levels of stress as a result of caring for a child with asthma are at greater risk of experiencing depressive symptoms. It should be noted that participants in Shalowitz et al.’s study expressed an interest in being involved with asthma related research. Motives for taking part in research and potential self-selection biases should be considered as they may confound findings. Moreover, the definition of asthma used in studies needs to be considered. For example, Shalowitz et al. (2006) included people who had been ‘diagnosed by a physician’ or had ‘at least one symptom consistent with asthma but no diagnosis’, i.e., they relied on caregiver self report. Asthma diagnosis inclusion criteria appear inconsistent across studies and will be discussed in more detail at the end of the review.

In one study, 47% of mothers with asthmatic children reported clinically significant levels of depression (Bartlett et al., 2001). The study by Bartlett et al. examined emergency asthma related hospital visits for asthma related care in young school aged children. The American study found that six months after their initial report,
mothers with high levels of depressed symptoms were 40% more likely to have taken their children to the Emergency Room (ER). After controlling for asthma symptoms, mothers with high levels of depressive symptomatology were still 30% more likely to report ER visits. Increased hospital visits add to the stress and burden experienced by the child and caregiver which consequently increases asthma symptoms and could further increase depressive symptoms in caregivers.

Bartlett et al. (2001) conducted telephone interviews, primarily with mothers to ascertain their psychological well-being. It is known that self-reporting of depressive symptoms will not always capture the extent of the difficulties and therefore may not be an accurate reflection (Bartlett et al., 2004). Of the sample, 98% were ethnic minorities living in the inner city. Both factors are associated with greater incidence of asthma and whilst the findings may highlight the needs of this group (Shalowitz et al., 2001), they may not be generalisable across populations.

A subsequent study using the same cohort reported that depressed caregivers found it more difficult to manage their child’s medication regime, resulting in missed doses and incorrect inhaler use (Bartlett et al., 2004). This has also been identified with caregivers who are more stressed (Bartlett et al., 2001). Depressed caregivers rated their ability to manage their child’s asthma symptoms less highly compared with non-depressed caregivers (Bartlett et al., 2004). It may be expected that children of caregivers experiencing depressive symptoms would have asthma that was less well managed. Increased ER visits have been directly associated with poorer managed asthma symptoms (Bartlett et al., 2004). The eligibility criteria in Bartlett et al. (2001 and 2004) required participants to have had at least one ER visit as a result of asthma in the previous six months and asthma symptoms in the children were required to be ‘significant and persistent’. Therefore, the eligibility criteria in the study may have confounded the findings.

Poorly managed symptoms may result in further deterioration of the regulatory and immune systems (Wright, 2008). This enables predisposed genetic sensitivities to be
triggered by environmental and/or emotional factors, resulting in an exacerbation of asthma symptoms. Consequently increased asthma symptoms contribute to the burden and stress experienced by the caregiver and child, making it more likely the child will have poorer managed symptoms and require increased medical intervention.

Kub et al. (2009) reported 25% of mothers with a child with asthma experienced depressive symptomatology. Kub et al. found that acute life stressors were not associated with depressive symptoms but chronic stressors were. Bartlett et al. (2001) and Kub et al. both found significant number of caregivers with depressive symptoms but there is a significant difference in the number who reported depressive symptoms between the studies. Both studies used self report and recruited from A&E departments based in inner city areas. However, Bartlett et al. used the shortened CES-D Scale to measure depressive symptomatology and Kub et al. used the full version. Although it has been shown there is good predictive accuracy between the two versions (Anderson, Mamgren, Carter, & Patrick, 1994; Irwin, Artin, & Oxman, 1999) this difference may account for some of the discrepancy. Additionally, Kub et al. recruited mothers with asthmatic children aged 6-12. The ages of the children in Bartlett et al. study were younger. Caring for younger children with asthma is more stressful and burdensome (Fiese et al., 2008) and therefore depressive symptoms are seen more frequently. This may account for the difference between the samples.

Anxiety.

In addition to depressive symptomatology, increased levels of anxiety in caregivers of children with asthma have been reported (Silver, Warman, & Stein, 2005). A longitudinal population based study found a positive association between maternal anxiety during pregnancy and subsequent diagnosis of asthma in children (Cookson, Granell, Joinson, Ben-Shlomo, & Henderson, 2009). Cookson et al. reported that children with more severe asthma had caregivers with greater anxiety levels. The study examined maternal anxiety scores during pregnancy and subsequent diagnosis
of asthma in children at age seven and a half years. The authors proposed that parental psychological state is one pathway influencing childhood asthma expression. Cookson et al. was one of the first longitudinal studies to demonstrate a link between in-utero maternal distress and asthma although the design of the study meant causality could not be inferred.

In Cookson et al.’s (2009) study, severity of asthma symptoms was unrelated to depression. This is an interesting finding given the volume of studies reporting a postnatal association between childhood asthma and caregiver depression. As with many longitudinal studies, there was considerable attrition over time resulting in lost data. Cookson et al. reported that much of the lost data was participants from socially disadvantaged backgrounds and those with higher depression scores. A significant loss of data from a sub-group of people introduces the possibility of selection bias. It is interesting that the demographics of those lost from the study have been shown in other studies to have children with elevated asthma symptoms.

Silver et al. (2005) examined postnatal caregiver anxiety and asthma in children and found increased levels of anxiety in caregivers of children with asthma. Participants were required to have a child who had been hospitalised for asthma within the previous year and participants were recruited via an unrelated asthma trial. There is a potential bias in the sample as a result of the recruitment method because it may be expected that caregivers with depressive symptoms or high levels of stress may not be motivated to participate in a study. It could also be hypothesised that more anxious caregivers would take their child to hospital more frequently than non-anxious caregivers and therefore be over-represented in the sample.

The stress and burden of caring for a child with asthma may contribute, in addition to other environmental and emotional stressors, to poorer caregiver psychological functioning (Shalowitz et al., 2006). Moreover lower perceived levels of self efficacy in managing their child’s asthma would be likely to have some bearing on caregivers mental health. However, an equally valid argument can be made in the opposite
direction. Caregivers with poorer mental health may be less responsive to their child’s needs and less able to buffer their child effectively from adverse life events, which act as stressors for the child exacerbating their asthma symptoms. Additionally caregivers with poorer psychological functioning are reported to be less compliant with their child’s medication regime resulting in asthma that is less well managed, requiring increased hospital visits (Rand, 2002). The result is increased stress and burden for the caregiver, further reducing their psychological functioning.

The literature examining caregiver mental health clearly indicates that poorer caregiver psychological functioning negatively impacts on the child’s well-being and asthma symptoms. Poorer quality parenting has been cited in the literature as a mechanism between caregiver depression and child well-being (Downey & Coyne, 1990). It therefore seems important to examine the literature surrounding caregiver psychological functioning and the impact on children and the family.

**Parenting Styles and Family Environments**

Increased stress and decreased caregiver psychological functioning is associated with asthma in children (Bartlett et al., 2001; Shalowitz et al., 2006). Literature highlights the detrimental effect of stress, poorer psychological functioning and specific environmental factors (such as poor quality housing) on family resources and parenting.

The quality of parenting a child receives has a marked impact on their development and well-being (Morawska & Sanders, 2006). Optimal parenting styles are considered to be a combination of warm responsiveness to the child’s needs whilst providing consistent boundaries and discipline. Alternatively, poor supervision, hostility and conflict have been identified as significant risk factors for children developing various forms of psychopathology (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Repetti, Taylor, & Seeman, 2002). This section aims at considering the social environment, focusing on parenting styles and narratives of family functioning.
Caregiver depression and parenting style.

Maternal depression has been consistently associated with unfavourable childhood outcomes (Cummings & Davies, 1994; Goodman & Gotlib, 1999). A comprehensive review identified that children exposed to postnatal depression experienced adverse outcomes in a number of areas (Murray & Cooper, 2003). Studies attempting to understand the mechanism by which caregiver depression is associated with adverse child outcomes have increasingly focused on the relationship between the caregiver and the child (Stanley, Murray, & Stein, 2004).

Observational studies of mothers with depressive symptomatology have indicated their parenting styles are frequently withdrawn, hostile, intrusive, insensitive, coercive and unresponsive (Cohn, Cambell, Matial, & Hopkins, 1990; Celano et al., 2008). The use of coercive techniques for managing children’s behaviours are thought to contribute to greater levels of child externalised behaviours (Downey & Coyne, 1990). Depressed mothers reportedly communicate less effectively and are less affectively attuned with their infants (Stanley et al., 2004). The association between caregiver depression and child developmental outcomes may not be unidirectional as poorer developmental outcomes likely adversely contributes to caregiver depressive symptoms (Lovejoy et al., 2000).

A meta-analysis found a moderate association between caregiver depressive symptoms and negative parenting behaviours (hostile and coercive behaviours particularly) with a small to moderate effect in the domain of disengaged behaviour and a small effect for positive interactions (Lovejoy et al., 2000). Depressed mothers perceived themselves as having more parenting difficulties than non-depressed mothers (Lovejoy et al., 2000). Lovejoy et al. concluded that depression was more strongly associated with negative parenting behaviours. Economic stress was associated with a reduction in positive parenting behaviours although the direction of
the relationship was unclear. This is a significant finding given the proportion of children with asthma from lower SES backgrounds.

There has been a frequent assumption in the literature that parenting styles will match the symptoms of depression, i.e., sad mood, loss of interest, low energy and poor concentration (Lovejoy et al., 2000). If this were true, it may be expected that the largest effect size in Lovejoy et al.'s study would be in the domain of disengaged behaviour. The authors tentatively considered whether the negative parenting behaviours were the result of caregiver distress rather than as a result of depression per se. Caregivers of children with asthma experience greater levels of parenting distress (Wiener, Vasquez, & Battles, 2001) and depressive symptoms (Bartlett et al., 2001). Therefore it may be expected that caregivers of asthmatic children demonstrate more negative parenting behaviours compared with caregivers of non-asthmatic children.

Interestingly, Lovejoy et al. (2000) reported that the effect size for negative parenting behaviour was greater when caregivers were rated as depressed at the point of data collection compared with caregivers who had experienced a depressive episode at some point over their lifetime. Both were rated as more negative than the control group. Disengaged behaviours were seen most frequently with mothers of young children although half of the studies examining disengaged behaviours were conducted with mothers of infants, therefore it is likely that including studies with caregivers of older children with asthma may alter this finding.

It has been suggested that negative parenting behaviours partially mediate the relationship between maternal depression and internalising symptoms (e.g., anxiety and depression) observed in children with asthma (Lim, Miller, & Wood, 2008). Child internalising symptoms mediated the association between maternal depression and negative parenting, and maternal depression and asthma expression (Lim et al., 2008). The authors concluded that maternal depression was directly linked with child psychological dysfunction and indirectly linked via negative parenting.
The focus of Lim et al. study was on maternal depression rather than other aspects of caregiver well-being which have been associated with asthma expression (e.g., Silver et al., 2005; Cootson et al., 2009). The design of the study did not allow the direction of influence between maternal depression, negative parenting and child psychological dysfunction to be identified, although the authors reported it was likely to be bidirectional. Moreover, Lim et al. recruited from an inner city hospital, which as discussed previously, may have resulted in a sample with poorer managed asthma from the outset (Bartlett et al., 2004). The study was laboratory based and therefore may not accurately reflect parenting in real life situations.

**Parenting and Families.**

A number of studies have reported finding a positive correlation between the level of expressed emotion (EE) observed in families and relapse rates in psychiatric disorders (e.g., Doherty et al., 2011). EE is defined as critical, hostile or emotionally over involved attitudes toward an individual by family members or close associates (Doherty et al., 2011). It has been suggested that critical attitudes and negative environments in high EE families act as stressors for patients, increasing the likelihood of future relapse. Applying this model to asthma, the assumption is that high EE, particularly around critical attitude and/or emotional over-involvement, results in the asthmatic child experiencing prolonged stress which may lead to further asthma attacks or an exacerbation of asthma symptoms (Schöbinger, Florin, Reighbauer, Lindemann, & Zimmer, 1993).

Schöbinger et al. (1993) demonstrated that mothers of asthmatic children make more critical remarks than parents of healthy children. Additionally, fathers of asthmatic children have been found to demonstrate a critical attitude and make longer sentences containing more negatives than fathers of healthy children (Schöbinger, Florin, & Zimmer, 1992). Caregivers displaying more negative verbal behaviours had children with higher IgE levels (Schöbinger et al., 1993). Elevated IgE levels are
associated with continued airway inflammation and consequently an exacerbation of asthma symptoms (Klinnert et al., 2001). Although IgE levels were only assessed in 61% of children in the sample, the finding is noteworthy because it indicates a possible pathway by which a critical family environment could result in elevated asthma symptoms.

Elevated negative verbal behaviours displayed by fathers were not associated with raised IgE (Schöbinger et al., 1992). It is possible this is explained by another outcome within the study which found that fathers with the most negative verbal interactions had the least face-to-face time with their child. Frequently, mothers are the primary caregiver and spend more face-to-face time with their children (Grietens et al., 2004). Potentially the impact of prolonged time spent with a parent with high EE increases IgE levels in children. Elevated stress levels and symptoms of depression have been associated with caregivers of children with asthma and with more negative parenting behaviours. This potential pathway goes some way to explaining how children with asthma have raised IgE levels which in turn are associated with exacerbated asthma symptoms.

In both studies (Schöbinger et al., 1993, 1994), the healthy control group was recruited via the asthmatic participants who were asked to “motivate friends and acquaintances to participate”. This may make the sample less representative but may increase comparatability as people often nominate those similar to themselves. Both studies compared asthmatic children and healthy children. Parents of healthy children may have less reason to make critical remarks and it is questioned whether comparing asthmatic children and a normative sample would have found the same results. No details were provided on sociodemographic variables of the sample, which have been linked with asthma onset in other studies. Additionally the mothers and fathers used in the two studies were ‘healthy’, but it is unclear whether this meant physically healthy, i.e. no chronic disease or atopic illness, or a more thorough definition.
Parental critical attitude has been directly associated with the number of times a child is hospitalised as a result of asthma (Wamboldt, Wamboldt, Gavin, Roesler, & Brugman, 1995). The number of times a child with asthma is hospitalised has also been associated with higher levels of depression in caregivers (Bartlett et al., 2004; Kub et al., 2009). Depressed caregivers display more negative parenting behaviours including hostility and coercive behaviours (Lovejoy et al., 2000). It is unclear whether the samples in Schöbinger et al.’s (1992, 1993) and Wamboldt et al.’s (1995) studies had raised levels of depression.

Wamboldt et al. (1995) also found that asthmatic adolescents whose caregivers were rated as highly critical demonstrated lower compliance with asthma medication. The design of the study prevents causality from being examined but it is possible caregivers and children become caught in negative interactions, whereby parental critical attitudes are directly related to non-compliance with medication but may also occur as a result of a child refusing to take their medication. The sample in Wamboldt et al.’s study was recruited from Immunology and Respiratory inpatient services and eligibility criteria required a diagnosis of severe asthma. Only including participants with severe asthma from inpatient services skews the sample and is suggestive of poorly managed asthma from the outset which may compound findings.

**Family Environment.**

Environments that are structured and organised with low levels of conflict are associated with more controlled asthma symptoms (Meijer, Griffioen, Vannierop, & Oppenheimer, 1995). Children with asthma living in families who report more conflict and strain are hospitalised more frequently (Chen, Bloomberg, Fisher, & Strunk, 2003). An analysis of narrative responses in families indicated it is family functioning, and not asthma symptoms, that predicted child behaviour difficulties (Spagnola & Fiese, 2010). Dysfunctional family interactions significantly impact on the course of atopic illnesses, such as asthma (Gustafsson, Kjellman, & Björkstén, 2002).
When toddlers with symptoms of atopic illness were exposed to regular positive family interactions, they were significantly less likely to display atopic illness symptoms by three years old (Gustafsson et al., 2002). Alternatively, when dysfunctional patterns were observed more frequently, symptoms of atopic illness at age three were more common. Gustafsson et al. posited that dysfunctional interactions diminished the capacity of the family to deal with stress thereby creating a vicious cycle of illness symptoms, stress and negative parenting.

It is proposed here that in families that function well, caregivers are less stressed, more responsive and feel better able to manage their child’s needs and buffer them from any adverse experiences. In turn, children experience less stress and as a result their asthma symptoms are reduced, minimising the potential for asthma related stress in caregivers.

The quality of parenting children receive has a major impact on children’s well-being (Morawska & Sander, 2006; Stanley et al., 2004). Research indicates that children with asthma will experience more negative behaviour compared with non-asthmatic children. Negative parenting behaviours have been consistently identified as significant risk factors in the development of emotional and behavioural difficulties (e.g., Collins et al., 2000; Repetti, Taylor, & Seeman, 2002).

The impact of asthma on the child’s behavioural and emotional adjustment

A comprehensive meta-analysis (McQuaid, Kopel, & Nassau, 2001) revealed that emotional and behavioural difficulties are more pronounced in children with asthma compared with non-asthmatic children. Elevated emotional and behavioural problems have been found in other studies (Blackman & Gurka, 2007; Collins et al., 2008). McQuaid et al.’s reported that when assessed by their caregivers, levels of internalising difficulties (anxiety, depression and somatic complaints) were greater than externalising difficulties (aggressive and delinquent behaviour). However,
children with asthma did not perceive themselves as being more depressed or anxious than their peers.

A number of methodological difficulties were identified in the studies included in McQuaid et al. (2001) review. For example, in many studies, the sample sizes were small and samples of convenience. A number of the studies did not consider the influence of sociodemographic factors or genetics on asthma and the majority relied on caregiver report rather than multiple informants, which is considered a more accurate method of assessment. Moreover, the assessment tool used by many studies included in the review was the Child Behaviour Checklist (CBCL; Achenbach, 1991). Reichenberg (2005) suggested not to exclusively utilise the CBCL to assess behaviour problems in children with asthma. The remainder of this section aims at consider the direction of influence between asthma and child behaviour difficulties.

**Asthma and the direction of influence on child behaviour difficulties.**

Stevenson (2003) concluded that elevated levels of behaviour problems preceded asthma onset. The author examined 150 children who developed asthma by 53 months and 115 children who had not, rating emotional and behavioural problems at 35, 41 and 53 months of age. Children were recruited between their first and second birthdays but those with severe behaviour problems were excluded from the study. It is unclear whether a birth cohort study and more inclusive criteria would have yielded different results.

The children in Stevenson’s study had atopic dermatitis and were at genetic risk of developing an atopic illness. Studies (e.g., Calam, Gregg, & Goodman, 2005) have indicated health problems of any kind are linked with poorer overall psychological functioning. Additionally, having more than one health problem is believed to negatively correlate with quality of life and well-being in children (Waters, Davies, Nicolas, Wake, & Lo, 2008). High levels of co-morbidity are observed in children with asthma and other atopic illnesses which may not be taken into account in many
studies. However, it is considered to be outside the scope of the current review to adequately consider the impact atopic dermatitis (or other chronic health conditions) may have on child and carer well-being.

A population based birth cohort study revealed children suffering recurrent wheeze symptoms and attacks at age three had significantly higher levels of behavioural difficulties compared with children with fewer symptoms (Calam et al., 2003). The study concluded that children with parentally reported respiratory problems at age three were at elevated risk of behaviour problems. The young age of the children meant the authors were unable to be certain whether symptoms observed reflected true asthma. Additionally, the study revealed that poorer caregiver mental health and family functioning was correlated with elevated child behaviour difficulties. Children at a genetically low risk of developing asthma were reported by their caregivers to experience more behaviour difficulties. This finding is particularly important given the large proportion of studies in this area that focus on children at a genetically high risk of developing asthma.

The initial research by Calam et al. (2003) did not allow the direction of causality between behaviour and asthma symptoms to be inferred. A follow up study (Calam, Gregg, Simpson, Woodcock, & Custovic, 2005) with the same cohort at age five concluded that behaviour problems preceded asthma diagnosis and were associated with the subsequent development of wheeze. This study did not have the confounding factors present in Stevenson's (2003) study but both studies concluded that behaviour problems precede asthma.

Diagnosing asthma in infants can be difficult (NHLBI, 2007) therefore whilst wheeze symptoms can be present throughout infancy (Gustafsson et al., 2002) and are associated with receiving a diagnosis, asthma is more commonly diagnosed in children aged between three to five (Klinnert, Kaugars, Strand, & Silveira, 2008; Wamboldt et al., 1995). It is suggested that recurrent wheeze present early in the child's life could be considered a stressor for caregivers, which consequently can
impact on their well-being and parenting and could result in elevated behaviour
difficulties prior to the diagnosis of asthma.

**Impact of behaviour problems on asthma.**

Associations between depression and anxiety in children and asthma symptoms by way of child behaviour have been reported (Lehrer, Feldman, Grardino, Song, & Schmaling, 2002). Depressive symptoms have been associated with increased airway resistance (Miller, Wood, Lim, Ballow, & Hsu, 2009). More severe depressive symptoms have been shown to impact to a greater extent on respiratory functioning (Miller et al., 2009). The impact of emotional states on the child’s biological systems may at least partly explain the associations between depression and paediatric asthma (Miller et al., 2009). Children with elevated behaviour difficulties reportedly are less compliant with their asthma medication regime (Wamboldt et al., 1995) which can result in an increase in asthma symptoms. Reduced compliance with medication is also observed in caregivers who are more stressed and those with more severe depressive symptoms.

**The Model**

This paper has reviewed a large number of studies examining biopsychosocial variables that may influence the onset and expression of childhood asthma. A model (Figure 1) is proposed that attempts to demonstrate diagrammatically a pathway to facilitate understanding of the way in which biopsychosocial factors influence paediatric asthma. The model proposes that genetics and the environment (potentially involving epigenetic processes) predispose and trigger onset of asthma symptoms. The model posits that stress experienced by the child plays a significant role in mediating the pathway. Experiencing chronic stress negatively impacts on the biological pathways involved in immune system regulation, often irreversibly. This makes it more likely a child will experience further asthma related symptoms.
Caring for a child with asthma is classified as a chronic stressor for caregivers (Shalowitz et al., 2001) and has been linked with poorer caregiver psychological functioning, in particular, increased levels of depression (Shalowitz et al., 2006). Poorer caregiver psychological functioning has been associated with a reduced ability to provide warm consistent parenting (Wamboldt et al., 2001). Poorer quality parenting is related to elevated emotional and behavioural difficulties in children (Wamboldt et al., 1995), which results in more severe asthma symptoms and consequently serves as a stressor for the child and caregiver. Many of the variables involved in the maintenance of asthma symptoms are bidirectional. A cyclical pattern is observed whereby variables, including asthma symptoms, exacerbate and are exacerbated. The key features of the model are presented in Table 1.

Figure 1. A biopsychosocial model of asthma
Table 1

Summary of biopsychosocial factors influencing asthma outcomes

<table>
<thead>
<tr>
<th>Genetics</th>
<th>Elements in the environment</th>
<th>Asthma symptoms</th>
<th>Asthma related stress</th>
<th>Caregiver psychological functioning</th>
<th>Parenting style and family environment</th>
<th>Child well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple genes</td>
<td>Biological triggers: Allergens, pollutants</td>
<td>IgE levels</td>
<td>Child: direct/ indirect</td>
<td>Depression</td>
<td>Critical attitude</td>
<td>Internalised</td>
</tr>
<tr>
<td>Epigenetics</td>
<td>Socioeconomic triggers</td>
<td>Chronic</td>
<td>Caregiver; burden and stress</td>
<td>Anxiety</td>
<td>High EE</td>
<td>Externalised</td>
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<tr>
<td></td>
<td>Emotional triggers</td>
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</table>

Methodological considerations

Across the literature there are a number of general methodological considerations. The definition of asthma severity utilised varies, as does the inclusion or exclusion of individuals with asthma symptoms but no formal diagnosis. Some studies use ‘healthy’ controls whereas others use normative samples. A meta-analysis indicated that the control group does not impact significantly on the findings (McQuaid et al., 2001) but it may influence levels of stress, highlighted in the current review as being an important influencing factor. Recruitment methods may confound findings, for example, many studies recruit from hospitals where it is anticipated asthma symptoms are already less well managed. Additionally, a large proportion of studies use participants living in inner city areas, from ethnic minorities with low SES or those with a high genetic risk of developing asthma which reduces the generalisability of findings. Information is often gathered by means of caregiver self-report. Self-report of asthma symptom severity often has a stronger correlation with behavioural difficulties compared with medical records (e.g., Klinnert, McQuaid, McCormick, Adinfoff, & Bryant, 2000). Self or caregiver report is often not considered the most accurate data gathering method.
despite being widely used (Kaugars et al., 2004). These considerations have implications for the results and conclusions drawn.

Implications

It is acknowledged that the model will not be true for all children with asthma. However, significant amounts of research have been published that highlight the extent to which biopsychosocial factors influence the course of asthma in young children. One particular strength of the current model is its ability to demonstrate the circular nature in which variables impact on each other and are involved in the expression of asthma. In order to further strengthen research in the area and develop the model, future research needs to elucidate causal relationships between variables rather than continuing to highlight relationships between factors, because plausible arguments can be made in either direction between many factors. Further studies examining the role of epigenetics in asthma expression may highlight novel areas for intervention.
References


Gustafsson, P., Kjellman, N-I., & Bjorksten, B. (2002). Family interaction and a supportive social network as salutogenic factors in childhood atopic illness. *Pediatric Allergy and Immunology, 13,* 51-57.


Sandel, M. & Wright, R.J. (2006). When home is where the stress is: expanding the dimensions of housing that influence asthma morbidity. *Archives of Disease in Childhood, 91*(11), 942-948.


Wright, R.J. (2011). Epidemiology of stress and asthma: from constricting communities and fragile families to epigenetics. *Immunology and Allergy Clinics of North America, 31*(1), 19+-.


<table>
<thead>
<tr>
<th>Study</th>
<th>Year published</th>
<th>Country</th>
<th>Type of paper</th>
<th>Sample and asthma etiology</th>
<th>Method</th>
<th>Main findings</th>
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</thead>
<tbody>
<tr>
<td>Wood et al</td>
<td>2008</td>
<td>USA</td>
<td>Empirical study</td>
<td>199 children with asthma aged 7-17 attending paediatric Emergency Departments as a result of asthma symptoms and their parent(s).</td>
<td>Children reported in interviews about parental conflict, parent-child relational security and depressive symptoms. Parents reported demographics, asthma history and symptoms.</td>
<td>Negative Family Emotional Climate (NFEC) predicted child depression which predicted asthma disease severity. Relational security inversely predicted depressive symptoms.</td>
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<tr>
<td>Wood et al</td>
<td>2007</td>
<td>USA</td>
<td>Empirical study</td>
<td>272 children with asthma aged 7-17 and their primary caregivers attending paediatric Emergency Departments as a result of asthma symptoms.</td>
<td>Children and primary caregivers together answered an Asthma Trigger Inventory. Children completed questionnaires on anxious (STAIC) and depressive (CDI) symptoms and on asthma related quality of life (PAQLQ). Caregivers reported on their child's internalising symptoms (CBCL-I) and depressive symptoms (CDI-P). A clinician also rated the child's depressive symptoms using CDRS-R.</td>
<td>NFEC was associated with depressive symptoms which were in turn associated directly and indirectly with asthma severity.</td>
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<tr>
<td>Study</td>
<td>Year</td>
<td>Country</td>
<td>Design</td>
<td>Sample Size</td>
<td>Details</td>
<td>Findings</td>
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<td>Klinnert et al 2001</td>
<td>USA</td>
<td>2001</td>
<td>Empirical study</td>
<td>150 children at risk of developing asthma in the community.</td>
<td>Parents were assessed for medical and psychosocial functioning during the third trimester. A home visit took place at three weeks old to assess parenting difficulties. Blood was drawn from infants at six months old to assess IgE levels. Parents and children came to the clinic multiple times until the child was six years old. At six years old a medical and behavioural questionnaire was completed.</td>
<td>Three variables had significant univariate relationships with children who had developed asthma by age 6-8: elevated IgE levels at 6 months old, global ratings of parenting difficulties at 3 weeks old and higher numbers of respiratory infections in the first year of life.</td>
</tr>
<tr>
<td>Mrazek et al 1999</td>
<td>USA</td>
<td>1999</td>
<td>Empirical study</td>
<td>150 children born to mothers with diagnosed asthma.</td>
<td>Part of the W.T. Grant Foundation Asthma Risk Study. Asthmatic mothers were recruited during their pregnancy and eleven potential risk factors (biological and environmental) were examined.</td>
<td>Elevated IgE levels, frequent respiratory infections, parenting difficulties at three weeks and eczema were all associated with early onset asthma.</td>
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<td>Authors</td>
<td>Year</td>
<td>Country</td>
<td>Study Type</td>
<td>Sample Description</td>
<td>Methodology</td>
<td>Findings</td>
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<tr>
<td>Suglia et al</td>
<td>2009</td>
<td>USA</td>
<td>Empirical study</td>
<td>3116 children enrolled in the Fragile Families and Child Wellbeing Study and their caregivers.</td>
<td>Caregivers were interviewed on enrollment and at subsequent time points in their home during the study.</td>
<td>Children of mothers experiencing interpersonal violence were significantly more likely to develop asthma. Those children with mothers experiencing IPV with low levels of child-mother activities were at a further increased risk of developing asthma.</td>
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<td>Stress and asthma</td>
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<tr>
<td>Wright et al</td>
<td>2002</td>
<td>UK</td>
<td>Empirical study</td>
<td>496 infants genetically predisposed to asthma were studied in a prospective birth cohort study.</td>
<td>Caregiver perceived stress and wheeze in children was ascertained bi-monthly for the first two to three months of life.</td>
<td>Greater levels of caregiver perceived stress when infants were two and three months old was related to increased risk of subsequent wheeze during the child's first 14 months of life.</td>
</tr>
<tr>
<td>Sandberg et al</td>
<td>2000</td>
<td>Finland/UK</td>
<td>Empirical study</td>
<td>90 children with moderate to severe asthma, aged 6-13. All regularly attended an asthma clinic and were prospectively followed over 18 months.</td>
<td></td>
<td>Stressful events significantly increased the risk of new asthma attacks.</td>
</tr>
<tr>
<td>Grant et al</td>
<td>1999</td>
<td>USA</td>
<td>Empirical study</td>
<td>The parents of 638 children of kindergarten age completed self administered questionnaires.</td>
<td>Cross sectional survey of parents of kindergarten aged children in eleven randomly selected schools across Chicago. Self administered questionnaires were utilised.</td>
<td>Children with diagnosed asthma had evidence of high levels of illness burden such as sleep disturbance as a result of wheeze. Self-reported access to medical care was high.</td>
</tr>
</tbody>
</table>
### Asthma and Child Behaviour

**McQuaid et al, 2001, USA**

**Meta analytic review**

26 studies reviewed (encompassing 28 data sets) examining data on 4923 children with asthma aged between 4 and 19. Seventy eight studies were initially reviewed, twenty six met inclusion criteria. Effect sizes were calculated for internalising and externalising behaviours, degrees of asthma severity and types of controls used.

Children with asthma have more behaviour problems than children without asthma. The effect for internalising difficulties was greater than externalising difficulties. Increased asthma severity was associated with increased behavioural difficulties.

### Parenting and Asthma

**Lovejoy et al, 2000, USA**

**Narrative Review**

Data from 46 studies were analysed. Forty six observational studies examining the depression and parenting behaviour were examined to determine the strength of the association.

The relationship between depression and negative parenting behaviour was the strongest. An association existed between depression and disengaged parenting behaviour. The association between positive parenting behaviour and depression was weak. Current depression was associated with largest effects.

**Kub et al, 2009, USA**

**Empirical study**

201 caregivers of asthmatic children aged 6-12 were recruited from community paediatric practices and emergency departments. Cross sectional descriptive design study consisting of baseline data from participants enrolled in a randomised asthma communication educations intervention trial.

Close to 25% of mothers had symptoms of depression. Education or unemployment and the use of quick reliever medications were associated with depressive symptoms in caregivers.
<table>
<thead>
<tr>
<th>Study Authors</th>
<th>Year</th>
<th>Country</th>
<th>Research Design</th>
<th>Sample Details</th>
<th>Data Collection Methods</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shalowitz et al</td>
<td>2006</td>
<td>USA</td>
<td>Empirical study</td>
<td>1149 mothers with diagnosed asthma, symptoms consistent with asthma or a randomly selected comparison group within the community.</td>
<td>During an interview mothers responded to questions about their own life stressors, support, mental health and their child's health.</td>
<td>Mothers of children with diagnosed asthma or symptoms consistent with asthma had more depressive symptoms than mothers of children without asthma.</td>
</tr>
<tr>
<td>Bartlett et al</td>
<td>2001</td>
<td>USA</td>
<td>Empirical study</td>
<td>Inner city elementary schools were contacted. 140 mothers of children with diagnosed asthma or symptoms of asthma participated.</td>
<td>Surveys were administered to mothers of asthmatic children living in Baltimore and Washington DC at baseline and six month follow up. Use of the Emergency Department was measured.</td>
<td>Of the mothers who participated, 47% reported depressive symptoms. There were no demographic or asthma related differences between the children of mothers with high and low depressive symptoms.</td>
</tr>
<tr>
<td>Bartlett et al</td>
<td>2004</td>
<td>USA</td>
<td>Empirical study</td>
<td>Surveys were administered to 177 mothers of young minority children in an inner city area.</td>
<td>Surveys were administered to Mothers at baseline and six months. The surveys intended to measure medication adherence, disruptiveness of asthma, and attitudes towards asthma illness and therapy.</td>
<td>No differences in child asthma morbidity were observed between mothers of high and low depressive symptoms. Mothers with high depressive symptoms had greater difficulty getting their child to using inhalers properly. Depressive symptoms were also associated with greater emotional distress and interference with daily activities caused by the child's asthma.</td>
</tr>
<tr>
<td>Authors</td>
<td>Year</td>
<td>Country</td>
<td>Study Type</td>
<td>Study Design</td>
<td>Sample Size</td>
<td>Methods</td>
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<tr>
<td>Silver et al</td>
<td>2005</td>
<td>USA</td>
<td>Empirical</td>
<td>Study</td>
<td>193 caregivers of children aged 2-12 who had at least one asthma related hospitalisation.</td>
<td>Caretakers completed an interview asking about children's asthma symptoms and acute care utilisation and a 29 item psychiatric inventory. National guidelines were used to classify asthma severity. Caretakers of children reported as having moderate-severe persistent asthma exhibited higher anxiety than those reporting milder symptoms. Symptom severity was unrelated to depression, anger, cognitive disturbance or overall distress in caregivers.</td>
</tr>
<tr>
<td>Cookson et al</td>
<td>2009</td>
<td>UK</td>
<td>Empirical</td>
<td>Study</td>
<td>Longitudinal population-based birth cohort study of 5810 children and their mothers.</td>
<td>Maternal anxiety was measured at 18 and 32 weeks gestation using the Crown Crisp Experiential Index. Asthma information in children was available when children were seven and a half following doctor diagnosis with symptoms present in the previous twelve months. There was a significantly higher likelihood of childhood asthma at seven and a half when maternal anxiety scores were recorded as high at 32 weeks gestation.</td>
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<td>Study</td>
<td>Year</td>
<td>Country</td>
<td>Study Design</td>
<td>Sample Details</td>
<td>Assessment Methods</td>
<td>Findings</td>
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<tr>
<td>Lim et al</td>
<td>2008</td>
<td>USA</td>
<td>Empirical study</td>
<td>242 children with asthma aged 7-17 and their mothers recruited from pediatric Emergency Departments.</td>
<td>Maternal depression was measured by self report and parenting was observed during family interaction tasks. Internalising symptoms were assessed by self and clinician report. Asthma disease activity was assessed according to National Heart, Blood and Lung Institute guidelines. Medication was measured using a 24 hour recall method.</td>
<td>Negative parenting partially mediated the relationship between maternal depression and child internalising symptoms. Child internalising symptoms mediated the associations between maternal depression and negative parenting and disease activity.</td>
</tr>
<tr>
<td>Schobinger et al</td>
<td>1993</td>
<td>USA</td>
<td>Empirical study</td>
<td>28 children with bronchial asthma aged 6-13 years and twenty three healthy children and their mothers participated.</td>
<td>Mothers were asked to describe their child (Five Minute Speech Sample). Mothers and children discussed a mutual problem (Problem Discussion). Maternal critical attitude was taken from the Five Minute Speech Sample and negative verbal behaviour during the problem discussion.</td>
<td>Mothers of children with asthma demonstrated more critical attitudes and made more critical remarks than mothers of healthy children. Within the asthma group, mothers who made more critical remarks had to make more effort to have their child comply with their medication regime. Mothers showing more negative behaviour had children with raised IgE levels.</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Country</td>
<td>Study Type</td>
<td>Participants</td>
<td>Findings</td>
<td></td>
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<tr>
<td>Schobinger et al</td>
<td>1992</td>
<td>USA</td>
<td>Empirical study</td>
<td>27 children with bronchial asthma aged 6-13 years and twenty three healthy children and their fathers participated. Fathers were asked to describe their child (Five Minute Speech Sample). Fathers and children discussed a mutual problem (Problem Discussion). Critical attitude was taken from the Five Minute Speech Sample and negative verbal behaviour during the problem discussion.</td>
<td>Fathers of children with asthma were shown to have a critical attitude and make more critical remarks than fathers of healthy children. No relationship was found between the fathers' critical attitude/ number of critical comments and the severity of the child's asthma symptoms, compliance with medication or IgE status.</td>
<td></td>
</tr>
<tr>
<td>Wamboldt et al</td>
<td>1995</td>
<td>USA</td>
<td>Empirical study</td>
<td>19 adolescents on an inpatient ward with severe, chronic asthma and their parents. Parental criticism towards their child was assessed using the Five Minute Speech Sample at the start of the child's inpatient stay.</td>
<td>Adolescents of parents were rated as more critical were shown to be less compliant with their medication on admission. Those with parents rated as highly critical were found to have greater overall improvement in their asthma severity, greater reduction in steroid use and shorter lengths of inpatient stays.</td>
<td></td>
</tr>
<tr>
<td>Gustafsson et al</td>
<td>2002</td>
<td>Sweden</td>
<td>Empirical study</td>
<td>82 infants with a family history of atopic illness were studied prospectively and their families. The families participated in a standardised family test when infants were 18 months old. The ability to adjust to demands of the situation (adaptability) and the balance between emotional closeness and distance (cohesion) were assessed by independent raters viewing video recordings.</td>
<td>An unbalanced family interplay at 18months was associated with relative risk of continuing atopic illness at three years old. There were weak positive confounding effects for smoking, eczema or three or more localisations and the amount of cat allergen in the house. Recovery from atopic illness was four times as probable in families rated with functional interactions and good social networks.</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Country</td>
<td>Study Design</td>
<td>Sample Description</td>
<td>Results</td>
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</tr>
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<td>-------------------------------</td>
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<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>Stevenson</td>
<td>2003</td>
<td>USA</td>
<td>Empirical study</td>
<td>150 infants who had asthma by age 53 months and one hundred and fifteen infants who did not and their parents. Data on the Behaviour Screening Questionnaire was obtained prospectively between 35 and 53 months.</td>
<td>At each age (35 and 53 months), the children who had asthma had more behaviour problems. For those children without asthma at 35 months, elevated behaviour scores were related to subsequent asthma onset at 53 months.</td>
<td></td>
</tr>
<tr>
<td>Calam et al</td>
<td>2003</td>
<td>UK</td>
<td>Empirical study</td>
<td>663 children were prenatally assigned to high, medium or low risk of developing asthma based on parental atopy and family history of the disease. At three years old parents completed the Eyberg Child Behaviour Inventory (ECBI), Family Relationships Index (FRI), Hospital Anxiety and Depression Scale (HAD) and the General health Questionnaire (GHQ).</td>
<td>Behaviour intensity scores as measured by the Eyberg Child Behaviour Inventory (ECBI) were significantly higher for children with parentally reported respiratory symptoms. Those in the low risk group were particularly likely to have elevated behaviour problems.</td>
<td></td>
</tr>
<tr>
<td>Calam et al</td>
<td>2005</td>
<td>UK</td>
<td>Empirical study</td>
<td>397 children who had never wheezed and those who developed late onset wheeze post age five (n=39). From the above mentioned study, scores from the ECBI taken at age three were used to compare the two groups.</td>
<td>Late onset wheezers were more likely to be above clinical cut off levels on the ECBI at age three for both problem and intensity scores compared with children who had never wheezed. Families who had children with late onset wheeze had poorer scores on family functioning variables.</td>
<td></td>
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Preface

Research highlights the reciprocal relationships between family functioning and children’s well-being. A relatively large body of research exists that link family interaction styles, disease management practices, family systems and child’s health and well-being (Kazak, Rourke, & Crump, 2003). Indeed an address from the President of the Journal of Pediatric Psychology stated the need to pay greater attention to the bidirectional influence of children and families (Brown, 2002). In line with such research, governments have acknowledged the substantial role of parents and families in child development and subsequently developed Every Child Matters (ECM; Department for Education & Skills, 2003); a policy which aimed at incorporating an approach supporting parents to promote strong family relationships.

The Triple P-Positive Parenting Program is a parent training programme that aims to promote the skills and confidence of parents and promote positive family relationships (Sanders, 1999). Triple P has five core principles: to create a safe and interesting environment, create a positive learning environment, develop assertive discipline skills, maintain realistic expectations and take care of oneself as a parent. Triple P is prevention orientated and aims to offer the minimally sufficient intervention required. It comprises five distinct interventions which increase in intensity at each stage. There is now a large body of literature demonstrating the effectiveness of Triple P in reducing child behaviour difficulties, promoting parenting skills and caregiver well-being in the general population.

The Triple P-Positive Parenting Program is expanding its reach by tailoring interventions to specific audiences. One such audience is caregivers of children with asthma. The association between asthma and parenting challenges and the elevated levels of behaviour problems observed in children with asthma was highlighted in Paper One. The challenges are such that a targeted parenting intervention may be beneficial. One of the first steps in the process is to examine engagement of
caregivers with asthmatic children with the programme. Paper two presented here aims to examine factors impacting on engagement with a self-directed, web-based Triple P-Positive Parenting Program.
References


Does providing illness specific information predict engagement with an online Triple P-Positive Parenting Program?
Abstract

Objective: The aim of the current study was to explore whether providing asthma specific information enhanced engagement with a web-based parent training programme. Further, the study investigated whether any pre-treatment variables predicted engagement.

Method: A parent advisory group (N=3) was conducted to obtain feedback on the study materials. An empirical study was conducted with caregivers of asthmatic children aged 2-8 years (N=79). Parents were randomly assigned to one of two conditions: behaviour information (n=39), asthma and behaviour information (n=40) prior to being given access to the online parent training programme, Triple P.

Results: A significant number of participants (42.8%) were lost prior to viewing the first seminar. Numbers of participants who remained engaged with the seminars steadily declined and just eight (10%) viewed all ten seminars. The analysis revealed no significant difference in engagement by condition. Further, no pre-treatment variables reliably predicted engagement.

Conclusions: The study demonstrated comparatively higher levels of engagement compared with other web-based interventions. The findings highlighted some methods which may maximise recruitment with web-based interventions. A lack of awareness among the general public with regards to the relationship between asthma and behaviour difficulties may at least partially explain some of the findings.

Keywords: childhood asthma, child behaviour, parenting, engagement, web-based interventions.
Children with asthma are at a greater risk of developing behavioural difficulties compared with non-asthmatic children (McQuaid, Kopel, & Nassau, 2001). It is well established that the prognosis for children with behavioural difficulties is poor (Costello, Mustillo, Erkauli, Keeler, & Angold, 2003; Ferguson, Horwood, & Ridder, 2005; Gardener, Burton, & Klimes, 2006). The quality of parenting a child receives has a marked impact on the development of behaviour difficulties and the child’s overall well-being (Morawska & Sanders, 2006). Preventing poor parenting practices is a priority given the cost of poor parenting to the child, family and communities.

Intervening early with families to encourage and promote consistent, warm and responsive parenting is considered one of the most effective methods of treating child behaviour difficulties and enhancing parenting skills (Baggett et al., 2010; Heinrichs, Bertram, Kuschel, & Hahlweg, 2005; Sanders, Markie-Dadds, Tully, & Bor, 2000). Of the large number of interventions available, parent training programmes based on social learning principles have the strongest empirical evidence for reducing behaviour difficulties in children and improving parenting skills (National Institute of Clinical Excellence, 2006).

Successful outcomes from parenting programmes are strongly linked to engagement and retention with programmes (Eysenbach, 2005; Morawska & Sanders, 2006). The success of an intervention rests not only in ensuring parents remain engaged for long enough to receive a sufficient intervention dose but also in ensuring programmes reach those that require it (Morawska & Sanders, 2006). Barriers to programme participation include logistical difficulties, such as the time and location of parent training programmes, insufficient motivation, perceived ethnic and cultural barriers and fears of social stigma (Miller & Prinz, 2003).

Research has attempted to identify factors that enhance engagement and reduce attrition (e.g., Conner & Norman, 2005; Morawska & Sanders, 2006). A systematic review of the literature highlighted the effectiveness of traditional means of recruiting individuals to health care interventions such as billboards, posters and radio adverts.
(Grilli, Ramsay, & Minozzi, 2002). Graham, Milner, Saul, and Pfaff, (2008) found that
online advertising recruited more individuals into intervention programmes compared
with more traditional advertising methods. In particular Graham et al. reported that
online advertising recruited a greater percentage of males, young adults, ethnic
minorities and those with less formal education. Tailoring of interventions is a further
method by which engagement with web-based interventions is enhanced (Couper et
al., 2010).

Sociodemographic variables associated with engagement have been extensively
studied, with mixed findings reported. For example, some studies have reported that
sociodemographic factors, such as socioeconomic status (SES) and ethnicity, are
associated with engagement (Garvey, Julian, Fogg, Krativil, & Gross, 2006; Sanders,
Markie-Dadds, Rinaldis, Firman, & Baig, 2007). Other studies have reported no such
association (e.g., Calam, Sanders, Miller, Sadhnani, & Carmont, 2008; Dumas,
Nissley-Tsiopinis, & Moreland, 2006). Child behavioural problems have been shown to
predict engagement with parent training programmes previously (Garvey et al., 2006;
Hill & Calam, in press).

However, many studies have demonstrated engagement with programmes under
research trial conditions (Chambless & Hollon, 1998) and the number of population
based studies investigating engagement remains notably lower (Winslow, Bonds,
Wolchnik, Sandler, & Braver, 2009). Population based studies that do exist
consistently report low levels of engagement with parent training programmes
(Winslow et al., 2009).

In an attempt to improve the reach of parenting interventions, a number of
programmes, such as the Triple P-Positive Parenting Program, developed self-
directed interventions. Studies examining the efficacy of self-directed programmes
have shown they compare favourably (Markie-Dadds & Sanders, 2006; Morawska &
Sanders, 2006). However whether such interventions have greater levels of
engagement and retention or whether they simply broaden opportunities for parents to participate is often not addressed.

The increased use of the internet across communities (Fox, 2005) has highlighted the internet as a possible source of disseminating programmes to reach a wide variety of individuals in a cost effective manner (Baggett et al., 2010; Feil et al., 2008). The internet has the capacity to remove logistical difficulties, reach a wide variety of individuals in a cost effective manner and can also remove associated stigma (Baggett et al., 2010). A comprehensive meta-analysis revealed that therapeutic interventions disseminated via the internet were on average as effective or almost as effective as traditional face-to-face interventions (Barak, Hen, Boniel-Nissim, & Sgapira, 2008).

Despite the potential benefits afforded by online self-directed interventions, difficulties engaging and retaining participants have been observed (Kaltenthaler et al., 2008). These difficulties remain even when recruitment techniques are specific and targeted (e.g., Glasgow, Nelson, Kearney, Reid, & Ritzwoller, 2007; Christensen, Griffiths, & Jorm, 2004). A paucity of literature exists examining engagement with web-based, self-directed parenting programmes.

If the success of an intervention is associated with the engagement and retention of parents with the programme (Eysenbach, 2005; Morawska & Sanders, 2006), strategies that enhance engagement should be examined further. Caregivers of children with asthma have been identified as one group who may benefit from parent training programmes given the elevated levels of child behavioural difficulties observed. It is therefore necessary to examine strategies that enhance engagement of caregivers with asthmatic children with a parent training programme. Morawska et al. (in press) suggested providing parents with information regarding the relationship between asthma and behaviour may enhance engagement. No research has previously examined engagement of caregivers of children with asthma with web-based, self-directed parent training interventions.
The aim of the current study was to examine factors predicting engagement, defined as the initial recruitment and subsequent completion of the intervention, with an online self-directed Triple P-Positive Parenting Programme. The study aimed at examining whether providing parents with information relating to the relationship between asthma and behaviour problems, compared with information on behaviour problems only, influenced engagement with the programme. It was predicted that information specifically linking asthma and behaviour would highlight that children’s behaviour is modifiable and consequently would result in caregivers staying engaged with the programme for longer.

Further to this, the study aimed at evaluating whether any pre-treatment variables, including sociodemographic factors, asthma or child behaviour, predicted continued engagement with the programme. A number of studies have examined whether pre-treatment variables predict engagement with interventions and have reported mixed results (e.g., Calam et al., 2003; Dumas et al., 2006; Garvey et al., 2006, Sanders et al., 2007). To the authors’ knowledge, no studies have previously investigated pre-treatment variables associated with parents of asthmatic children engaging with a web-based parent training intervention.

Methodology

Ethical approval was granted by the School of Psychological Sciences Research and Ethics Committee at the University of Manchester (project number 660/07P).

Parent Advisory Group

A parent advisory group was conducted with parents of asthmatic children aged 2-8 in the Manchester area. The aim of the group was to obtain feedback on the study materials. Participants (N=3) consented to the group being recorded and were paid £5 for their participation. The study materials used in the empirical research consisted of
information either on behaviour difficulties in children or on the relationship between asthma and behaviour difficulties in children. Participants were asked to comment on examples of different versions of the study materials. Participants felt the information in both conditions should be positive and non-blaming of parents. The ideas and comments from the group were fully incorporated into the information participants received in the empirical study.

Empirical study

Design.

The study was an experimental design utilising web-based opportunity sampling. Participants were randomly allocated to one of two conditions: 1) behaviour (n= 39) or 2) asthma and behaviour information (n= 40). The behaviour condition provided parents with information on children’s behaviour difficulties (Supplementary material 1). The second condition, the asthma and behaviour condition made specific links between asthma and behaviour difficulties in children (Supplementary material 2). Both conditions aimed at briefly demonstrating how Triple P may help parents tackle behaviour difficulties. Attempts were made to ensure the length of information presented in the two conditions were the same.

Participants.

Participants were 79 parents of asthmatic children aged 2-8. Participants were recruited from across the UK via a variety of methods. A recruitment advert was posted online on Asthma UK Facebook page and on the forums of parenting websites (Netmums, Bounty and Parents Lounge). Additionally Netmums were paid to feature the advert on the homepage of the Barking and Dagenham site for one month. Emails and printed adverts were sent to primary schools and nurseries across the UK.


**Materials.**

**Advert.**

The advert (Supplementary material 3) contained the same written content across all media. Online adverts allowed participants to click on the website link and be transferred directly to the homepage.

**Triple P Materials.**

The following Triple P- Positive Parenting Program materials were used in the study: Triple P asthma tip sheet (Appendix 13), 10 online Triple P self-directed online seminars, Triple P self-help book.

The Triple P Asthma Tip Sheet: a brief information sheet (two sides of A4) for parents on dealing with their child’s asthma and behaviour problems. The tip sheet was developed by researchers at the Triple P-Positive Parenting Program Centre (Australia) in collaboration with researchers and medical specialists in the UK.

The Triple P self-help book: *Every Parents Self-help Work-book* (Markie-Dadds, Sanders & Turner, 1999; formerly *Every Parent’s Workbook*, Sanders, Lynch, Markie-Dadds, 1994) was included as an incentive to aid recruitment. Participants who provided their contact details were sent a free copy of the book.

Triple P seminars: The seminars were used, with permission from the developers of the *Evaluation of a Video-Based Media Series to Promote Effective Parenting* (NCT00611832). The seminars were ten episodes, 12 minutes per episode. They aimed at demonstrating positive parenting practices for effectively handling a range of difficult child behaviours.
Information Sheet.

An information sheet was included and viewed by participants prior to randomisation and being given access to the seminars. The sheet provided information about the study and informed participants they could contact the author or drop out at any point.

Measures.

The following measures were administered at the pre-intervention stage only.

The Family Background Questionnaire (FBQ).

The FBQ: adapted from the Western Australian Child Health Survey (Zubrick et al., 1995) was used to measure a range of demographic factors including socioeconomic status (SES), child age and gender, relationship with child, participant educational level, family and household information.

Eyberg Child Behaviour Inventory (ECBI).

The ECBI (Eyberg & Robinson, 1983) measures parental perceptions of behaviour in children aged 2-16. The ECBI measures the frequency of 36 disruptive behaviours (Intensity Scale; rated on a 7 point scale ranging from never to always) and whether behaviours are a problem for the parent (Problem Scale) using a yes/no format. The ECBI has high internal consistency with alpha reliability across groups ranging from .92 to .95 for intensity score and .86 to .94 for problem score and has good test-retest reliability (r<sup>=</sup> .86; Robinson, Eyberg & Ross, 1980).

Asthma Questionnaire.

This measure included eight questions aimed at finding out about the child’s asthma. Specifically asking about the severity and frequency of asthma symptoms, asthma medication and the impact of asthma (e.g., days off school, visits to hospital).
Procedure.

An online website was designed which recorded participants’ responses to questionnaires and patterns of use including website access and the number of times participants visited sections of the site. Participants accessed the website and were provided with brief information about Triple P-Positive Parenting Program and the study. Participants were asked to read the information sheet, confirm they had read and understood the nature of the study and complete the consent form. Participants had the option of contacting the author via the website if they had a query about the study. Participants were asked to provide log identification information (email address and create a password) which enabled them to access the website in the future. Participants were asked to provide a contact address to send the self-help book to.

Finally, participants were requested to complete the measures and were then randomly allocated to either the behaviour or asthma and behaviour condition. All participants were then given access to the Triple P asthma tip sheet and 10 Triple P web-based parent training seminars. Participants could view the seminars in any order (although the intended order was clearly labelled).

Results

Preliminary analyses were conducted to examine the sample on all sociodemographic variables. Participants randomised to the two conditions were compared on all variables measured by the FBQ and the ECBI (both Intensity and Problem scores) and responses to asthma questions. The results showed no significant differences between the two groups. A number of the categories were collapsed to ensure the minimally sufficient number in each cell.
Sample Characteristics

Participants were 79 parents with a child with asthma. The mean age of the child was 4.4 years (SD = 1.8; Range = 2 to 8). Over half (60.6%) responded regarding a male child. Sociodemographic information was provided by 71 participants. The majority of respondents were the child’s mother (97.2%), 64 (90%) reported their ethnic origin to be white, and 55 (78%) were living with a partner (married or co-habiting). Participants reported whether they were in paid employment: 30 (42%) were in paid employment and they reported their highest level of education: 17 (24%) were educated to university degree level, 19 (27%) to Advanced Level (a Level) education, 25 (35%) reported their highest level of education was General Certificate of Secondary Education (G.C.S.E) and 10 (14%) were educated to trade/apprenticeship level or had alternative qualifications.

The majority of participants (42; 59.2%) reported they managed to ‘get by’ financially, 11 (15.5%) reported their finances were ‘good’ and 18 (25.4%) ‘struggled to get by’. Just over half of respondents (37; 52%) reported receiving benefits. The majority (36; 50.7%) reported receiving ‘slight’ or ‘moderate’ support, 26 (36.6%) reported being ‘very’ or ‘extremely’ supported with 9 (12.7%) reporting feeling ‘not at all’ supported. None of the participants reported having been involved with a Triple P-Positive Parenting Programme in the past.

All participants provided information about where they had seen the advert. Of the respondents, 5 (6.3%) participants reported seeing the advert on the Asthma UK Facebook page. None responded to the paid advert on the local Barking and Dagenham Netmums site or the Parenting Lounge forum. The 15 local Netmums forum sites and Bounty website forums were cited by 52 (65.8%) and 5 (6.3%) of participants respectively. Contact in schools and nurseries yielded 13 (16.5%) of
participants and word of mouth recruited 4 (5.1%). Table 1 compares demographic information for the participants in the two conditions.

**Asthma Information**

Participants (n=64) provided information of their child’s asthma symptoms. Almost half (46.9%) described their child’s asthma symptoms as ‘moderate’ with smaller numbers 19 and 13 (29.7% and 20.3%) describing attacks as mild and severe respectively and two (3.1%) participants reported their child’s symptoms did not fit into the categories. Of the sample who responded, all reported their child received reliever medication and the majority (85.9%) had also been prescribed preventer medication. A smaller percentage (37.5%) had been prescribed Prednisolone.

Participants reported that 26 (40.6%) of their children had been hospitalised and 44 (68.8%) had visited Accident and Emergency Departments (A&E) as a direct result of asthma. Within the previous 12 months, 40 (62.5%) had missed a day off school, 39 (60.9%) had visited their General Practitioner (GP) and 28 (43.8%) had attended hospital (either hospitalised or A&E) as a direct result of asthma. Table 2 provides details of asthma characteristics in the sample.
Table 1

Demographic characteristics of the sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Behaviour Information</th>
<th>Asthma and Behaviour Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Child Gender</strong></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
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<tr>
<td>Female</td>
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<td><strong>Respondent</strong></td>
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</tr>
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<td><strong>Family Type</strong></td>
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<tr>
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<tr>
<td>Stepfamily</td>
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<tr>
<td>Sole Parent</td>
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<td>25</td>
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<tr>
<td>Other</td>
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<tr>
<td><strong>Marital Status</strong></td>
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<tr>
<td>Single</td>
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<td>30.5</td>
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<td>50</td>
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</table>
Table 2

Asthma characteristics of the sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Behaviour Information</th>
<th>Asthma and Behaviour Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than once a week</td>
<td>n</td>
</tr>
<tr>
<td>Frequency of symptoms</td>
<td>More than once a week</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>but not daily</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Daily but not at night</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Day and night</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>7</td>
</tr>
<tr>
<td>Severity of attacks</td>
<td>Mild</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Preventer medication</td>
<td>yes</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>6</td>
</tr>
<tr>
<td>Reliever medication</td>
<td>yes</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>yes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>23</td>
</tr>
<tr>
<td>Hospitalised</td>
<td>yes</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>19</td>
</tr>
<tr>
<td>Asthma A&amp;E visit</td>
<td>yes</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>9</td>
</tr>
<tr>
<td>Days off school</td>
<td>yes</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>11</td>
</tr>
<tr>
<td>Asthma related GP visit</td>
<td>yes</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>14</td>
</tr>
<tr>
<td>Hospitalised (last 12 months)</td>
<td>yes</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>16</td>
</tr>
</tbody>
</table>
**Child Behaviour Information**

Tests of normality were employed on data obtained from 71 participants who completed the ECBI. A Kolmogorov-Smirnov test of normality indicated the ‘Intensity’ Score was normally distributed ($D(66) = 0.08, p = 0.20$). The ECBI ‘Problem’ Score indicated a non-normal distribution ($D(66) = 0.130, p < 0.01$). Following the transformation of the data using natural logarithms, the ECBI ‘Problem’ score did not differ significantly from a normal distribution ($D(66) = 0.10, p = 0.199$). As a result, the geometric mean and interquartile range (IQR) are reported.

The mean ECBI ‘Intensity’ Score for the whole sample was 122 ($SD = 37.8$) with a range from 46 to 214. The geometric mean for the ECBI ‘Problem’ Score was 9.32 (IQR = 2-15). It is suggested that ‘Intensity’ Scores greater than 131 and ‘Problem’ Scores greater than 15 are indicative of difficulties within the clinical range (Eyberg & Pincus, 1999). Scores indicated that 35% were in the clinical range for ‘Intensity’ of behaviour problems and 21% in the range for ‘Problem’ behaviours.

**Does providing asthma specific information predict engagement?**

Of the 79 participants who registered to take part in the study, 71 (89%) completed the sociodemographic and child behaviour measures. The asthma measure was completed by 64 (81%). The asthma tip sheet was viewed by 52 (65.8%) people and 46 (58.2%) clicked to view the first seminar. The number of participants who viewed the seminars declined steadily and eight (10%) clicked to view all ten seminars. Figure 1 presents the dropout attrition curve across the intervention. Table 3 displays the number of participants who clicked to view each of the ten seminars. Five participants logged back into the site to view a seminar for a second time (one participant logged in to view the tenth seminar three times).
Figure 1

Number of participants engaged at each stage of the intervention

Figure 1a

Number of participants engaged at each stage of the intervention in the two groups
### Table 3

**Number of seminars viewed**

<table>
<thead>
<tr>
<th>Seminar number</th>
<th>Viewed seminar</th>
<th>Did not view seminar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>46</td>
<td>58.2</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>36.7</td>
</tr>
<tr>
<td>3</td>
<td>22</td>
<td>27.8</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>26.6</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>22.9</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>13</td>
<td>16.5</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>15.2</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>12.7</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>10.1</td>
</tr>
</tbody>
</table>

### Table 3a

**Number of seminars viewed in the two conditions**

<table>
<thead>
<tr>
<th>Seminar number</th>
<th>Behaviour</th>
<th>Asthma and behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
In order to test whether condition impacted on seminars viewed a Mann Whitney U test was conducted. Initial analyses revealed the total number of seminars viewed was not normally distributed, which remained after tests for outliers and transforming the data (using the natural logarithm) occurred. The results of the Mann-Whitney U ($Z = -1.462$, Asym. Sig. (2-tailed) = .144) revealed no significant difference in the number of seminars viewed by participants in the two conditions.

**Pre-treatment variables predicting engagement**

Sociodemographic, asthma specific and child behaviour variables were examined in order to identify whether any variables predicted engagement with the study. Engagement was determined by whether participants clicked to view seminar one or not. Initially, continued engagement with the study, i.e., the number of seminars a participant viewed, was the intended measure but high rates of attrition prevented an accurate regression model from being developed. A threshold of $p<.10$ is considered an appropriate level for developing a logistic regression model (Austin & Tu, 2004).

The following factors were analysed using the Mann Whitney U test: marital status, relationship with the child, gender, where the participant saw the advert, the household the child lived in (e.g. original or step-family), ethnicity, employment status of the participant, whether the participant received benefits, medication for asthma, whether the child had been hospitalised, whether the child visited A&E and their GP, missed days off school. The results from all the tests revealed that three variables had a statistically significantly relationship with the number of seminars viewed at the .10 level: where the advert was placed ($Z = -1.612$, Asym. Sig. (2-tailed) = .10), receiving benefits ($Z = -1.855$, Asym. Sig. (2-tailed) = .065) and whether the participant was in paid employment ($Z = -1.84$, Asym. Sig. (2-tailed) = .066). The analysis indicated that those in paid employment, who did not receive benefits and were recruited via the
online advert, were more likely to remain engaged with the programme. The remaining variables were not significant at the .10 level (all remaining variables, \( p > .16 \)).

The Kruskal Wallis was employed to analyse the following factors: highest level of education, severity of asthma symptoms, household finances, perceived support and frequency of asthma attacks. The results revealed that no variables were statistically significant at the .10 level (for all variables, \( p > .30 \)).

The remaining factors were analysed using a Spearman’s Rank Correlation Coefficient: age of the child, total intensity score (ECBI), total problem score (ECBI), number of hospital visits and the number of A&E visits. No significant relationship was found between any variable and the number of seminars viewed (for all variables, \( p > .28 \)).

The preliminary analysis involved multiple comparisons, which can inflate the chance of a Type 1 error. This was accounted for using a binary logistic regression. Binary logistic regression does not require data to be normally distributed (Hilbe, 2010). The outcome variable was engaged (clicked to view seminar one) ‘yes’/’no’. A hierarchical (blockwise entry) logistic regression was chosen whereby variables that could be analysed in the current research and have been previously shown to have predictive utility in relation to outcome are entered first, followed by new predictors (Field, 2005).

In order to explore the predictive utility of these variables, they were entered into a binary logistic regression in the following order: Known predictors (ECBI behaviour and problem scores), followed by new predictors identified in the current study (Where the advert was located, participant in paid employment and participants receiving benefits). The results are shown in Table 4 below.
Table 4

**Predictors of engagement: Results from the Binary Logistic Regression**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>S.E</th>
<th>χ²</th>
<th>Sig.</th>
<th>Exp</th>
<th>C.I.</th>
<th>B</th>
<th>S.E</th>
<th>χ²</th>
<th>Sig.</th>
<th>Exp</th>
<th>C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child behaviour Score (Intensity)</td>
<td>-0.01</td>
<td>0.01</td>
<td>1.56</td>
<td>0.12</td>
<td>0.99</td>
<td>.89-.99</td>
<td>-0.01</td>
<td>0.01</td>
<td>1.12</td>
<td>0.18</td>
<td>0.99</td>
<td>.88-.99</td>
</tr>
<tr>
<td>Child behaviour (Problem) Score</td>
<td>0.17</td>
<td>0.04</td>
<td>5.94</td>
<td>0.06</td>
<td>1.14</td>
<td>.97-1.11</td>
<td>0.13</td>
<td>0.04</td>
<td>3.69</td>
<td>0.16</td>
<td>1.15</td>
<td>1.01-1.16</td>
</tr>
<tr>
<td>Advert location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.56</td>
<td>0.78</td>
<td>4.03</td>
<td>0.29</td>
<td>0.68</td>
<td>.48-.1.02</td>
</tr>
<tr>
<td>Benefits (re 1: Yes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.38</td>
<td>0.67</td>
<td>2.35</td>
<td>0.13</td>
<td>0.28</td>
<td>.07-.1.3</td>
</tr>
<tr>
<td>Paid employment (ref 1: no)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.27</td>
<td>0.63</td>
<td>1.98</td>
<td>0.12</td>
<td>0.4</td>
<td>.15-.1.2</td>
</tr>
</tbody>
</table>
When the known predictors were entered (blockwise) into the regression, it did not improve the fit of the model ($\chi^2 (3, N=46) = 3.27, p= .30$). When the second block (where the advert was located, whether participants were in paid employment and received benefits) was added, the fit of the model did not improve ($\chi^2 (4, N=46) = 4.86, p= .17$). The overall model was not significant ($\chi^2 (5, N=46) = 6.98, p= .23$).

**Discussion**

In order to improve outcomes from web-based parent training programmes, participant engagement needs to be better understood. The current study was the first to examine engagement of caregivers of asthmatic children with a web-based parent training programme. High rates of non-completion and relatively low levels of uptake were observed. The results indicated that providing illness specific information did not enhance engagement with the programme. Moreover the results revealed no sociodemographic, asthma or child behaviour variables predicted engagement with the programme. Many studies have highlighted the difficulties recruiting to face-to-face and web-based parent training interventions.

Many studies utilising the internet as a means of disseminating public health interventions have reported difficulties engaging people with interventions and high levels of drop out (e.g., Neve, Collins, & Morgan, 2010; Samoocha et al., 2011; Winslow, Bonds, Wolchik, Sandler, & Braver, 2009) which was observed in the current study. However, brief engagement with a programme may not automatically indicate the intervention has been unsuccessful as disengagement may occur following successful changes in behaviour (Stretcher, Shiffman, & West, 2005; Strecher et al., 2008). However, the majority of researchers developing web-based programmes acknowledge a minimum engagement period exists to receive a therapeutic dose (Glasgow et al., 2011).
An interesting and unexpected finding emerged from the parent advisory group and comments received via the online forums that may help explain the results. Whilst the number of participants in the parent advisory group and the number of comments received were too few to conduct formal analyses, they gave some indications of areas for further consideration in future studies attempting to improve on uptake and retention. Participants in the advisory group clearly indicated they had not considered the link between asthma and behaviour problems prior to participating in the group. The discussion within the group enabled the psychosocial impact of asthma to be explored and appeared very enlightening to participants. Likewise, comments received via the online forums indicated a lack of awareness of the association between asthma and behaviour difficulties in children.

Comments from three participants received via the online forum have been included here to highlight the views and types of responses received 1) ‘umm, I’m a nurse and work with children and have lots of experience with asthma, children with asthma do not have behaviour problems:) they are just ‘normal’ kids,’ 2) ‘I have never heard of behaviour problems from asthma,’ and 3) ‘my girl is 2 and a half and has asthma she has no problems apart from her breathing so how does it affect behaviour? never heard of that’.

Such responses from the public indicate that the association between asthma and behaviour difficulties might be largely unrecognised. Taking this into account, it may be assumed parents would be less interested in participating in the study because the purpose of participating, and potential benefits are less clear. Morawska et al. (in press) examined the beliefs of parents with children with asthma and found parents predominantly considered asthma medication or child factors (such as personality) to be the cause of their child’s behaviour difficulties. Attributing a child’s behaviour difficulties to uncontrollable factors may make it more likely caregivers will be sympathetic and make allowances for their child’s behaviour. In turn those caregivers may be much less interested in participating in interventions based upon the principle
that behaviours are modifiable. Target audience levels of interest are an important factor in engagement and outcomes for web-based interventions (Cunningham, 2008). Further research could aim to investigate whether parents of children with asthma are interested in parenting programmes and what adaptations need to be made to the programmes in order to suit the needs of such parents.

In light of the additional findings and their potential implications it seems possible that the content of the Triple P-Positive Parenting Program media-based seminars, not developed specifically for parents of children with asthma, may not have appeared immediately relevant to the participants in the current study. Being unaware of the perceived relevance of an intervention and how it would be beneficial is unlikely to encourage prolonged participation with the study and may help explain the high attrition rates observed. This is a central issue when adapting 'generic' materials for specific groups; - to what extent do the materials need to be specialised for that group.

The findings in the current study highlight the need to examine whether parenting interventions in their current form are suitable for parents of children with asthma. A focus on the medical implications of asthma and a seeming lack of awareness of the link between asthma and behaviour difficulties in children with asthma indicate that uptake of parenting programmes such as Triple P will remain low. Further research needs to elucidate whether parenting programmes are beneficial interventions for parents of children with asthma and whether the content of such programmes are suitable for the needs of the target audience.

A lack of interest and understanding of why an intervention is relevant and beneficial to the individual significantly reduces the likelihood that person will engage with that particular programme. The seemingly low levels of awareness regarding the links between asthma and behaviour problems in children is something that has been highlighted by the current study. It is therefore unsurprising that low rates of uptake and high rates of attrition were noted. This highlights some significant areas where
future research would be beneficial, i.e., we need to engage people using persuasive communications with parents.

Yet despite this, rates of continued engagement with the current study were higher than noted in other studies (e.g., Christensen, Griffiths, & Jorm, 2009; Farvolden, Denisoff, Selby, Bagby, & Rudy, 2005). Between one quarter and one third of participants reported scores above the clinical range for intensity and problematic child behaviour difficulties. These figures highlight the need for parenting interventions in this particular sub-group of the population. The comparably higher rates of continued engagement may reflect the usefulness, ease and convenience of the intervention. However, caution should be applied given the relatively small numbers, the different client target groups between studies and the lack of qualitative data supporting the assumptions.

No pre-treatment variables were related to continued engagement with the programme. This has been found in other studies (e.g., Calam et al., 2008; Dumas et al., 2006). Three variables (where the advert was located, whether the participant was in paid employment and received benefits) appeared to have a relationship with engagement with the study although the results of the logistic regression indicated the variables did not predict engagement with the study. However, owing to the exploratory nature of the current research, the small sample size and high rates of attrition, the results cannot be interpreted with confidence and the variables, and possible future directions, are considered in more detail.

The majority of participants did not provide information on their occupation, number of hours they worked or their salary. This made it difficult to code the results to determine SES of participants. However, two variables (receiving benefits and being in paid employment) appeared to have a relationship with engagement and may be indicative of an individual’s SES. Previous research has demonstrated that demographic variables, such as lower SES, are associated with greater incidence of asthma among children (Sandel & Wright, 2006) and lower engagement in face-to-
face parent training programmes (Garvery, Julian, Fogg, Krativil, & Gross, 2006; Sanders, Markie-Dadds, Rinalsdis, Firman, & Baig, 2007).

Lower SES and economic hardship has been linked with high rates of depressive symptoms (Kub et al., 2009), and burden and stress in caregivers of children with asthma (Shalowitz et al., 2006). Participants not in paid employment and/or who receive benefits may be more likely to experience high levels of stress, burden and depressive symptoms and such factors may indicate other variables, such as poor housing quality, that have also been linked with stress, burden and increased asthma symptoms in children (Nikiéma, Spencer, & Séguin, 2010; Suglia, Ryan, Laden, Dockery, & Wright, 2008). Caution is advised given the limited data available that enables other explanations, such as actively choosing not to be in paid employment, is not explored in the current study but could potentially influence the findings.

The total number of people who saw the advert in the various locations was not collected. This information would be helpful to establish which locations yielded greatest uptake. Nevertheless, the findings here are important because they provide some, albeit tentative, information with regards to maximising uptake. Further, participants in the current study appeared to respond when the advertising methods were more personalised, e.g. discussion forums and letters from school, compared with a more generic online advert. Personalising interventions has been found by others to help maximise engagement and decrease attrition with web-based studies (Strecher Shiffman, & West, 2005). This is useful information when considering ways to maximise engagement in the future.

A number of limitations may have affected the validity of results in this study. Participation in the study was voluntary therefore a response bias is possible which may have resulted in the sample not being reflective of the population. Eligibility for the intervention required participants to have access to the internet and an active email account which limits generalisability across the population. All participants, particularly those recruited through schools, demonstrated motivation to further
investigate the study and log onto the website. It is therefore possible that parents with reduced motivation, such as those with depressive symptomatology, may not have signed up and taken part in the study. It is possible that sending out the self directed Triple P-Positive Parenting Program book, which was intended as an incentive, actually decreased the number of seminars viewed as the information was presented to participants in an alternative format. The number of analyses that could be carried out were limited. For example a survival analysis was attempted but not completed as a result of the data.

One of the benefits of web-based interventions is their potential wide reach. Calam et al. (2008) argued less traditional intervention methods attract participants from a wider range of sociodemographic backgrounds compared with more traditional face-to-face interventions. The design of the current study attempted to be non-selective by recruiting across the UK and by including few eligibility criteria (asthmatic child aged 2-8). However the study may only have attracted a subset of the population, for example, the majority of participants were mothers from white ethnic backgrounds.

**Implications**

The findings here are important for a number of reasons. First, the study has demonstrated comparatively higher levels of continued engagement compared with other web-based interventions. The potential reach of an intervention such as this means very large numbers of parents can access it, potentially offering a public health-level benefit. Moreover, the relatively low cost of delivery compared with face-to-face interventions means non-completion of the programme does not represent a significant loss of investment. Further research should investigate the minimally sufficient intervention dose required for caregivers with a child with asthma.

In the current study, it appears that a lack of interest and/or knowledge of the relationship between asthma and child behaviour may have resulted in low uptake and reduced engagement with the intervention. This has highlighted the need to consider
that caregivers of asthmatic children are a sub-set of the population for whom specific engagement strategies need to be considered. An area which may benefit from consideration in the future is clarifying public awareness of the association between asthma and behaviour in children. This will provide additional information to potentially guide engagement and retention strategies for this particular group to web-based interventions.
References


Sandel, M. & Wright, R.J. (2006). When home is where the stress is: expanding the dimensions of housing that influence asthma morbidity. *Archives of Disease in Childhood, 91* (11), 942-948.


Supplementary Material

Most people start out as parents with little preparation, and learn through trial and error. There is no single right way to parent and ultimately, each parent needs to develop their own approach to dealing with their child's behaviour.

Although there are common parenting challenges, each family has its own unique challenges as well. Parents can sometimes get caught in parenting traps, such as getting into power struggles with your child, which adds to the stress many parents experience at some point.

The Triple P program is designed to provide parents with information and suggestions on coping with your child’s behaviour. It also aims to provide helpful solutions to everyday parenting concerns, ultimately leaving you as a parent feeling more positive.

'I always question myself as to whether I am doing the right thing and handling things the right way. This makes me feel guilty in case I’m not.’

Supplementary material 1

Children suffering asthma sometimes show more problems with behaviour and emotions, and this can make managing asthma even more difficult. Even mild symptoms can impact on regular activities, play, and school attendance.

Many children resist taking the medication and parents can struggle in making sure that their child maintains their asthma management plan. Parents can sometimes get caught in parenting traps, such as getting into power struggles with their child, which adds to the stress many parents experience at some point.

The Triple P program is designed to provide parents with information and suggestions on coping with your child’s behaviour. It also aims to provide helpful solutions to everyday parenting concerns, ultimately leaving you as a parent feeling more positive.

'I never thought before that his asthma might have anything to do with his behaviour – I just felt guilty when his nursery said he had been naughty again.’

Supplementary material 2

Does your child have asthma? Is your child aged between 2-8 years old?

Children with asthma often have more behaviour problems than children without asthma. Parents often feel isolated and sometimes may find it hard to make sure their children stick to their asthma management plan.

Triple P is an international parenting programme that offers advice and parenting strategies that are effective and easy to use.

To receive your free Triple P, book please go to: www.behaviourandasthma.org.uk

Supplementary material 3
Although recent research suggests a slight decline in prevalence rates of childhood asthma, it remains the most prevalent childhood chronic illness (Malik, Tagiyeva, Aucott, McNeill, & Turner, 2011; Simpson & Sheikh, 2010). Identifying the psychosocial variables involved in the expression and outcomes of asthma in children and subsequently examining how and where effective interventions can be targeted is prudent in reducing the impact of asthma on families. Two papers are presented in this thesis, which aim at contributing to research in this area.

Paper One was a review of the literature, emphasising the role of psychosocial variables in the expression and outcomes of asthma in children. Within the literature, the raised levels of behaviour problems observed in asthmatic children were highlighted. Child behaviour difficulties are a major concern and constitute a significant proportion of all referrals to child services (Kazdin, 1995). The literature review highlighted modifiable areas associated with increased prevalence of asthma.

On the basis of the review and model, it is possible to identify areas for intervention to tackle behaviour problems in children, which subsequently may impact on the severity of asthma symptoms experienced and the functioning of families as a whole. Highlighting strategies that enhance, and understanding barriers that prevent, engagement with effective, accessible and efficacious interventions to tackle behaviour problems is prudent.

The second paper, an empirical study, aimed at examining whether providing asthma specific information to caregivers improved engagement with the self-directed, web-based parent training programme, Triple P. Paper Two was the first study to examine and provide information on the engagement of caregivers of asthmatic children with the programme. This third section aims at examining in more detail some of the additional outcomes as well as the strengths and weaknesses of the empirical study, implications and possible directions for future work.
Paper One - Literature Review

The literature review examined a wide variety of literature spanning the fields of asthma and child development. Whilst previous papers have proposed models to understand the influence of families and psychosocial influences on asthma outcomes (e.g., Kaugars, Klinnert, & Bender, 2004; Wood et al., 2007; Wood et al., 2008), they often focused on a small segment of research without incorporating other variables known to influence asthma expression. Additionally, many proposed models are unidirectional yet the findings within the literature indicate a bidirectional pathway between many of the variables. The model proposed in Paper One aimed to address these concerns.

Notably, within the literature on the psychosocial variables associated with childhood asthma expression, there is a limited number of population based studies. A significant proportion of studies use samples who live in inner city areas, are from ethnic minorities and low socioeconomic status (SES) backgrounds and at high genetic risk of developing atopic illnesses. Many samples are recruited directly from asthma based clinics or hospital settings. This may confound findings and limit their generalisability to the general population. Moreover, inclusion criteria varied greatly between studies with regards to definition of asthma. Single informants and self report data were also highlighted in the research.

Paper Two – Empirical Study; Engagement and Attrition

The planned empirical work consisted of an initial consultation with an advisory group made up of parents of young children with asthma. It is recommended that groups consist of between 6-10 participants (Morgan, 1997). This was followed by an experimental study utilising web-based opportunity sampling where participants were randomly allocated to one of two conditions. An initial power calculation based on a
medium effect size ($w=0.30$) indicated a sample size of 144 would be required for the empirical part of the study.

**Parent Advisory Group.**

Initially 53 Sure Start Centres were contacted via email to request they display a poster (Appendix 2) aimed at recruiting participants for the parent advisory group. Of all the centres contacted, eight responded to say they would display the posters. No participants responded to the adverts placed in the eight Sure Start Centres. It is considered that this may be partially explained by the time of year the posters were displayed, which corresponded to the school summer holidays but even taking this into account, the response was disappointing.

In total, three participants were recruited to the group. Provided participants have relatively high levels of involvement in the discussion, it is considered reasonable to have a group of three to provide preliminary data for a primarily quantitative study (Morgan, 1997). Participants in the current group included a nurse, local authority administrative support staff member and a clinical psychologist all of whom were female. The participants were recruited by word of mouth and an email sent around a local authority team. Taking into account how the participants were recruited, their professions and the limited number of participants, it is acknowledged the group could not be as representative of the target population as hoped for.

Recruiting further participants to the group was limited by time constraints. Two separate applications to the ethics committees were required; one for the parent advisory group, then, after running the group, submission of a further application for the empirical part of the study was needed. Further, given that the task in the group was providing feedback on study materials (for the empirical part of study), once feedback from the group had been fully incorporated into the study materials these were submitted with the second application to the ethics committee meaning no
further adjustments could be made. The researcher was unable to delay recruitment for the empirical part of the study and therefore it was decided to run the group with three participants and not recruit additional participants.

**Empirical Study.**

In total, 79 participants were recruited to the main study, a lower number than was originally identified. It is considered there are a number of possible reasons for this. First, there was a significant delay in receiving ethical approval for the main part of the study. The application was made following the advisory group but as a result of changes in the structure of the ethics committee there was a delay of several months before the second application was reviewed and ultimately accepted. This shortened the time available for the researcher to recruit.

Second, out of 186 primary schools, nurseries and child care organisations contacted, only 13 responded and agreed to distribute the poster (Appendix 3). Four responded to say they were unable to help and the remainder did not respond. Of the 13 organisations that agreed, 12 had some affiliation with the researcher. The large proportion of organisations that did not respond limited the opportunities available to recruit participants to the study.

Third was the response to the advert placed online (Appendix 4). The researcher paid for an advert to appear on the homepage of a local Netmums site for one month (Netmums is a national website but is divided into local areas. Members are required to sign up to a particular local area). The local site was chosen for its high number of members and the availability of the advert slot. The advert was shown 3836 times, was clicked on eight times but no participants went on to take part in the study. This difficulty recruiting both online and via organisations is likely to have significantly contributed to the reduced sample size, but provides important information on the difficulties of recruitment by this method.
Attrition rates were extremely high in the current study. A large proportion of participants (89%) completed the measures (81% completed the asthma measure) but this number fell to 52 (65.8%) who viewed the first seminar (see Appendix 5 for graph demonstrating attrition rates). Only five participants logged back into the site to view a seminar for a second time (one participant logged in to view the tenth seminar three times). It is unclear however whether logging back in was because participants had not viewed the whole seminar or wanted to view it a second time. For those that did not click to view a seminar more than once, perhaps that was all they required? The majority did not click to view more than one seminar and only eight participants viewed all ten seminars. The implications around the difficulties recruiting and retaining people to the study are considered immediately below.

Additional Findings and Implications.

An interesting and unexpected outcome emerged from the parent advisory group which may have significantly impacted on recruitment to both parts of the study. It is well documented in the literature that children with asthma have more behaviour problems than non-asthmatic children (McQuaid, Kopel & Nassau, 2001). However, this came as a surprise to participants in the group who clearly indicated they were unaware of this association and had not considered it before. This was somewhat unexpected, particularly given the occupation of two participants in the focus group (clinical psychologist and a nurse) as it may be assumed they would be well placed to have an understanding of links between physical health issues and behaviour difficulties.

Initially, the association was rejected by the group participants but during further discussions the relationship was explored and participants then responded positively to the idea that asthma and a child’s behaviour may impact on one another. One participant became quite emotional during the discussion expressing relief at gaining
an alternative understanding of some of her child’s behaviours. As a result of the focus group, the participants expressed a keen interest in learning more about Triple P, which had not been present at the start of the group.

Following this the researcher reflected on the possibility that people may not be as aware of the link between asthma and behaviour as originally assumed but caution was applied given the very limited number of participants in the group. However, it appears the views expressed by the group were largely corroborated by responses (N=7) received via online parenting website forums and on the Asthma UK Facebook page (see Appendix 6 for comments). The adverts contained the same written content across all media but the online forums allowed individuals to make comments about what had been posted. It should be noted that the researcher did not respond to comments placed on forums so as not to influence recruitment. One individual responded positively about Triple P but was confused as to the aims of the particular study focusing on asthma. Only one person responded with support for the study.

In contrast to this single positive view, the remaining responses and comments demonstrated respondents’ confusion and disbelief at the idea that asthma and behaviour might be linked. In some cases respondents appeared irritated by the advert. The advert was removed from four forums following complaints. Email discussions with the editor of the relevant parenting forum sites indicated it was a particular sentence in the advert (‘children with asthma often have more behaviour problems than children without asthma’) that had caused people to complain. As a result, the ethics committee was contacted and subsequent adverts stated ‘children with asthma sometimes have more behaviour difficulties than children without asthma’. The editor of the parenting website agreed to continue to allow the advert to be placed on the various forums.

It is perhaps unsurprising that it was challenging to recruit participants if the idea of links between asthma and behaviour was both novel and rejected by many. For those recruited via their child’s school, they received a printed poster and therefore their
response to the advert was not available to the researcher. In terms of implications for the area of asthma and child behaviour, this significantly impacts on initial recruitment of participants. It would have been interesting to find out why those who registered for the study did so: -what were they hoping for and what were they expecting?

Participants in the parent advisory group commented that the diagnostic process and regular asthma monitoring appointments were predominantly medical in their content. This may be in part why little appeared to be known among potential service users about the relationship between asthma and behaviour. It may also indicate medical professionals do not know about the link either and highlights a potential area for future development. The author also considered whether this may have contributed to the high attrition rates. Participants may have been anticipating something other than a parenting programme, perhaps something addressing more medical concerns and therefore the interventions may not have seemed relevant.

The researcher wondered whether altering the content of the advert would have increased uptake to the study. The original advert was designed to provide some details around asthma, behaviour and Triple P but remained brief and to the point. Perhaps explaining that ‘behaviour problems’ incorporates internalising and externalising difficulties and providing individuals with examples of how these difficulties develop may have aided understanding and in turn the study may have appealed to a wider audience. Alternatively promoting positive ways to parent rather than being problem focused may have yielded a greater uptake.

It may have been assumed that the organisations contacted (e.g., schools and nurseries) would have an interest in parenting programmes and improving children’s behaviour. It is possible that the lack of understanding of this association was also a factor in the willingness of organisations to respond and distribute the advert, although it is acknowledged a number of other factors may have also contributed to this. The reluctance of many organisations to become involved in studies is an important
consideration for future recruitment. Understanding what is behind this reluctance would be extremely helpful for the implementation of future interventions.

**Strengths and weaknesses**

**Sample.**

A number of different methods were utilised to recruit participants. This ensured the study was available to large numbers of people from a wide range of sociodemographic backgrounds in urban and rural settings across the UK. Recruitment methods were far reaching but at the same time recruitment was limited to those organisations who agreed to disseminate the posters or those participants who used the online sites. The use of parenting forums to share, offer and receive help and ideas from others may appeal to a certain type of person and therefore the range of participants recruited may not have been as extensive as hoped.

The advert was placed on the ‘dad’s section’ of parenting forums, but predominant users of the parenting websites (in particular, as the name Netmums suggests) are female. This potentially limited the number of male caregivers recruited but does not allow any inferences to be made as to whether males would have signed up if the focus of recruitment was elsewhere or whether the sample would still have been predominantly female. White females predominantly made up the sample in the current research. This finding is in line with other web-based interventions which indicate that females generally are more active information seekers compared with males (Eysenbach, 2002). Verheijden, Jans, Hildebrandt, and Hopman-Rock (2007) examined determinants of engagement with a web-based weight management and lifestyle programme. Verheijden et al. found lower uptake among younger participants but not among males or those with less formal education. It may be considered that the demographics related to engagement with web-based programmes are related to the programme area.
Previous research has highlighted self-selection patterns created by internet access which results in greater proportions of white females with higher levels of formal education accessing interventions (Stopponi et al., 2009; Buis, Janney, Hess, Culver, & Richardson, 2009). Sub-groups within a population known to access web-based interventions less frequently may benefit from receiving programmes more specifically related to their needs.

Within the current study, between two thirds and three quarters of participants reported child behaviour intensity and problem scores below clinical cut-off levels. This indicates that a significant proportion of those engaged with the programme would be unlikely to come into contact with child services owing to child behaviour problems. One of the benefits of offering online interventions is their visibility and accessibility and that they are not associated with the stigma often attached to parenting programmes.

Research literature has highlighted that caregivers of asthmatic children have poorer psychological functioning; in particular, caregivers of asthmatic children are reported to have higher levels of depressive symptoms compared with caregivers of non-asthmatic children. Would caregivers with depressive symptoms have had the motivation to participate in the study? Information with regards to caregiver contact with mental health services was collected as part of the Family Background Questionnaire (FBQ; Zubrick et al., 1998) but in the interest of brevity and participant burden, more detailed symptom based information was not gathered. Gathering additional self-report data, although not always considered the most accurate method (Kaugars et al., 2004), may have helped provide information on whether the study attracted caregivers with poorer psychological functioning.

Research has indicated that asthmatic children are significantly more likely to come from lower socioeconomic status (SES) and ethnic minority backgrounds and live in inner city areas (Sandel & Wright, 2006). However, the majority of studies also utilised lower SES, ethnic minorities and those living in the inner cities in their samples. In the
current study, no analyses were carried out on the type of area participants lived in. Most participants responded that they ‘managed to get by’ financially. Just over half of participants indicated on the FBQ that they received benefits. It is unclear whether some may have been referring to child benefit, available to all parents, rather than to other government benefits intended to support families with very low incomes. It is unclear whether the demographics of participants in the current study are in line with findings in other population based research with regards to children with asthma, more representative of the demographics of individuals living in the UK or reflective of those motivated to take part in the study.

Methodological considerations.

The asthma specific information presented at the start of the intervention appeared to have no significant impact on continued engagement although high attrition rates made it difficult to draw any firm conclusions. Feedback from participants in the parent advisory group was helpful in ensuring whether the asthma specific information presented was appropriate although a larger sample size in the group would have ensured greater levels of confidence.

Gathering sociodemographic (Appendix 7), child behaviour (Appendix 8) and asthma information (Appendix 9) at the start of the study ensured data were collated for the majority of participants, even if they dropped out of the study. The researcher considered that being required to complete detailed measures at the start of the study before being given access to the intervention may have resulted in participants dropping out. Samoocha et al. (2011) reported that 17% of individuals who did not participate cited not wanting to fill out questionnaires as reasons for non-participation. However, in the present study only 11% dropped out before or whilst completing the measures. The design of the website required participants to complete every aspect of a measure before moving on. This ensured that completed measures were received by the 89% of participants who remained engaged and provided a rich source of data.
Participants were required to view the homepage (Appendix 10), read the information sheet (Appendix 11) and complete the consent form (Appendix 12) before being given access to the information and completing the measures. In a previous study examining engagement and retention of parents with an online parent training programme (Mansell, 2010), over half (65%) of participants dropped out following a built-in delay between registration and being able to access the seminars. This was a specific research strategy to identify specific participant characteristics that might be predictors of engagement. Participants in the current study were given access to all ten seminars immediately after completing the measures. This led to a slightly greater proportion (58%) clicking to view seminar one but a high number were still lost before the intervention.

The researcher considered whether the inclusion of asthma questions in the initial stages encouraged engagement. The questions were symptom and medication focused, which in light of feedback received about asthma and behaviour, is an area participants were familiar with. Enabling access to the seminars without a built in time delay probably helped increase the proportion of participants who clicked to view seminar one but a significant number were still lost. This highlights the importance of efficiency and ‘capturing’ participants. Understanding engagement with programmes remains an important aspect of offering web-based interventions that is not fully understood.

A significant concern was the high levels of attrition noted in the current study, whereby only 8 (10%) participants remained engaged to view all ten seminars. Engaging people long-term with web-based programmes is a difficulty cited by many researchers attempting to engage participants in such programmes (e.g., Neve, Collins, & Morgan, 2010; Samoocha et al., 2011; Strecher et al., 2008). Samoocha et al. (2011) reported that just 9% of the target population exposed to an invitation to participate in an intervention actually enrolled onto the programme. Strecher et al.
reported an average 18% increase in the likelihood an individual would disengage from their web-based intervention with every web-based section they opened.

The attrition figures in the current study are consistent with previous research and actually indicate a higher proportion was retained in the current study compared with figures reported in other studies (e.g., Christensen, Griffiths, & Jorm, 2009; Farvolden, Denisoff, Selby, Bagby, & Rudy, 2005) although it is acknowledged the target samples of the studies would likely impact on engagement. It is not known whether a sub-group of the population were aware of the link between asthma and behaviour and therefore welcomed the intervention or that the methodology of the study captured individuals who were motivated to participate or additional reasons. A limitation of the design meant it was not known whether participants viewed seminars in full or simply ‘visited’ them which is a consideration for all web-based interventions measuring continued engagement. Data with regards to this would be useful given the levels of attrition noted here.

The focus of the research was engagement with the programme and therefore follow up outcome data were not gathered. However, given the difficulties recruiting and engaging participants, further qualitative information on motivation for taking part, understanding of the study and reasons for drop out would have provided valuable information in the area of engaging caregivers with asthmatic children to parent training programmes. An additional factor that may have impacted on attrition rates was sending out the Triple P self-help book (Markie-Dadds, Sanders & Turner, 2001) as an incentive. This was done to encourage participation but it may have been more appropriate to send it after they had viewed the seminars as this may have encouraged participants to remain engaged and removed the possibility that participants stopped viewing seminars because the relevant information was provided in the book. Signing up to a study in order to receive incentives has been identified as a possible reason for high attrition rates in other studies (Samoocha et al., 2011)
Statistical Analysis.

Advice was sought to ensure the rationale for each statistical analysis carried out was sound. The relatively small sample size and high rate of attrition impacted on the statistical analyses conducted. Some groups were combined into larger groups to enable valid statistical tests to be carried out. Three variables (advert location, employment status and receiving benefit) were approaching significance when examining factors predicting engagement. The non-normal distribution of the dependent variable meant further regression analyses were not appropriate but highlighted areas for future examination.

However, given the exploratory nature of the current study, it was considered whether to conduct further analyses with those factors approaching significance. The dependent variable (number of seminars viewed) was not normally distributed therefore a multiple regression analysis was not conducted (to identify predictor variables). The researcher considered whether to carry out a logistic regression analysis. A number of the groups did not have the minimally sufficient number of ten participants needed to conduct a logistical regression and therefore a binary logistic regression was carried out examining engagement with the programme, 'yes' or 'no' (determined by whether participants clicked to view seminar one). In light of the significant attrition rates, the results should be considered preliminary.

Clinical Implications

A number of clinical implications have arisen as a result of the current study. The study highlighted the difficulties involved in engaging caregivers of asthmatic children but also in retaining them within the intervention. Ensuring the intervention is immediately accessible did not reliably ensure individuals stayed engaged until the first seminar. The significant number of individuals who dropped out at the early stages and did not return has been found in this study and other studies (e.g., Eysenbach, 2005). It suggests there may be some benefit in maximising engagement
strategies in the initial phase and perhaps front-loading key information in the early stages to ensure people are fully engaged and remain with the intervention.

Results from the current study appeared to indicate that more personalised recruitment strategies (e.g., letter from schools and messages on parenting website forums), yielded greater uptake than less personalised strategies, such as generic adverts. Strecher et al. (2008) reported that more personalised, highly tailored message sources were related to continued engagement. Waldorff, Siersma, Nielson, Steenstrup, and Bro (2009) reported that mailing reminder letters increased the probability participants would engage with a programme. A study by Lieberman (2006) aimed at developing a personalised guide which provided participants with stimulated reactions similar to those that might be expected within a therapeutic relationship. Participants who received feedback remained engaged with the programme for longer. Likewise, Lawrence et al. (2008) found that interactive tools providing tailored feedback positively impacted on outcome. This has also been found in other studies (e.g., Pike, Rabius, McAlister, & Geiger, 2007; Swartz, Noell, Schroeder, & Anj, 2006).

A recent systematic review of the literature examining characteristics related to engagement with web-based interventions reported that peer support, therapist feedback, contact (email/ phone) and updates of the website were related to better engagement (Brouwer et al., 2011). A vast body of literature exists highlighting the importance of the therapeutic alliance over the content or type of therapy offered in traditional face-to-face interventions (Lieberman, 2006). Web-based interventions are potentially extremely useful in that they are cost effective and can be disseminated widely (Graham, Milner, Saul, & Pfaff, 2008; Strecher et al., 2008) but the direct therapist alliance, shown to have a significant impact, is absent. Personalising interventions may be one way in which continued engagement is achieved.

In the current study the researcher paid for an advert to be placed on the homepage of a parenting website. The advert was seen by over 3000 people but did not result in any individuals engaging with the study. Data on the number of individuals who saw
the other adverts are not available and therefore caution is advised in interpreting the results but the content of the advert and the location impacted on uptake. Marketing and media promotion have been largely associated with public demand for an intervention (Graham et al., 2008). Online advertising is an extremely large business but the mechanisms involved to boost consumer demand for public health interventions is less well understood (Grilli, Ramsay, & Minozzi, 2002).

Graham et al. (2008) examined the effectiveness of various approaches to recruit smokers to interventions. The authors reported that humorous adverts were the most effective in reaching those less likely to participate in interventions and were also successful in recruiting those with less formal education. Adverts that focused on the importance of getting support did not increase the volume of males taking up the treatment although paid search adverts did recruit a higher percentage of males. As a result of the comments made in response to the wording used in the current study, a different message on the advert may have yielded a greater uptake. The message and the approaches used to appeal to the target audience, in this case caregivers of asthmatic children, may benefit from more detailed examination and investigation.

One of the most significant findings to result from the study is the lack of awareness of the association between asthma and behaviour difficulties in children. It was unrealistic to expect high levels of engagement with a parent training programme if the benefits were not obvious to those being recruited. Tackling the discrepancy between what is known in the research and what appears to be understood by caregivers in the population needs addressing.

A consideration in the current study is the characteristics of the group that responded to the study. Statistical analyses revealed no sociodemographic variables predicted engagement but it is possible that compared with the general population, there was little variability among the participants. One of the benefits of web-based interventions is their wide reach and the ability to impact at a population level. Reaching caregivers who would be unlikely to come into contact with services
highlights this. Attracting a wide range of individuals may help to reduce the stigma and acceptability of parent training programmes. However, it may also partially explain attrition rates. If the intervention was considered unnecessary, participants may be unlikely to continue.

The low recruitment rate has consequences for the representativeness of the sample. The majority of participants were recruited via online forums. It is possible caregivers on such forums were already seeking support making it more likely they would engage with the intervention. With the particular group that took part in the current study, the greater issue surrounds retaining them to the intervention. Further examination into the area could help identify whether drop out resulted from stigma attached to parenting interventions, whether the demographics of the group meant they did not feel they required additional support or whether it was linked with understanding of asthma and the ways in which the intervention could help.

**Future Research**

One significant finding to come out of the current research is the need to increase awareness and understanding of the association between asthma and behaviour problems in children. The relatively small sample size involved in both the parent advisory group and the main study mean that findings can only be considered preliminary. Future research examining parental understanding of behaviour difficulties in asthmatic children could examine whether caregivers provided with more information about the area, such as occurred in the advisory group, would be more likely to stay engaged with the programme.

Wider dissemination via the use of the internet and parenting forums appears on the face of it a good way to try and engage caregivers. However, the current research, and evidence from other studies highlights the difficulty in engaging and retaining participants with a web-based parent training programme. Understanding how caregivers of asthmatic children search for information, what would attract them to
take part and which features of the intervention would increase engagement would all facilitate understanding in the area. Findings in the research indicate personalised highly tailored recruitment messages, reminders, personalised feedback that closely mirrors feedback expected from a therapeutic relationship all enhances engagement with programmes.

There will always be a place for therapist delivered face-to-face interventions. However, web-based interventions have the potential to reach a large proportion, are cost-effective, easily accessible and a way of reducing stigma but still providing interventions. Understanding ways to maximise engagement with interventions is therefore prudent, particularly for a sub-group of the population for whom elevated behaviour problems have been identified.
References


Sandel, M. & Wright, R.J. (2006). When home is where the stress is: expanding the dimensions of housing that influence asthma morbidity. *Archives of Disease in Childhood, 91*(11), 942-948.


APPENDIX 1
Guidance for Authors

Papers one and two are stand-alone papers prepared for submission for Clinical Child and Family Psychology Review and the Journal of Pediatric Psychology respectively.

Paper One – Clinical Child and Family Psychology Review

Paper one is a literature review prepared as a standard review article. The journal was selected because of the reviews potential relevance in the field of child and family work and the clinical interests of the journal. The instructions for authors is summarised here but was downloaded from the journal website: http://www.springer.com/psychology/child+%26+school+psychology/journal/10567

The instructions for authors stated the following:

- The text should be typed double-spaced with generous margins on all sides.
- An abstract should be provided that is preferably no longer than 100-200 words.
- Directly underneath the abstract, a list of 4-5 keywords should be presented.
- Tables should be numbered with Arabic numerals and within the text should be referred to by the number. Illustrations are also to be presented with a consecutive series of Arabic numerals.
- References should be listed at the end of the paper and referred to in the text by the name and year. The style and punctuation should conform to APA guidance. The guidance recommends following the 1994 Publication Manual of the American Psychological Association (Fourth Edition).
- Footnotes should be avoided where possible. If necessary they should be numbered with Arabic numerals

NB The guidance does not include any instructions with regards to the size of the review either in word limit or number of pages.

Paper Two – Journal of Clinical Child and Adolescent Psychology

Paper two is an empirical study prepared for submission to the above names journal. It was written as a regular article. The journal was considered appropriate for the empirical paper because of its emphasis on the development and evaluation of assessment and interventions used with a child and adolescent population and its focus on cross-cultural and sociodemographic issues impacting on child and adolescent theory and practice. The instructions for authors is summarised here but was downloaded from the journal website: http://www.tandf.co.uk/journals/journal.asp?issn=1537-4416&linktype=44

The instructions for authors stated the following:

- The manuscript including all text, references, tables, diagrams etc should be prepared according to the guidelines set by the Publication Manual of the American Psychological Association (6th ed.).
- A regular article must not exceed 11,000 words including references, footnotes, figures and tables.
- Regular articles must include a title of no more than 15 words.
- It should include a structured abstract of no more than 250 words which include the following headings:

  Objective (brief statement of the purpose of the study);
  Methods (summary of the participants, design, measures, procedure);
Results (the primary findings of this work); and
Conclusions (statement of implications of these data).

Abbreviations, diagrams and references should be avoided in the abstract.

- Manuscripts should include detailed descriptions of participants (including age, sex, ethnicity and SES) and the discussion should make reference to the diversity within the sample.
- Authors should indicate how consent was obtained and report who granted ethical approval.
APPENDIX 2
Small changes, big differences

Does your child have asthma? Is your child aged between 2-8 years old?

Would you like to be involved in research looking at ways to support parents of children with asthma to manage their child’s behaviour more effectively?

If you have answered ‘yes’ to these questions, please contact Hayley Nixon

Hayley.nixon@postgrad.manchester.ac.uk or 07734822644
Small changes, big differences

Does your child have asthma? Is your child aged between 2-8 years old?

Children with asthma often have more behaviour problems than children without asthma. Parents often feel isolated and sometimes may find it hard to make sure their children stick to their asthma management plan.

Triple P is an international parenting programme that offers advice and parenting strategies that are effective and easy to use.

To receive your free Triple P book, please go to:

www.behaviourandasthma.org.uk
DOES YOUR CHILD HAVE ASTHMA?
IS YOUR CHILD AGED 2-8?

Triple P is an international parenting programme that offers advice and parenting strategies that are effective and easy to use.

To find out more and receive your FREE Triple P book, please go to:

www.behaviourandasthma.org.uk
Figure 5. Number of Participants Engaged at Each Stage of the Intervention

Appendix 6
The following comments were received by the researcher via online sites (Asthma UK Facebook page and various local Netmums sites). The comments have been anonymised but the repeated verbatim here.

- How do breathing problems affect a child's behaviour?
- my girl is 2 and a half and has asthma she has no problems a part from her breathing so how does it affect behaviour? never heard of that. 18th February, 2011
- Same here think my little boy is as cheeky and a menace like any other 4yr old. I have never heard of behaviour problems from asthma 18th February, 2011
- umm, im a nurse and work with children and have lots of experience with asthma, children with asthma do not have behaviour problems:) they are just 'normal' kids, what is your evidence based research that links the 2 things please??
- Thats a bit of a bold statement????? I dont have a child with Asthma but if I did I would not be impressed with your statement!
- emma says: Or they might feel relieved that someone is recognising the difficulties they face. Can't see what you took offence to myself.
- triple p is a fantastic programme to help parents with any kind of behaviour, mild or serious, sleeping, eating issues, with their children. i am confused as to why u only suggest that it may help asthma in kids as i think u r missing out on the point of the programme and ho fantastic it is. I recently completed a programme on triple p at my sons nursery, my son is 2 and my only problem was tantrums and now i can manage them successfully, other mums on the programme had more serious problems ie child not eating, child major tantrums/violence, child not sleeping at night etc etc it doesnt matter what extreme the problem is, the course is FANTASTIC, i cannot recommend it enuf, and i think that u r limiting interest by only suggesting it may help a childs asthma. The programme has totally changed my way of thinking and now my son also benefits as i feel i am a better mum and can deal with issues quickly and efficiently.
# Family Background Questionnaire

This questionnaire collects information about your family. Please read and answer every question in this booklet. All information provided will be held in strict confidence and will not be made available to any other source.

## Your Family

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>1. Child's name:</td>
<td>________________</td>
</tr>
<tr>
<td>2. Child's sex:</td>
<td>Male ( ) Female ( )</td>
</tr>
<tr>
<td>3. Child's age today:</td>
<td>_____ (years)</td>
</tr>
<tr>
<td>4. Child's date of birth:</td>
<td><strong><strong><strong>/</strong></strong></strong>/______</td>
</tr>
<tr>
<td>5. Your relationship to this child:</td>
<td>Mother (biological or adoptive) ( ) Father (biological or adoptive) ( ) Step-mother ( ) Step-father ( ) Foster mother ( ) Foster father ( ) Other (please describe) ____________________________</td>
</tr>
<tr>
<td>6. Your current marital status:</td>
<td>Married ( ) Divorced ( ) Separated ( ) Live in partner ( ) Never married/no partner ( ) Widow/er ( )</td>
</tr>
<tr>
<td>7. Which best describes the household in which your child is presently living?</td>
<td>Original family (both biological or adoptive parents present) ( ) Step family (two parents, one being a step parent) ( ) Sole parent family ( ) Other (please describe) ____________________________</td>
</tr>
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## Your Education and Employment

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>8. I have:</td>
<td>No qualifications ( ) GCSEs, CSEs, or O-levels ( ) A levels/ BTEC ( ) Trade/apprenticeship ( ) University degree ( ) Other qualification (please specify) ____________________________</td>
</tr>
<tr>
<td>9. Your partner's highest level of education (if applicable):</td>
<td>No qualifications ( ) GCSEs, CSEs, or O-levels ( ) A levels/ BTEC ( ) Trade/apprenticeship ( ) University degree ( ) Other qualification (please specify) ____________________________</td>
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<tr>
<td>10. Are you currently in paid employment?</td>
<td>Yes ( ) No ( ) If Yes, how many hours per week? _____ hrs Occupation? ____________________________</td>
</tr>
<tr>
<td>11. Is your partner currently in paid employment?</td>
<td>Yes ( ) No ( ) If Yes, how many hours per week? _____ hrs Occupation? ____________________________</td>
</tr>
<tr>
<td>12. What is the approximate combined total income for your family per week?</td>
<td>£__________ How would you describe your family finances?</td>
</tr>
</tbody>
</table>

## Ethnic Background

13. How would you describe your child’s ethnic background? Please circle one. | Answer |
<table>
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<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>White</td>
<td>Black Caribbean</td>
</tr>
<tr>
<td>Mixed</td>
<td>Black African</td>
</tr>
<tr>
<td>Indian</td>
<td>Other Black</td>
</tr>
<tr>
<td>Pakistani</td>
<td>Chinese</td>
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<tr>
<td>Bangladeshi</td>
<td>Other Asian</td>
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<tr>
<td>Other Asian</td>
<td></td>
</tr>
</tbody>
</table>

## Your Child's Health

14. Does your child experience any of the following problems:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Yes ( ) No ( )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) A vision or hearing impairment?</td>
<td>Yes ( ) No ( )</td>
</tr>
<tr>
<td>b) A severe chronic illness that results in regular hospitalisation?</td>
<td>Yes ( ) No ( )</td>
</tr>
<tr>
<td>c) A physical disability?</td>
<td>Yes ( ) No ( )</td>
</tr>
<tr>
<td>d) An intellectual disability?</td>
<td>Yes ( ) No ( )</td>
</tr>
<tr>
<td>e) A developmental delay?</td>
<td>Yes ( ) No ( )</td>
</tr>
<tr>
<td>f) A restrictive/therapeutic diet prescribed by a health professional?</td>
<td>Yes ( ) No ( )</td>
</tr>
</tbody>
</table>

If Yes to any of the above, please provide details ____________________________

15. Is your child having any regular contact with another professional or agency for emotional or behavioural problems? | Yes ( ) No ( )

If yes, please describe ____________________________

132
APPENDIX 8
## Eyberg Child Behaviour Inventory

**Directions:** Below are a series of phrases that describe children’s behaviour. Please (1) circle the number describing how often the behaviour currently occurs with your child, and (2) circle either “yes” or “no” to indicate whether the behaviour is currently a problem.

<table>
<thead>
<tr>
<th>How often does this occur with your child?</th>
<th>Is this a problem for you?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Seldom</td>
</tr>
<tr>
<td>1. Dawdles in getting dressed</td>
<td></td>
</tr>
<tr>
<td>2. Dawdles or lingers at mealtime</td>
<td></td>
</tr>
<tr>
<td>3. Has poor table manners</td>
<td></td>
</tr>
<tr>
<td>4. Refuses to eat food presented</td>
<td></td>
</tr>
<tr>
<td>5. Refuses to do chores when asked</td>
<td></td>
</tr>
<tr>
<td>6. Slow in getting ready for bed</td>
<td></td>
</tr>
<tr>
<td>7. Refuses to go to bed on time</td>
<td></td>
</tr>
<tr>
<td>8. Does not obey house rules on own</td>
<td></td>
</tr>
<tr>
<td>9. Refuses to obey until threatened with punishment</td>
<td></td>
</tr>
<tr>
<td>10. Acts defiant when told to do something</td>
<td></td>
</tr>
<tr>
<td>11. Argues with parents about rules</td>
<td></td>
</tr>
<tr>
<td>12. Gets angry when doesn’t get own way</td>
<td></td>
</tr>
<tr>
<td>13. Has temper tantrums</td>
<td></td>
</tr>
<tr>
<td>14. Answers back to adults</td>
<td></td>
</tr>
<tr>
<td>15. Whines</td>
<td></td>
</tr>
<tr>
<td>16. Cries easily</td>
<td></td>
</tr>
<tr>
<td>17. Yells or screams</td>
<td></td>
</tr>
<tr>
<td>18. Hits parents</td>
<td></td>
</tr>
<tr>
<td>19. Destroys toys and other objects</td>
<td></td>
</tr>
<tr>
<td>20. Is careless with toys and other objects</td>
<td></td>
</tr>
<tr>
<td>21. Steals</td>
<td></td>
</tr>
<tr>
<td>22. Lies</td>
<td></td>
</tr>
<tr>
<td>23. Teases or provokes other children</td>
<td></td>
</tr>
<tr>
<td>24. Verbally fights with friends own age</td>
<td></td>
</tr>
<tr>
<td>25. Verbally fights with sisters and brothers</td>
<td></td>
</tr>
<tr>
<td>26. Physically fights with friends own age</td>
<td></td>
</tr>
<tr>
<td>27. Physically fights with sisters and brothers</td>
<td></td>
</tr>
<tr>
<td>28. Constantly seeks attention</td>
<td></td>
</tr>
<tr>
<td>29. Interrupts</td>
<td></td>
</tr>
<tr>
<td>30. Is easily distracted</td>
<td></td>
</tr>
<tr>
<td>31. Has short attention span</td>
<td></td>
</tr>
<tr>
<td>32. Fails to finish tasks or projects</td>
<td></td>
</tr>
<tr>
<td>33. Has difficulty entertaining self alone</td>
<td></td>
</tr>
<tr>
<td>34. Has difficulty concentrating on one thing</td>
<td></td>
</tr>
<tr>
<td>35. Is overactive or restless</td>
<td></td>
</tr>
<tr>
<td>36. Wets the bed</td>
<td>1</td>
</tr>
</tbody>
</table>
**Information about your child’s asthma**

Please complete the following questions about your child’s asthma.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 How severe are your child’s asthma symptoms?</td>
<td>□ Symptoms occur less than once a week</td>
</tr>
<tr>
<td></td>
<td>□ Symptoms occur more than once a week but less than once a day</td>
</tr>
<tr>
<td></td>
<td>□ Symptoms occur daily but night-time symptoms occur less than once a week</td>
</tr>
<tr>
<td></td>
<td>□ Symptoms occur daily and night-time symptoms are frequent</td>
</tr>
<tr>
<td></td>
<td>□ Other (please describe)</td>
</tr>
<tr>
<td>2 How severe are your child’s asthma attacks?</td>
<td>□ Mild (breathless when walking, able to talk in sentences, moderate wheeze)</td>
</tr>
<tr>
<td></td>
<td>□ Moderate (breathless when talking, talks in phrases, loud wheeze)</td>
</tr>
<tr>
<td></td>
<td>□ Severe (breathless even when resting, talks in words, loud wheeze)</td>
</tr>
<tr>
<td>3 Has your child been prescribed preventer medication? (usually a brown or orange inhaler, sometimes a purple or red inhaler)</td>
<td>□ Yes</td>
</tr>
<tr>
<td>If Yes, please describe</td>
<td>□ No</td>
</tr>
<tr>
<td>4 Has your child been prescribed reliever medication? (usually a blue inhaler)</td>
<td>□ Yes</td>
</tr>
<tr>
<td>If Yes, please describe</td>
<td>□ No</td>
</tr>
<tr>
<td>5 In the last 12 months, has your child been prescribed prednisolone? (small pink tablets)</td>
<td>□ Yes</td>
</tr>
<tr>
<td>If Yes, please tell us how many times?</td>
<td>□ No</td>
</tr>
<tr>
<td>6 Has your child ever been hospitalised due to asthma difficulties?</td>
<td>□ Yes</td>
</tr>
<tr>
<td>If Yes, please tell us how many times?</td>
<td>□ No</td>
</tr>
<tr>
<td>7 Has your child ever been to accident and emergency (A&amp;E) due to asthma difficulties?</td>
<td>□ Yes</td>
</tr>
<tr>
<td>If Yes, please tell us how many times?</td>
<td>□ No</td>
</tr>
<tr>
<td>8 In the last 12 months, how many times has your child...</td>
<td>□ missed time from school due to asthma difficulties?</td>
</tr>
<tr>
<td>a.</td>
<td>□ made an unscheduled visit to the G.P due to asthma difficulties?</td>
</tr>
<tr>
<td>b.</td>
<td>□ been admitted to A&amp;E/hospital due to asthma difficulties?</td>
</tr>
<tr>
<td>9</td>
<td>□ No</td>
</tr>
</tbody>
</table>

In the last 12 months, how many times has your child...

a. missed time from school due to asthma difficulties?

b. made an unscheduled visit to the G.P due to asthma difficulties?

c. been admitted to A&E/hospital due to asthma difficulties?
APPENDIX 10
Small changes, big differences

Welcome and thank you for accessing our website!

As parents of children with asthma, we would like to invite you to take part in our study.

Please read the information sheet and decide whether you want to be sent a FREE Triple P book and have FREE access to our online Triple P seminars and asthma tip sheet. If you would like to ask any questions please use the contact form.

If you have already registered, please click here to log on.
Does your child have asthma?
Is your child aged between 2-8 years old?

Introduction

Asthma is very common. It affects about 1 in 10 children. Effective treatments are available, but parents of young children have to play a key role in both giving these treatments and following management plans. Parents of young children with asthma can struggle to administer treatment and deal with symptoms and challenging behaviour, especially when their child is unwell. This can make it more difficult for parents to manage their child’s difficult behaviour and can make giving treatment harder.

What is the purpose of the study?
Triple P is an Australian based skills training programme which offers parents suggestions and ideas on positive parenting to promote their child’s development. The purpose of the study is to find out whether the Triple P programme is helpful to parents of children with asthma.

Why have I been asked to take part?
Across the UK we are offering parents of children 2-8 years old who have been diagnosed with asthma, the opportunity to try out some of the positive parenting advice for themselves.

What will happen if I agree to take part?
We will ask you to complete some questionnaires about your family background, your child’s asthma and about their behaviour in general. This will take about 10 minutes to complete and will be completed on-line.

You will then see some brief information to read around behaviour and then you will be asked to fill in your address and will receive a Triple P self help book free in the post and have access to free online Triple P seminars.

If at any point you have any concerns regarding your child, you should contact your GP for advice.

Do I have to take part?
No, It is entirely up to you if you wish to take part or not. Not taking part will have no effect on the current treatment you receive from the health professionals involved in your child’s care. If you do decide to take part you can change your mind and withdraw from the study at any time you wish without affecting the care your child receives.

Will it be kept confidential?
All the information about you/ your child will be kept strictly confidential.
Because the group involves children and we are bound by child protection guidelines, you need to be aware that if you give us any information that led to concerns that a child might be harmed, we might need to break confidentiality and report this to the relevant authority, which may include the police. In these circumstances we will try to contact you first.

I am interested and would like to find out more...
Please contact: Hayley Nixon
Hayley.nixon@postgrad.manchester.ac.uk
Small changes, big differences

Does your child have asthma?

Is your child aged between 2-8 years old?

Consent Form

1. I have read and understood the Participant Information and Consent Form. I have been given enough time to consider my participation, ask questions and have had these answered satisfactorily.

2. I understand that all my personal information will be kept confidential and that the results of the study will be used for scientific objectives.

3. I understand that my participation in this study is voluntary and that I am completely free to withdraw my consent or refuse to participate at any time without giving a reason.

4. I understand that I am not waiving any legal rights as a result of signing this consent form.

5. I understand that there is no guarantee that this study will provide any benefits to my child.

To print this page, please click on the print button in your browser.

This project has been approved by the School of Psychological Sciences Research Ethics Committee.

Research Ethics Committee
School of Psychological Sciences
The University of Manchester
Oxford Road
Manchester
M13 9PL